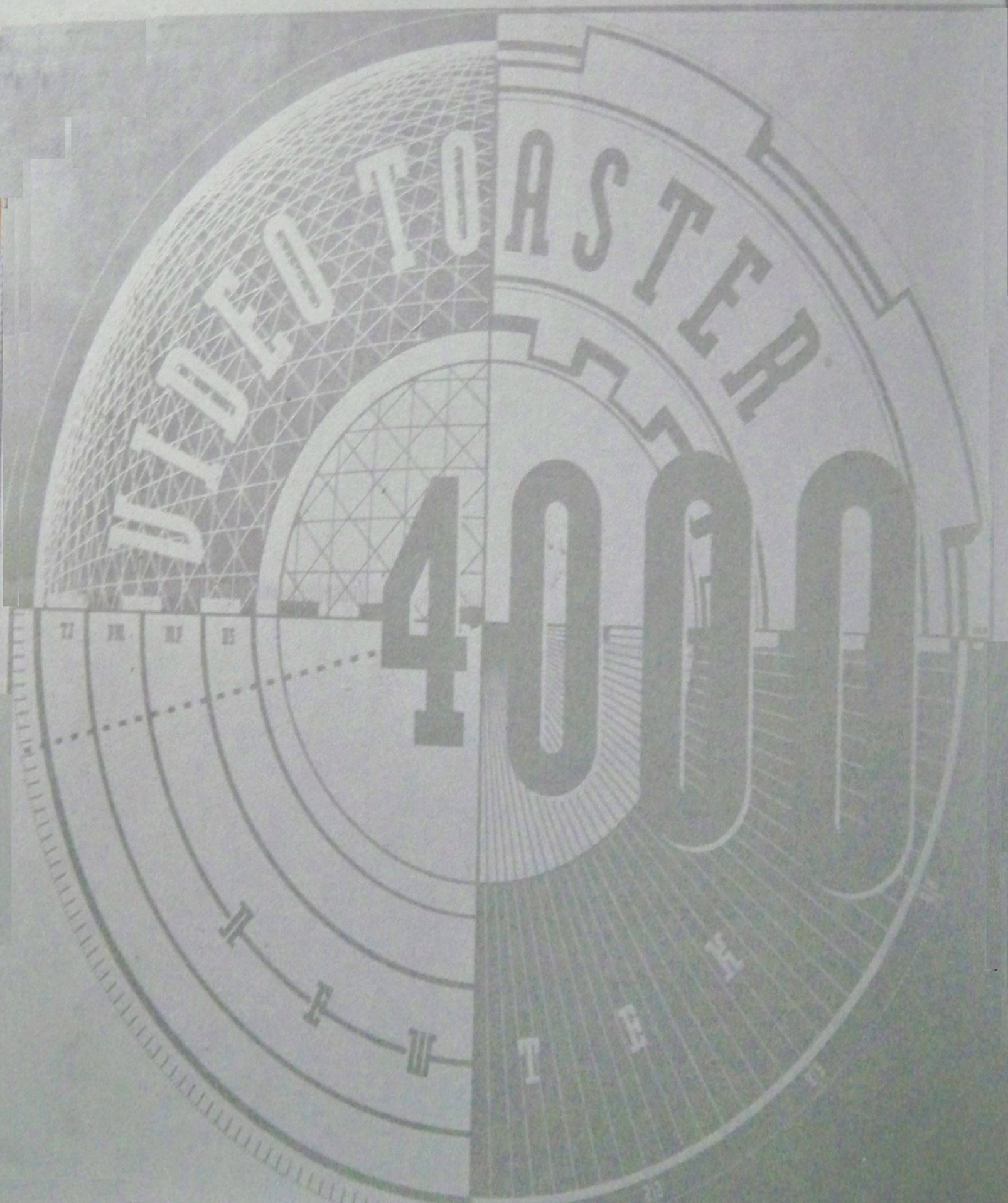
VIDEO TOASTER® 4000



Important! Last-Minute Changes

About System 4.0

Read these notes before operating your Video Toaster Flyer! The following items explain a variety of changes that have occurred throughout the System 4.0 software release.

- The most important change comes in the form of two additional installation steps that were not included in the manual: autohueing your Toaster and calibrating your Flyer. Make sure that you perform these two steps *after* following all of the other installation steps and *before* you start the new software.
- Other changes affect various Toaster video graphic applications, as listed on the following pages.

Installation Step J: How to AutoHue and Calibrate Your Toaster/Flyer Installation

Before you start System 4.0, you'll need to AutoHue your Video Toaster (to match the digital framebuffers) and calibrate the Flyer (to match the playback channels). After these steps, you'll be able to run System 4.0! (If you skip these steps, your Flyer will not record and play back video with correct color.)

Here's how to do it.

Part 1: AutoHue the Toaster

Requirements:

- A stable video source on input 1.
- If you have the original Toaster card, a video cable connecting the main out to input 2. (Note: In previous versions of software this was input 4.)
- If you have the Toaster 4000 card, you need no additional cabling.

1. Double-click on the drawer where you installed the Toaster 4.0 software.
2. Double-click on the Programs drawer.
3. Double-click on the AutoHue icon.

Follow the on-screen messages, if any.

You will see a great deal of screen flashing. When the process is complete, your system has been fine tuned.

Note:
If the system repeatedly requests that you perform AutoHue, try a different video source on input 1.

Note:
Once your system has been autohued, you should not need to re-run the AutoHue program again unless you notice a distinct difference between the color match of the digital channels.

Part 2: Calibrate the Flyer

Requirements:

- A stable video source on input 1.

1. Double-click on the drawer where you installed the Toaster 4.0 software.
2. Double-click on the Programs drawer.
3. Double-click on the FlyerCalibrate icon.

Follow the on-screen messages, if any. The process will take several minutes (it may even appear to have stopped while internal adjustment are made). Do not attempt to use the computer during calibration, as this may cause incorrect adjustment of the Flyer. As with AutoHue, you will see a great deal of screen flashing. When the process is complete, your system will have been calibrated.

4. When you see the message "Press Return to exit," do so. You are now ready to run System 4.0.

Note:
If your Flyer fails to calibrate correctly, the ribbon cable (from the Flyer to the Toaster) may be damaged. If you can, test this at your dealer. Otherwise, contact Technical Support for a replacement.

Note:
Once your system has been calibrated, you should not need to re-run the FlyerCalibrate program again unless you notice a distinct difference in the color match of the two channels used for Flyer playback (inputs 3 and 4).

Errata:
NewTek and Technical Support Information

The information in the 4.0 Manual was inadvertantly taken from an earlier manual and has the incorrect phone numbers and address for NewTek and Technical Support. Make note of these changes so that you do not use the old information.

Executive Offices

9-5 Central Standard Time

1200 SW Executive Drive
Topeka, KS 66615

Voice	(913) 228-8000
FAX	(913) 228-8001
Customer Service	(800) 847-6111
Dealer Sales	(800) 368-5441
Dealer FAX	(913) 228-8099

Technical Support

9am-1pm, 2pm-5:30pm Central Standard Time

Voice	(913) 228-8282
FAX	(913) 228-8222
BBS	(913) 271-9299

Errata: Introduction/Installation

Installation Change

The option to Update Toaster software is no longer part of the installation.

Also, a new step has been added. The install porgram will ask you "Do you want to install the Flyer software?" Answer Yes or No, as appropriate. (Do **not** answer Yes if you do not have a Flyer. Doing so will only cause additional files to be copied to your system that you cannot use. Don't waste the space.)

New Amiga-to-Toaster Keyboard Command

On page 11, the 4.0 manual incorrectly identifies the keyboard shortcut for jumping from the Toaster software to the Amiga Workbench. The command is different than it was in previous releases of Toaster software.

The correct way to go from any of the Toaster editor screens to the Amiga Workbench is to hold the **Left Amiga** key and press the letter **m** on your keyboard. To return to the Toaster software, use the same keystroke.

Installation Chart

Two of the entries for installation have incorrect procedures listed.

- Under the **Amiga 3000** listing, the option **Install <u>both</u> Video Toaster and Flyer** should show procedures D, B, F.
- Under the **Amiga 2000** listing, the option **Install <u>both</u> Video Toaster and Flyer** should show procedures D, A, E.

Errata: Tutorials

ToasterPaint Tutorial #1

Skip Step 4 (where you adjust the aduio playback level). There is no such control in ToasterPaint. We don't know what we were thinking.

Modeler Tutorial #1

Skip Step 4 (where you adjust the aduio playback level).

Modeler Tutorial #4

Skip this tutorial. It in another version of Tutorial 3.

Errata: Sequencer/Switcher

Alternate View for Files Windows, Page 5

The keyboard command to change views is the **Right Amiga** key..

Specific Usage Tips, bottom of Page 10

The keyboard command to change views is the **Right Amiga** key..

Errata: Appendices

Appendix 13: SMPTE Support

1. Currently the Flyer does not output time code during playback.
2. When recording to the Flyer, use serial cable A for time code input.
3. The Flyer does not support LTC. Rather, it supports serial time code. (For this reason, an LTC-to-serial time code translator is recommended, such as the Horita model mentioned in the appendices.)
4. If your equipment uses VITC only, you can use a combination of two devices to input time code to the Flyer: a VITC-to-LTC converter connected to an LTC-to-serial translator. Again, Horita manufactures such equipment. Or, see your dealer.

New Appendix: Audio Support for Professionals

The audio levels on the Flyer (i.e., consumer style which uses RCA connectors, and is a -10dBv unbalanced signal) are different from the audio levels used by BetaCam VCRs (professional style which uses XLR connectors and is a +4dBu, balanced signal).

A balanced to unbalanced converter is necessary to convert from one standard to the other. Y/C Plus manufactures such a device. Contact them at the phone and address below.

Y/C Plus, Inc.
310 SW 6th Avenue
Topeka, KS 66603-3109

Voice 913/235-5014
FAX 913/235-3485

Sequencer/Switcher Notes

Video Clip Length

How Long Can a Video Clip Be?

Any length is fine. However, a bug causes a problem when you drag the slider through a clip that is longer than 9 minutes (the audio playback is lost). You can always use the numeric time code gadgets to jump to other locations in a clip if the slider becomes inoperable.

How Short Can a Video Clip Be?

Currently, video clips cannot be edited so that they are less than 10 frames (or 00:00:00:10), or 1/3 of a second.

Exiting (Shutting Down) Toaster Programs

To shut down ChromaFX, ToasterPaint, ToasterCG, or LightWave 3D, hold the Shift key on the keyboard and select that program from the pop-up Programs button on any main editor screen.

Flyer Stills

System 4.0 introduces a new concept called the "Flyer still."

In previous versions of Toaster system software, when you saved a still frame to the Amiga drive you were saving a file in a special format called a *framestore*. All Toaster applications had this option.

With the Flyer software, you have the option of saving a still frame as either a *framestore* (on the Amiga drive) or a *Flyer still* (on a Flyer video drive). You can make Flyer stills from the Process panel of any clip, by dragging the in and out sliders so that they are side by side. When they are in contact, they define a single four-field clip, a Flyer still. You can also make Flyer stills from ToasterPaint, using the Arexx script **MakeStill**.

When you select one format or the other, keep this in mind: The major difference between the two kinds of files is directly related to sequencing a video project. Flyer stills can be loaded more quickly than framestore images. An additional benefit of this is that not only do Flyer stills load more quickly when sequencing, they also take up less hard drive space. A Framestore image that is 686K in size becomes a Flyer still around 362K in size.

Audio Clip Length

How Long Can an Audio Clip Be?

Audio clips do not have a limit on length (other than the amount of audio a hard drive can hold).

How Short Can an Audio Clip Be?

Currently, audio clips cannot be shorter than about 10 frames (or 00:00:00:10), or 1/3 of a second.

How Transitions Work

Special effects, also called transitions, overlap the ends of two video clips (the two clips which sandwich the effect on the project storyboard) equally. This means that approximately one-half of the effect occurs over the end of the previous clip, and one-half occurs over the beginning of the next clip.

For this reason, clips *need* lead-in time (if you're familiar with video, you might think of this as pre-roll time) in order to allow for the transition. We recommend about 3-5 seconds of excess time on all clips (this excess can always be trimmed later if if you don't use many transitions and drive space becomes critical). Just in case, always try out the newly trimmed clip in the project sequence first, before removing the original file to make more space.

Split Audio Requirement

In order to use split audio edits, you *must* have an audio drive connected to SCSI chain C of the Flyer.

Maintaining Unity Gain when Recording and Playing Back Audio

In order to maintain unity gain (or near-unity gain) levels for audio, you should:

(a) Record audio into the Flyer at the optimum record level. This is the default setting for the audio sliders. However, very high or very low level audio may require adjustment to achieve better levels.

(b) Set clip playback levels to 95%.

Operating CG Key Pages Manually

A recent change in the Sequencer/Switcher now allows you to operate the fade-in and fade-out rate of a ToasterCG key page manually, using the T-bar.

In the Project/Switcher display, when you select a key page, it will autoload into the Superimpose bus, ready to be displayed. If you wish to dissolve it on screen manually, simply drag the T-bar down. To dissolve it off screen manually, drag the T-bar once again.

See the Sequencer/Switcher manual for further information on how to display key pages.

Seq./Switcher Notes (cont.)

ARexx

The following scripts were added to the editor. They work like any crouton, and can be dragged into a project (note that not all were designed for sequencing, so they may not work in this manner). Double-click to run.

FlyerStopFrame.rexx
Requires GPI trigger hookup. Records 1 frame each time it is triggered. Between grabs, will half-dissolve live and frozen images (for reference). Each frame is added to a Flyer clip (whose name you provide). (Note that you cannot quit the script early, it must complete.)

FlyLaps.rexx
Sample script. Makes a time lapse clip recording.

Haiku.rexx
Just for fun.

IFF2Clip.rexx
Creates a Flyer clip out of a sequence of IFF images (in the format **filename.###**). This is faster than using Toasterpaint.

Import.rexx
Loads and displays any graphic to framebuffer DV1. Less than full-screen graphics will be stretched to fill the screen while maintaining the correct aspect ratio.

RePlay.rexx
Causes a project to begin playing from the beginning. Useful for repeating kiosk applications. There will be a delay between repeats.

StopFrame.rexx
Requires GPI trigger hookup. Records 1 frame each time it is triggered. Between grabs, will half-dissolve live and frozen images (for reference). Images are saved as IFF 24-bit images with the filename format **filename.###**. (Note that you cannot quit the script early, it must complete.)

TimeLapse.rexx (does not require Flyer)
Will grab frames at user-specified time interval (in minutes only). Images are saved as IFF 24-bit images with the filename format **filename.###**.

How to Run ARexx Scripts from the Editor

To run the ARexx scripts that are a part of the Sequencer/Switcher, navigate to the Editor directory (Toaster:ARexx/Editor) and double-click it.

Most of the scripts will bring up a control panel for you to utilize.

Note: These scripts are **not** meant to be included in sequences, as they require direct feedback and will probably interrupt playback.

How to Remove Jitter from a Flyer Still

1. Drag the still into the project window.
2. Go to the Switcher/Files view.
3. Double-click on the still to display it.
4. Click the Freeze button.
5. Drag the pointer over the Stabilize button and select one form of image stabilization.
6. Press the key **beside** the number 1 on top of the keyboard (it has a tilde symbol on it, like this: ~) to bring up the New Clip panel.
7. Select Main Out as the input source.
8. Record a few seconds of the still image.
9. Go to Make Clips, and continue with the process of defining this clip. If you wish, you can then go into the clip and create a Flyer still from it.

General Notes

FlyerFormat TroubleShooting

If, when you run FlyerFormat, the program appears to "hang" while looking for drives, usually there is one of two possible problems present. Either a non-standard CD-ROM is connected to the system, or your SCSI cabling or termination is the culprit. Most of the time, this will occur after you have disconnected and reconnected your drives, or added a new drive to the system.

First, while the system is still on and FlyerFormat is looking for drives, try turning off the power to your CD-ROM drive (if it is an external drive). If FlyerFormat does not show the remaining drives after a moment, reboot the system and try FlyerFormat again (this time without the CD-ROM turned on). If this works, then your CD-ROM may be unsupported somehow, or its SCSI cabling or termination may be wrong. You will have to check each of these things to see which is causing the problem.

Second, if your CD-ROM appears to be fine, it's most likely that your SCSI cables are improperly terminated, or a cable is loose, or a cable is bad. SCSI termination is critical for the Flyer. You may wish to disconnect all drives from the Flyer and reconnect them, one at a time, each time running FlyerFormat to make sure that this drive can be found. If you just added or changed the drive configuration, check the items you've changed. They're the most likely cause.

FlyerFormat Tip

Did you know that you can use FlyerFormat to find out what hard drives are connected to a system, and what their SCSI ID numbers are (without having to format them)? Just run FlyerFormat and read the drive display that comes up. It will tell you the SCSI ID number, drive make, drive model, Flyer format type, and drive name for each drive connected to the Flyer.

ToasterPaint Notes

The following buttons and their functions are not included in ToasterPaint 4.0 (although they appear in the manual):

Save 4-bit Alpha
Save 8-bit Alpha
Straight Line Tool (use the Polygon Tool instead. A left-click starts drawing a line. A right-click will complete the line.)

The **Smoothing** button on the Trans/Warp panel was renamed to **Antialiasing**.

The following ARexx scripts are included with ToasterPaint:

BlurVignette.rexx (works on clips and images)
Blurs the outer edges of the screen in an oval shape.
BronzeClip.rexx (works on clips and images)
Makes the screen appear bronzed in color.
BWBorderVign.rexx (works on clips and images)
Makes a black-and-white border edge of the image with the full-color version framed within.
Clip2IFF30.rexx (works on clips)
Converts the selected clip to a sequence of IFF 24-bit frames.
Clip2IFF60.rexx (works on clips)
Converts the selected clip to a sequence of IFF 24-bit fields.
Clip2IFFfm.rexx
Converts the selected clip to a sequence of IFF 24-bit framestores.
Colorize.rexx (works on clips and images)
Will tint the screen using the current color.
ColorVignette.rexx (works on clips and images)
Will make an oval shaped black-and-white vignette (the center of the screen remains in color).
CopyClip.rexx (works on clips)
Makes a copy of the selected clip.
DSpeed.rexx (works on clips)
2x-speed. Makes a new clip that is one-half as long as the original (twice as fast).
DSpeed4.rexx (works on clips)
4x-speed. Makes a new clip that is one-fourth as long as the original (four times as fast).
DSpeed8.rexx (works on clips)
8x-speed. Makes a new clip that is one-eighth as long as the original (eight times as fast).
Export.rexx (works on images)
Exports current screen to another file format (file requester allows you to choose).
HalfSpeed.rexx (works on clips)
Makes a new clip that is twice as long as the original, so that it plays back more slowly.
IFF2Clip.rexx (works on images)
Converts a sequence of numbered IFF files to a Flyer clip. Filename format must be **filename.###**.
Import.rexx
Imports files of most any format (JPG, PICT, etc.).
MakeStill.rexx (works on images, but must be selected and processed from the clip processing buttons)
Makes a Flyer still from the current image.
Negative.rexx (works on clips and images)
Makes a negative image of entire screen.
NegVignette.rexx (works on clips and images)
Will make an oval shaped negative vignette (the center of the screen remains in color).
ReRead.rexx (works on clips and images)
Will update the rexx pop-up menu (rereads the directory in case you have added new scripts while paint was running).
Sepia.rexx (works on clips and images)
Converts screen to sepia toned image.
SepiaVignette.rexx (works on clips and images)
Will make an oval shaped sepia-tone vignette (the center of the screen remains in color).
Skeleton.rexx
Does nothing. A skeleton clip process script that you can edit to make use your own processes.
TPBalls.rexx (works on clips and images)
Sample script. Makes a series of small balls on screen.
TPEpsLoad.rexx (works on clips and images)
Similar to the EPS load script found in ToasterCG. However, it will ask for the height of the brush you want created. Aspect ratio is always preserved. Note: not all EPS artwork may be supported.
TPLenses.rexx (works on clips and images)
Sample script. Makes a series of lens-like squares on the screen.
TPMirrorL-R.rexx (works on clips and images)
Takes the left half of the screen and reverses it over the right half.
TPMirrorR-L.rexx (works on clips and images)
Takes the right half of the screen and reverses it over the left half.
TPPads.rexx (works on clips and images)
Sample script. Uses current gradient colors to make pad-like tile shapes on screen.
Write2.rexx (works on clips and images)
Writes current image to two fields of a Flyer clip.
Write4.rexx (works on clips and images)
Writes current image to four fields of a Flyer clip.
Write8.rexx (works on clips and images)
Writes current image to eight fields of a Flyer clip.

Note:
When ToasterPaint writes to Flyer clips (either through the Save Clip button or through an ARexx script), it always generates a complete clip (i.e., it opens the clip file, writes in the new data, and closes the file). You do not need to "close" or "quit" writing to a Flyer clip, since ToasterPaint handles this automatically after each access.

ToasterPaint Notes (cont.)

Keyboard Command Changes

The following keyboard commands have been added or altered in System 4.0.

Shift+a	Transporter Draw Mode (requires air brush)
i	Write current screen to Flyer clip (adds 1 field to the clip. Note that 4 fields are required to add a full frame.)
Shift+i	Generates crouton with image matching current screen for Flyer clip.
Shift+u	Toggle global fill mode
F1	Toggle Tools and Trans/Warp panels

ToasterCG Notes

New Arexx script: EPS load

This new Arexx script, EPSload, allows you to load Encapsulated PostScript files into ToasterCG.

First, you drag out a box graphic on screen. Then you run the EPSload script (either press the correct Alt+Fkey combination if you have it assigned to an function key, or press Alt+F1 and select the script from the ARexx launch requester).

Import will ask if you wish to maintain the aspect ratio of the original image. If you want the image in ToasterCG to look as closely as possible to the original, select Yes. If you'd rather squeeze the image to fit the box exactly, select No.

After a moment of processing, the image will be fitted to the box. It will also be saved to the Brushes directory of your Toaster software, so that you can reuse it in other graphics, or reload it if you return to edit this page further.

Important!
If you select a box graphic from the screen to load an EPS graphic, make sure that you have selected the box correctly! To be safe, click on the box twice. The first click places a text cursor for CG entry (the box changes color and looks like it is selected, but it is not). The second click actually activates the box (and removes the text cursor). Also, if you look at the font pop-up, you'll see the word **Box** when the box is selected.

New Arexx script: Import

This new Arexx script, Import, allows you to load a wide variety of image files into ToasterCG (including Targa, TIFF, PCX, BMP, PICT, and more).

It works in similar fashion to the EPSload script. First, you drag out a box graphic on screen. Then you run the Import script (either press the correct Alt+Fkey combination if you have it assigned to an function key, or press Alt+F1 and select the script from the ARexx launch requester).

Import will ask if you wish to maintain the aspect ratio of the original image. If you want the image in ToasterCG to look as closely as possible to the original, select Yes. If you'd rather squeeze the image to fit the box exactly, select No.

After a moment of processing, the image will be fitted to the box. It will also be saved to the Brushes directory of your Toaster software, so that you can reuse it in other graphics, or reload it if you return to edit this page further.

Important!
If you select a box graphic from the screen to load an EPS graphic, make sure that you have selected the box correctly! To be safe, click on the box twice. The first click places a text cursor for CG entry (the box changes color and looks like it is selected, but it is not). The second click actually activates the box (and removes the text cursor). Also, if you look at the font pop-up, you'll see the word **Box** when the box is selected.

LightWave 3D Notes

Scene panel

Show, Hide pop-ups

These two buttons globally show or hide items in Layout. There are three options: All Objects, All Bones, All Lights. After selecting one of these you will notice the item's visibility state will change accordingly.

Objects panel

Bones

(This should fit into the Limited Influence text as it is currently.) ...Limit this region of influence by activating Limited Range and entering a minimum and maximum range for the bone. The influence of the bone will be at full strength anywhere inside the minimum distance from the bone. The range of the bone will fall-off gradually until it is equal to 0 at the maximum distance.

Unseen by Rays

This option utilizes LightWave's ability to selectively ray trace. When an object is unseen by rays, it will not be ray traced during rendering. This saves time during rendering by telling LightWave to ignore non-essential objects when calculating reflections, refractions, and shadows.

Reflection Options

The reflection options panel allows greater control of LightWave's calculation of reflections. These options reflect: Backdrop Only, Ray Tracing+BackDrop, Spherical Reflection Map, and Ray Tracing+Reflection Map.

Backdrop Only

This surface reflects only the colors in the backdrop.

Ray Tracing + Backdrop

This surface reflects any objects in the scene as well as the backdrop colors.

Spherical Reflection Map

This surface reflects the selected image as a spherical reflection. (Note: With spherical reflection mapping, use the Image Seam angle field to rotate the image in order to hide edges of a non-repeating image).

Ray Tracing + Spherical Map

This surface reflects both an image (that you select to be spherically mapped) and any objects in the scene. This is useful for scenes that use a background image, or for creating complex realistic-looking reflections without a lot of object detail in the scene.

Shadow Alpha

Useful for compositing animation elements with live action. By activating Shadow Alpha and Save alpha, the alpha channel will contain information for the shadow only. Let's look at an example.

To make an animated character blend into a live-action scene, it needs to cast shadows on its live-action "surroundings." To accomplish this you create some objects that roughly mimic the live action background. These objects will be surfaced with black (no diffuseness) and have Shadow Alpha turned on. Surface the animated character as you normally would. The end result?

- In the alpha channel is a black image with white areas representing the 3D character and its shadow.
- In the RGB image is a black image except for the 3D character which would be its normal colors.

When you composite the RGB, the alpha, and the live-action footage, you end up seeing an animated character with shadows that conform appropriately to the background image.

Glow Effect

Activating the Glow button will cause that surface to glow according to the Glow Settings on the effects panel. See Glow Settings in the Effects section for a more complete description.

Images panel

Load Image pop-up

You can now load Flyer clips from Flyer video drives.

Flyer Clip Parameters

This section of the image panel makes it possible for you to tell LightWave which portion of a Flyer clip to use. Drag the mini-sliders to set the first and last frame values. LightWave will then treat the clip like an image sequence. For example if you set the first frame value to 2 seconds 15 frames (00:00:02:15), LightWave would use that frame for its first rendered frame (frame one), then LightWave would move on to 2 seconds 16 frames for frame 2 and so on until it reached the last frame.

There is a window directly beneath the the First Frame/Last Frame fields that contains information about the clip you have selected. The window will tell you the name of the clip as well as the clip's duration in standard SMPTE format.

Lights panel

Global Flare Intensity

Global Flare Intensity provides a simultaneous envelope control over *all* lens flares in a scene.

The default value is 100%. At this setting all flares will have their normal intensity. This control functions as a percentage for all flare intensities. In other words, if you have a flare set to 30% intensity, and the global flare intensity is set to 50%, the actual flare intensity would be 15%.

This is a useful feature when creating scenes such as explosions, where many flares of different intensities need to ramp up or down together. It could also be used for a city blackout where building and street lights shut off simultaneously.

Lens Flare Options

Anamorphic Distort
This button was previously named Anamorphic Squeeze. It functions in the same manner, but now has a Distortion Factor option.

Distortion Factor
The DF value works as an aspect ratio for the flare. The fault value, 1.77, causes LightWave to calculate the flare's width to be 1.77 times greater than its height. (Note that 1.77 is the default value for the original Anamorphic Squeeze, which did not have a DF option.)

If the value of the distort were set to 3, the flare's width would be 3 times greater than its height. If you want to distort the flare vertically, simply use a fraction less than 1. For example, a distortion factor of .3 would cause the flare's width to be one third that of its height.

Note:
Distortion factor is always based on the height of the flare, so when a distortion factor greater than one is used the flares total volume will get larger, but when a value less than one is used the flare's volume will decrease.

Streak Intensity
This value is a percentage the brightness set by Central Glow. It affects the intensity of the lens flare's streaks. (If Central Glow is 100% and this is 50%, the streak intensity will be 50%.)

Streak Density
This number is multiplied by a fractal value that will result in an approximate number of streaks (i.e., a value of 50 will result in a number of streaks around 50).

Streak Sharpness
This relates to the falloff of each streak. A higher value makes for very sharp-edged streaks (to the point of appearing jaggy if too sharp). A lower value makes for very wide, soft-edged streaks. A value of 0 makes for infinitely wide streaks, probably not a useful number.

Camera Panel

Pixel Aspect
This is a custom pixel aspect setting that allows you to set the aspect ratio (height to width) to match other footage or display devices.

Effects Panel

Image Compositing
This button displays a screen specifically for compositing images and image sequences. There are three image requesters: one for Background Image, one for Foreground Image, and one for Alpha Image. There are also Foreground Dissolve and Foreground Key controls, with high and low key color fields. See manual for descriptions of each.

Gradient Backdrop
When on, this button switches on the gradient background color buttons (and rendered images show gradient background colors). When off, this button tells LightWave to use a solid backdrop color (chosen from the backdrop color requester).

Fog Type
This pop-up gives you the choice of three fog types: Linear, Nonlinear1 and Nonlinear 2. Nonlinear 2 offers a slight variation on the fog falloff curve so that the fog amount increases more quickly closer to the camera.

Glow Options

Enable Glow Effect
Glow can be assigned on a "per surface" basis, however glow's parameters (intensity and radius) are global. Glow is a post-process operation. Therefore you cannot have varying levels of intensity and radius on a single image.

Glow Intensity
This field allows you to enter a number between 0 and 100% that will adjust the amount of glow around an object. Note that 100% means the first pixel around an object will have a glow equal to the edge of the object, the remaining glowing pixels will fall off from there.

Glow Radius
Enter a number in this field to tell LightWave how far you want the glow to extend (in pixels) outward from objects in the scene.

For example, a value of 8 results in a glow extending 8 pixels from the object. A setting of 24 increases the spread to 24 pixels.

Note that different resolutions will cause drastically different results with the glow effect. 8 Low Resolution pixels are much larger on screen than 8 High Resolution pixels. Keep this in mind when doing render tests at lower resolutions.

OutPut FileName Format
This pop-up lets you choose among several different filename output formats. This allows you to manipulate imagery on a variety of platforms. The options are Name001, Name0001, Name001.xxx, and Name0001.xxx (xxx represents a 3 character extension such as TGA, BMP, PCT, etc.).

Name001 and Name0001 are standard naming conventions for Amiga programs and should be used as such.

Name001.xxx and Name0001.xxx are the standard "eight-dot-three" naming convention that Windows programs require (eight characters for the name, a period, then three characters for the file type). The three-character extension tells other programs what kind of file it is without having to open it to find out.

Important!
Many Windows NT machines have their hard disks partitioned as NTFS. If if this is the case, you are not limited to the eight-dot-three filenames. For regular Windows users there are also third-party add-on programs that will break the eight-dot-three barrier.

Silicon Graphics computers also like to have file extensions although they are not limited to 8-character filenames.

Saving Animations as Flyer Clips

With the initial release of System 4.0 software, you have received version 3.5 of LightWave 3D. This version of LightWave does not fully support the Flyer yet.

You will receive a **free** update to LightWave 4.0 when it is released (soon after the Flyer release). That version will support the Flyer for both reading and writing video clips.

However, a "back door" has been added to LightWave 3.5 that allows you to save LightWave animations as Flyer clips. Here's how to use it.

1. Set up your animation as usual.
2. When you are ready to render the animation, go to the **Record** panel.
3. Set the **ANIM Type** pop-up to **Medium Resolution Preview (VT4000)**.
4. Select **Save ANIM File.** Choose the Flyer video drive where you want to save the animation.

Important!
Do **not** select the Flyer drive using its **device name!** (i.e., FA0:, or FB0:, etc.) You **must** select the drive by its volume name (i.e., FlyerA, FlyerB, whatever). Otherwise, the animation will not be saved properly.

5. Enter a name for the animation. Press Return.
6. Start automatic rendering as usual.

Rendering and saving will proceed as usual, with the animation being written to the Flyer video drive you selected. When rendering is complete, you may go to the Flyer and play the animation.

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.

Reds	**R**	**G**	**B**
brick	156	102	31
cadmium red	227	23	13
coral	255	127	80
firebrick	178	34	34
indian red	176	23	31
maroon	176	48	96
pink	255	192	203
raspberry	135	38	87
red255	0	0	
salmon	250	128	114
tomato	255	99	71

Oranges	**R**	**G**	**B**
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	**R**	**G**	**B**
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

Whites	**R**	**G**	**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	**R**	**G**	**B**
cold grey	128	138	135
grey	192	192	192
slate grey	112	128	144
warm grey	128	128	105

Blacks	**R**	**G**	**B**
black	0	0	0
ivory black	41	36	33

Blues	**R**	**G**	**B**
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	**R**	**G**	**B**
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	**R**	**G**	**B**
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

LightWave Modeler Notes

Variable undo levels

Location: Under Objects/Options. This number determines the number of undo levels available. Redo will always store the same number as Undo, i.e. 5 levels of Undo results in 5 levels of Redo. This number is saved with the Mod-Config file.

New Metaform Option

Location: Subdivide panel. The new option is called Smoothing Angle Field. This allows "hard-edged" metaforming, wherein objects that have severe angles or creases can retain their hard edge(s) based on the smoothing angle used for the operation. Reduce the smoothing angle to allow for more hard edges to remain unconverted.

New Amiga View Modes

Location: Display Options panel. On the Amiga there are now three Moving display modes: Wireframe, Solid, and Frontface.

Wireframe shows the object in a see-through wireframe form. Frontface shows the object in a wireframe form where only the polygon whose normals are facing you are visible. (You can still see "through" some polygons, since there may be polygons behind them whose normals also face you.) Solid shows only the polygons that you would actually see if the object were truly solid (i.e., you cannot see "through" any polygons).

All platforms share the same three views in Static display mode (Wire, Frontface, Solid).

New Bevel Settings

Location: Multiply menu, Bevel panel. The new bevel options are called Outer and Custom Surface.

Outer pushes the points outwardly allowing objects with thin areas to be beveled with out flipping polygons. This is especially useful for beveling text with serifed edges.

Custom Surface allows the user to choose whether the new polygons created by the bevel will retain the surface name of the original polygons or have a new surface name assigned to them. This is useful for text, as you can bevel the text and simultaneously rename the edges to something more meaningful like **edges**.

Numeric entry fields, Part 1

Numeric entry fields can now accept math functions. I.E., you could enter this is the numeric panel for Move: **x[5m/2m+15mm]** and Modeler will do the math for you! Moving the selected item the correct distance.

Numeric fields, Part II

Now these fields can do measurement standards conversion. All requesters are set to default to either feet or meters, depending on the setting under Display Options.

When Modeler is set to use the metric system, all requesters will assume that any number entered without a specific measurement designation will refer to meters. For example, enter 3 and modeler assumes you mean 3 meters. Enter .3 and modeler returns with 3mm. The same is true of the English system.

If you want to mix and match measurement systems, it's no problem. Suppose you want to use an English measurement, such as feet, when Modeler is set for the metric mode. Just type 4 ft (or 4') and Modeler will automatically translate that number into meters. (Put this together with the ability to calculate functions and you could do the following in the numeric panel for Move: x[4ft*3m+2mm/16in-3"].)

User Definable View Presets

The numbers on the numeric keypad (on the right hand side of your keyboard) can be assigned to jump among 10 different screen views.

For example, drag the view out so that the Face view fills the screen. Hold the Shift key and press numeric 1. You have just assigned the numeric 1 key to this view. Any time you press numeric 1, the view will jump to the configuration you just set up.

You can do the same for any other views you like to use often.

Modeler will remember the display orientation (logo, map, side, or vehicle), the screen positions, and the zoom size for each of the 10 numeric keys. You can assign them freely, and recall them just by pressing the number key itself.

Modeler ARexx Macros

Here are concise descriptions of the macros included with Modeler. Read the files themselves for more info, or try them out on various objects.

AddMacro
Used by Modeler to add macros to its pop-up macro list.
BBox
Generates a bounding box the size of the current object.
Cage
Creates a spline box.
Calculate
Calculates numeric strings.
Center
Centers current item(s) on all three axes.
Center1D
Centers current item(s) on one axis.
CommandSeqProc
Processes a sequence of shell commands.
CoordSys
Polar coordinate systems conversion utility.
CurveText
Generates PS text on a curve.
CutFaces
Cuts all faces from the current layer.
Dinner
A fun haiku-like poem generator.
Explode
Shifts points in an object as if exploding or imploding it.
Fractalize
Subdivides and jitters an object.
FrenchTickler
ARexx test program.
Haiku
A fun poem generator.
Halve
Scales an object by .5 around its center.
Julienne
Slices an object along an axis.
LightSwarm
Makes a cloud of lights.
LoadFonts
Preloads a group of fonts with Modeler.
Logotron
Generates beveled text.
LWenvelope
Generates an envelope file for Layout.
M2in
Converts between English and metric.
Make Motion
Create a motion path file.
MartianPlumber
Creates an object with strange tubes and connectors.
MetricScale
Scale an object with wrong units to metric.
MVPlot
For MathVision contour plots.
NearBG
Puts all nearby non-empty layers into background state.
NextEmpty
Jumps to next empty layer.
ParametricCurve
Create a curve object using parametric functions.
PathToMotion
Converts path in layer to motion path for Layout.
Pclone
Clones layer data at offset using points in bg layers.
Plot
Plots a line function as a set of connected segments.
Plot2D
2D function surface maker.
PointCenter
Find average center point position (center of mass).
PointPlane
Generates plane of points.
Points
Make points at X, Y, Z, coordinates.
Points2Polys
Convert selected points to single-point polygons.
PointSep
Displays point separation.
PointSpread
Distributes points in Modeler.
PointXform
Transform points algorithmically.
Prick
Generates randomly distributed points on a surface.
Prims
Platonic solid generator (tetra, octahedron, and others).
ProCalc
Uses spreadsheet data from "Professional Calc" program.
Router
Bevels polygons with mutli-level bevels.
SaveMe
Auto-save every 10 minutes.
ShapeText
Extrude/Bevel text and other objects.
Shell
Make a seashell from an outline shape.
Spherize
Make a sphere of the current object.
Symmetrize
Make layer n-fold symmetric.
Text
Makes several lines of text in one operation.
Toroid
Generates a donut shape.
TrajMotion
Make a ballistic trajectory motion path.
Wedge
Makes a wedge or ring.
WrapToSphere
Wrap data onto a sphere.

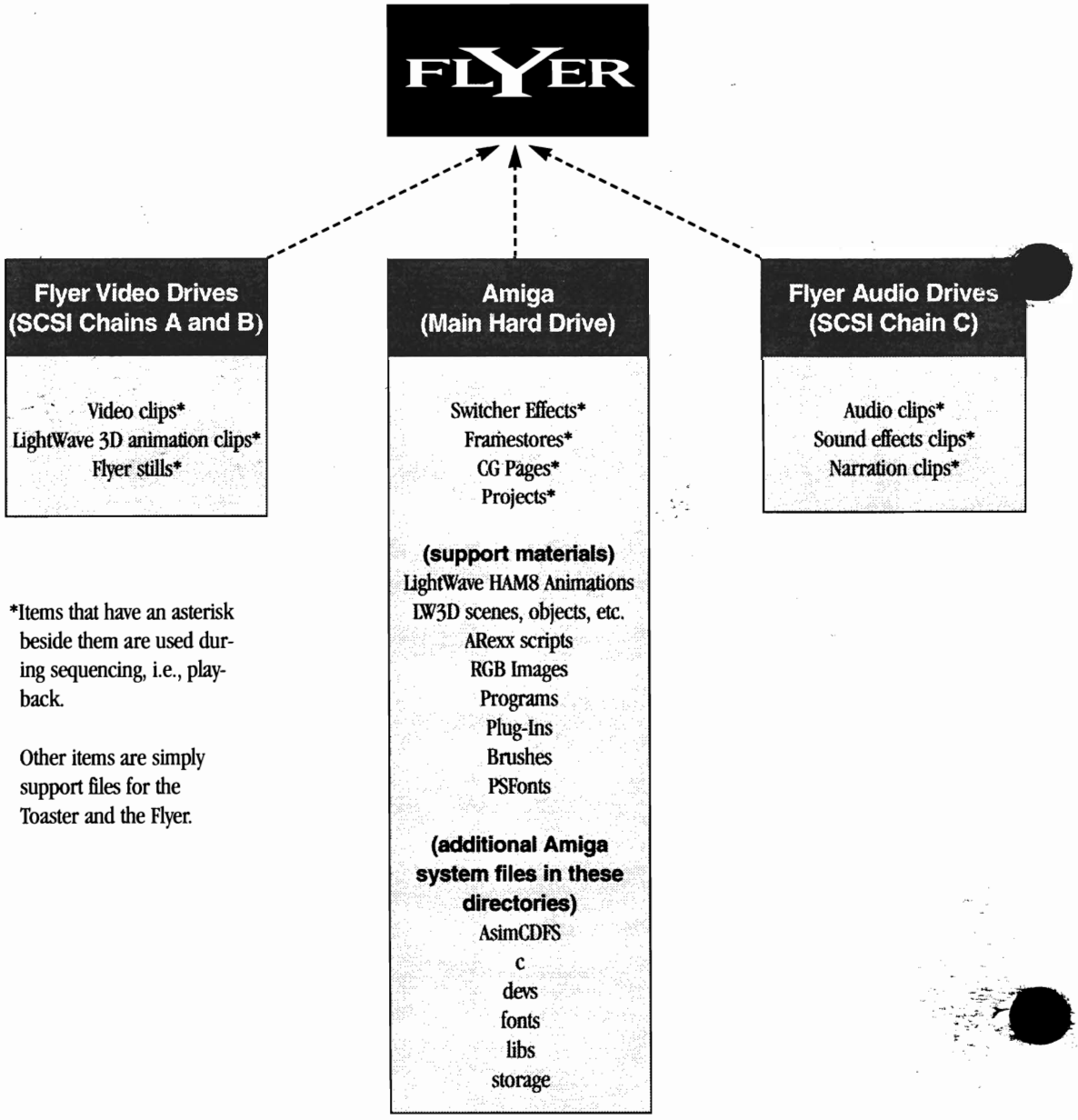
How the Flyer Uses and Stores Resources

It's important to understand the big picture where the Flyer is concerned.

This includes the organization of all of the materials that go into the making of a Flyer project, i.e., a television program. When the Flyer plays a program, it pulls resources from all of the locations listed below. If you back up, or archive, this project, all of the resources necessary to recreate the project are copied to the backup medium.

The simple chart below should give you an idea of what the Flyer uses when editing and sequencing video. We refer to all of these materials as *content*. Items that have an asterisk beside them are used during sequencing, i.e., playback. The other items are simply support files for the Toaster and the Flyer.

Important!
Do not mix these files on different drives. Video clips and stills should be placed on video-formatted drives only. Audio clips should be placed on audio-formatted drives only. Framestores should be kept on an Amiga drive. Any attempt to mix these items on other drive types will likely result in problems during project playback (stuttering, jitter, etc).



*Items that have an asterisk beside them are used during sequencing, i.e., playback.

Other items are simply support files for the Toaster and the Flyer.

Introduction and Installation

Installation

Table of Contents

This section contains detailed instructions on installing the Video Toaster 4000 card, the Video Toaster Flyer card, or both.

Do not follow every one of these install procedures! Certain steps pertain to specific systems such as the Amiga 2000, 3000, or 4000. See the Installation Chart on pages 16-17 to learn which procedures you need to follow.

Before you install hardware or software, please read through the introductory material to familiarize yourself with all that the Toaster and Flyer install procedures require.

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Acknowledgements

NewTek, Inc., wishes to express its appreciation to the following organizations and individuals for their participation in the release of the Video Toaster software. Many offer catalogs of their work, or will custom-design items for you. Feel free to contact them at the addresses provided.

Ron Thornton (3D scene)
Visual Effects Designer Ron Thornton is the creative genius behind the special effects for Babylon 5, which he designed and rendered using the Video Toaster. Ron's credits include the Dr. Who television show, Terminator 2, and The Addams Family films. Ron provided SpaceFighters, an excellent example of texture mapping, motion paths, and hierarchical motion. LightWave enthusiasts would do well to study Ron's work.

SpaceFighters is an animation that includes two space ships, a planet, stars, and several texture maps. 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 scene.

ViewPoint, Inc. (3D objects)
Orem, Utah 84058
Phone 801/224-2222
Phone 800/748-4170
FAX 801/224-2272

- Beethoven
- Cow
- Foot Bones
- Low-top (Tennis Shoe)
- 1964 Thunderbird
- Galleon
- Triceratops

Virtual Image Labs (3D objects)
4925 Edgewood Road
College Park, MD
20740
Phone 301/220-0072
FAX 301/220-0081

- 747
- Smallplane
- SmallplaneProp
- DC-10

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

- Camcorder object

Brett Hester
13032 Copenhill Road
Dallas, TX 75240
214/233-5493

- United States objects

C. William Henderson
Color effects filters for ChromaFX.

Scott Wheeler
Joseph J. Dox
Galaxy Video and Animations
(508) 535-8787

- Delorean scene/objects for LW3D
- HoverCraft scene/objects for LW3D
- Flags of the World scene/objects for LW3D

H. Wrobel
The post.library used by ToasterCG and ToasterPaint was provided by H. Wrobel for Joan Thuesen.

Images rendered for LightWave 3D.
This manual includes texture imagery from the following collections.

Textiles, Volumes 1-4
Mannikin Sceptre Graphics
Suite 258
3208-C.E. Colonial Drive
Orlando, FL 32803
407/644-9547

Texture City Image Library
3203 Overland Avenue #6157
Los Angeles, CA 90034
310/836-9224

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Video Toaster 4000 FCC Notes - FCC ID# IB73773669007 Class B

16 — Device requires shielded cable for compliance with FCC regulations. Properly shielded cables are required for full compliance with FCC Class B emissions specifications
37 — Complies with new rules of docket 87-389.

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.

Using this Book

This manual contains the information you'll need to create professional, broadcast-quality video with the Video Toaster™ and Video Toaster Flyer™. There are separate reference manuals for each of the Video Toaster's applications, so you can turn directly to the section that interests you most.

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, you'll find a list of Keyboard Shortcuts and the Index. At the beginning of every section marked by a tab, there is a Table of Contents to that section. Each section contains its own index for fast access to the information you need.

In the next 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.

As the world's first computer designed for video production, the Toaster borrows some terms and ideas from both the television and computer worlds. Throughout the manual you'll find these terms explained where necessary. But don't worry, this is not a technical reference. A great deal of care has gone into creating a user-friendly design.

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 step through the Video Toaster and its screens, so that you are familiar with getting around in general. Instructions are numbered in steps, indicating each action for you to take. Additional material between steps contains general background information that explains the procedure in greater detail.

Mail in Your Registration Card!

NewTek is already at work designing the next generation of the Video Toaster. Unfortunately, if you don't send in your registration card, you may never know about it! Send in your registration card now. We'll notify you of updates and add-ons as soon as they are available.

Manual Revision List

How To Reach NewTek

Main Business Office
9:00am – 6:00pm Central Time

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

By Fax (24 hours)
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

How to reach Technical Support

9:00am - 8:00pm Central Time

Steps for calling 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 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
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 Guidelines

If a Support Specialist determines that a problem may exist in your Toaster and/or Flyer, 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.

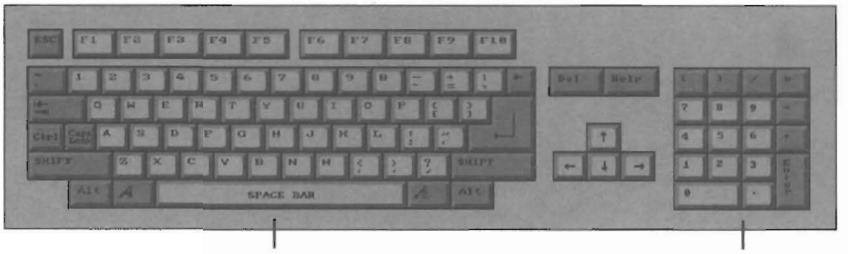
NewTek cannot ship a replacement unit until the defective unit has been returned. NewTek understands that you rely on your equipment, and we will make every effort to repair or replace your unit as soon as possible. Make certain you send only the items that the Support Specialist instructs you to return.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

Information You Should Know

Rather than repeat in every section of the Toaster Manual, "click means for you to press the mouse button..." we have opted to place this important information here, at the beginning of the manual. This section contains basic definitions of terms the manual may use, explanations of common screen controls you will need to understand, and other information that is pertinent throughout the Toaster.

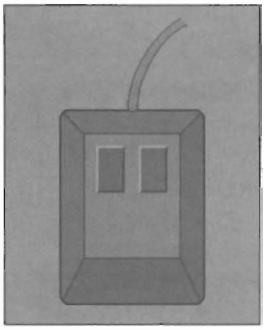
About the Keyboard and Mouse

The applications within the Video Toaster may use either the mouse, the keyboard, or both as input devices. Even if you are new to operating a computer-based system like the Toaster, the keyboard is probably a familiar sight. Similarly, the mouse, used as a pointing and selecting device, is common to most computers sold today.



Keyboard

Numeric Keypad



The important distinction that the Toaster makes about the keyboard is that is has two portions—the main keyboard and the numeric keypad. The main keyboard is the large set of adjoining keys, while the numeric keypad is a small number set to the right. Certain functions require you to use specific keys, so a key on the keyboard may not have the same function as a key on the keypad. Read carefully.

The mouse is the tool you use to move the onscreen pointer. The buttons on the mouse allow you to activate or select the things you can point to. Press once to select something on screen. Press twice to activate it. Some operations use the right mouse button, while others use the left.

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 Understanding Toaster Terminology.

Understanding Toaster Terminology

Click and Select
Click means to press and then quickly release the 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).

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. Certain tools may also make use of dragging with the **right** mouse button held down.

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).

Understanding Toaster Screen Controls

Each of the Toaster's programs has a main screen made up of distinct parts: panels, buttons, windows, and menus. There are slight variations on these elements, as you will see below.



A **panel** looks like a raised surface that contains a number of buttons and windows.



A **button** looks like an actual button. When selected, or clicked on, it will highlight as if it lit up. Some buttons may be clicked once to select a function, and clicked twice to engage that function.



A **pop-up menu** or **pop-up button** is a button with an up/down arrow on it. Drag the pointer over it to display a list of items. Highlight one to select it.



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 **box** or a **field** is a special kind of window you can enter text into.



A **menu** is a list of related commands that you may select from. For example, the Polygon Menu in LightWave Modeler displays commands related to polygon operations. In LightWave 3D, these are often referred to as **control panels** rather than menus.

How the Toaster Responds to You

In General
Generally, the Toaster will display a change on screen to show you that the button you have selected, or the function you have invoked, is in effect. Buttons will either depress or highlight, to indicate that you have selected them. A menu may display a new operating mode. If the Toaster cannot perform the requested operation, it may display an error message, a response indicating why. At other times, the screen may flash once, which is another form of indicating that it cannot perform the desired function.

Screen Flash
One of the first things you will notice about the Toaster (when it starts, and during certain operations) is that the screens sometimes flashes. Don't worry. This is entirely normal for the Video Toaster, and won't harm any of the equipment hooked up.

Error Messages
Occasionally, depending on various conditions, the Video Toaster will be unable to perform a requested operation. In these cases, either the Amiga 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.

About the Amiga's Operating System

The Workbench
The underlying operating system that supports the Video Toaster is known as the Workbench. The Workbench is a graphic interface, which is an industry term for "using a mouse to tell the computer what to do by pointing and clicking on items displayed on a screen." Macintosh computer users call this the Desktop. PC users call it Windows. It's very popular and very convenient. The Video Toaster is a highly graphical device.

The Workbench on your system must be version 2.1 or 3.0. The operating system software offers a variety of screen display options that can cause display difficulties when operating (or immediately after operating) the Video Toaster. We recommend against using the following with the Video Toaster:

- Mouse Accelerators/Screen Blankers - These are commonly known as "Commodities" under Workbench 2.0 and later. They can cause drawing problems in ToasterPaint, and display problems elsewhere. Even older Workbench 1.3 screen blankers and mouse accelerators can affect the Toaster adversely. Your best bet is to experiment carefully and, if the Toaster is not responding as you expect, try disabling these programs before using the Toaster.

- Overscan Display - Any program (including the Workbench software) that can change the main computer display to an overscan mode (for example, a paint program) can cause difficulty with the Toaster's sync. This can result in the Toaster's output becoming distorted. The reason for this is that the overscan mode of such programs uses display information at the top and left edges of the screen that is also used by the Video Toaster. There are two possible solutions:

Avoid using overscan displays where possible. Acceptable display modes include 320x200, 640x200, 320x400, 640x400. Display modes that go beyond these dimensions may cause problems. Such problems are unlikely to harm anything in the Toaster or your hard drive, but they can cause unwanted display glitches.

Activate the Video Toaster Genlock Utility prior to running another program in an overscan mode. The Genlock Utility causes most programs to shift their display downward by several pixels. This has the effect of maintaining the integrity of the uppermost display lines on screen, thus maintaining more stable sync.

Further Overscan Note:
If you exit the Toaster using the Ctrl-Ctrl-L Alt-L Alt key combination, the Exit button in Preferences, or the ARexx command TOWB, you should be able to use overscan program settings without a great deal of interference (especially if you use the Genlock Utility). However, if you exit using the operating system command Amiga-N from certain Toaster screens, you are more likely to experience difficulty, since this command bypasses the more standard Toaster operations. It is not recommended.

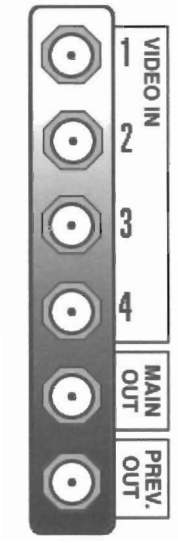
Input and Output Connections

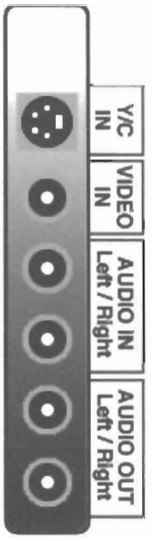
Below is a set of diagrams showing the input and output connections for the Video Toaster and the Video Toaster Flyer cards.

Amiga 2000 Installations

Below left - The Video Toaster card as seen from the back when installed in the Amiga 2000.

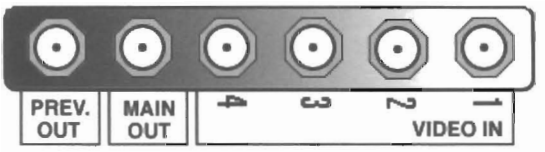
Below right - The Flyer card as seen from the back when installed in the Amiga 2000.

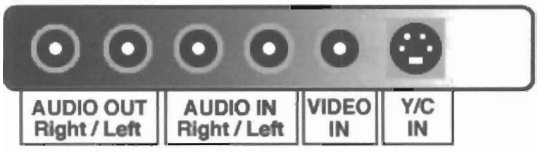




Amiga 3000/4000 Installations

Below - The Flyer card as seen from the back when installed in the Amiga 3000 or 4000.





Above - The Flyer card as seen from the back when installed in the Amiga 3000 or 4000.

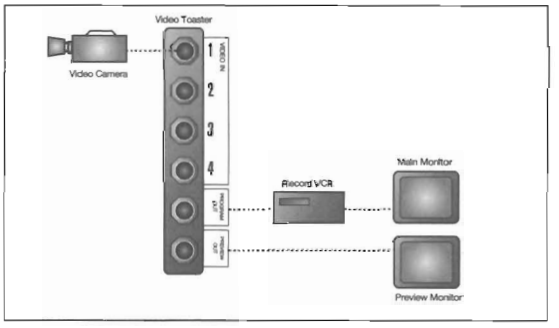
Sample Hookup Diagrams for Video Toaster Systems

The following diagrams demonstrate a variety of basic video system hookups. These are included to give you an idea of how you might wish to connect your Video Toaster system. If you're relatively new to video, you might wish to try each hookup in order to gain experience and understanding of video signals. With the vast array of video equipment and features available to consumers, NewTek cannot adequately troubleshoot any given installation. For more in-depth discussion of video equipment and connections, we refer you to the Recommended Reading appendix, specifically the television production books by Zettl, Wurtzel/Acker, or Smith.

The Toaster accepts its master sync from input #1. Therefore, as you will see in the diagrams below, whenever you connect video to the Toaster you must always start with input #1. (If you plan on using the Toaster as a graphics generator only, such as for LightWave animations, and you do not need to run a video source to it, you are not required to connect a video source to input #1. It is only necessary when you intend to send video both *into* and *out of* the Toaster.)

A Single Source: a Video Camera

A video camera sends out an electronically stable signal. This kind of video source may be connected directly to the Video Toaster's #1 input. If the screen exhibits excessive tearing or breakup, you may need to adjust the Toaster's *center frequency*. Contact Technical Support for details on this simple procedure. (Note: most laser disc players also output a stable video signal, one that the Toaster is capable of accepting.)



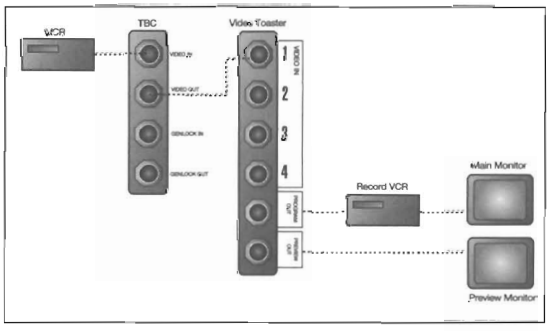
This hookup allows you to use special effects to add character generator titles, freeze frames, still frames (or LightWave animations from an Amiga 4000) to your single video source.

A Single Source: a VCR

The nature of video recording is such that no VCR can generate a stable video signal when playing a tape. Therefore, a device known as a *time-base corrector*, or *TBC*, must be employed to insert stable timing signals into the video. The TBC is connected in-line, between the VCR and the Toaster, as shown.

The VCR in this example could just as easily be a camcorder that is playing back a tape. At that time, it is functioning exactly as a VCR.

Note that this sample diagram, and all diagrams that follow, are based on using an *infinite window* TBC. Infinite window TBC's are pretty much the standard today. If you plan on using a TBC that does not have this feature, you may need to ask your video dealer to assist you in hooking up your system, as more expertise is required.

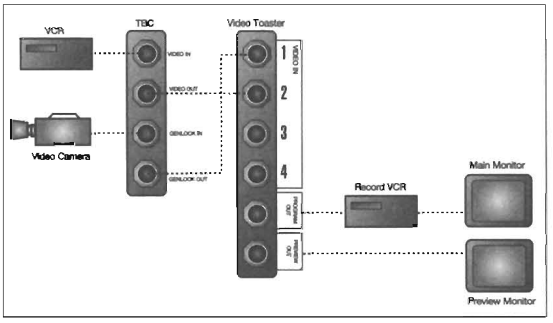


This hookup allows you to use special effects to add character generator titles, freeze frames, and still frames (or LightWave animations from an Amiga 4000) to your single video source.

Two Sources
A Video Camera and a VCR

This configuration demonstrates a special situation, using a stable video source a both as video source and a sync source. The video camera sends its video signal to two places: Toaster input #1 and the TBC's genlock input. First, this allows the Toaster to receive a stable signal. Second, it enables the TBC to "lock on" to the same signal and cause the video that is being received from the VCR to scan at the same rate. This *genlocks* the two signals together so that the Toaster can generate special effects between the two without a glitch.

This configuration takes advantage of the fact that the genlock signal doubles as the main video source. Therefore, it runs from the camera to the TBC (where it provides a sync reference for the VCR's video) and then on to the Toaster (where it provides the video image).



This hookup allows you to perform special effects between a live source (the camera) and a taped source (the VCR), as well as use titles and still frames (or LightWave animations from an Amiga 4000).

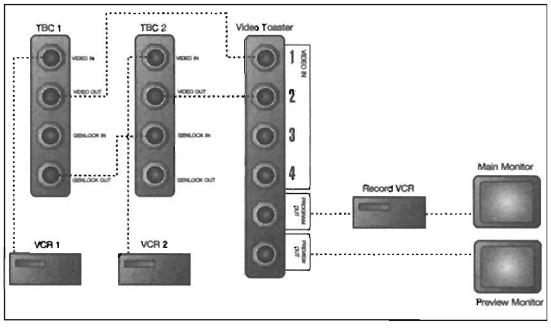
Two Sources
Using Two or more VCRs

Earlier diagrams showed that a VCR required a TBC in order to connect to the Toaster. How many TBCs do you think you need for *two* VCRs? The answer is two. In fact, here's a simple rule of thumb: for every VCR that you connect to the Toaster simultaneously, each needs its own TBC. The diagram for a two-VCR hookup can easily be expanded for three or four VCRs, simply by adding another TBC and extending the genlock signal to it in a daisy-chain fashion.

In this case, VCR 1 sends video to TBC 1. TBC 1 sends the stabilized video on to Toaster input #1. (So far, this is just like connecting a single VCR.) VCR 2 sends video to TBC 2, and TBC 2 sends the stabilized video on to Toaster input #2. Finally, the genlock output of TBC1 connects to the genlock input of TBC 2. The TBCs insert stable sync into each signal, making the signals acceptable to the Toaster, while at the same time causing these two signals to be genlocked at the same scan rate, so they arrive at the Toaster *in sync* with one another.

To add another VCR to this hookup: VCR 3 sends video to TBC 3, which sends the corrected signal on to Toaster input #3. The genlock output of TBC 2 is connected to the genlock input of TBC 3, thus genlocking the video. The same types of connections hold for adding a fourth VCR as well.

You may need to *time* and *phase* the TBCs in order to match up the video sources in terms of picture line-up and color. These are relatively simple procedures with today's TBCs. You'll find that the instructions are included with yours. If not, their technical support staff will provide you with the information you need.



This hookup allows you to perform special effects between two VCRs (or more, with additional TBCs), add titles, still frames, or Lightwave animations from an Amiga 4000.

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Before You Install

Important Notes for All Installations!

General Note
The installation procedure is not as difficult as it may appear, but since there are two models of Video Toaster card, and five models of Amiga it can be installed to, a great deal of thought and detail has to be devoted to covering all the bases.

Beware Static Electricity
Prior to opening the computer and installing any add-on cards, open the Disposable Wrist Strap packet and put on the strap per the instructions on the envelope. The Video Toaster card, the Flyer card, and many other computer components are sensitive electronic devices that can be damaged by relatively minor static electrical charges. The Disposable Wrist Strap reduces the risk of static electricity damaging any of the components you handle.

Do not operate your system without the cover.
The Video Toaster card and the Flyer card require proper ventilation for operation and can be damaged by heat. Do not operate them in any Amiga with its cover removed. This reduces the flow of air current across the circuit boards. Excessive heat may damage the cards.

Parts List (What You'll Need to Install the Toaster and/or Flyer)

> **Note:**
> Because of the variety of SCSI and serial cables available, the cables listed in the parts list are general in nature. You and your dealer will need to determine your specific cabling needs based on your system configuration. The illustrations and instructions provided are for the NewTek SCSI accessory cable. Use them as a guide for connecting the drives in your particular configuration.

Tools
- #2 Phillips Screwdriver
- #5-6 or #6-8 Slotted Screwdriver

Hardware
- An Amiga computer (model A2000, A3000, A3000T, A4000, or A4000T with Workbench 2.1 or 3.0, see note below)
- A Video Toaster card (either the original card for the A2000, or the Video Toaster 4000 card for any model Amiga)
- Video Toaster Flyer
- 2 SCSI II Hard Drives (that have passed the DriveTest program for video usage)
- 1 SCSI I or SCSI II Hard Drive (for audio use)
- 1 CD-ROM drive
- *either* 1 NewTek SCSI accessory cable (this is a combination SCSI/serial cable assembly)
  or 4 SCSI cables *and* 2 serial cables (serial cabling is needed for SMPTE time code only)

Software
- 1 Installation Diskette
- 1 CD-ROM (Video Toaster 4.0/Flyer software)
- 1 Video Toaster/Flyer/4.0 Manual

About Workbench Support

At this time the Video Toaster 4.0/Flyer software supports two releases of the Workbench system software: 2.1 and 3.0.

Although version 3.1 has been released, it has not been officially released by Commodore Business Machines, therefore programmer and developer information has not been made available. At this time the Video Toaster/Flyer does not support Workbench 3.1

The Basic Flyer Configuration

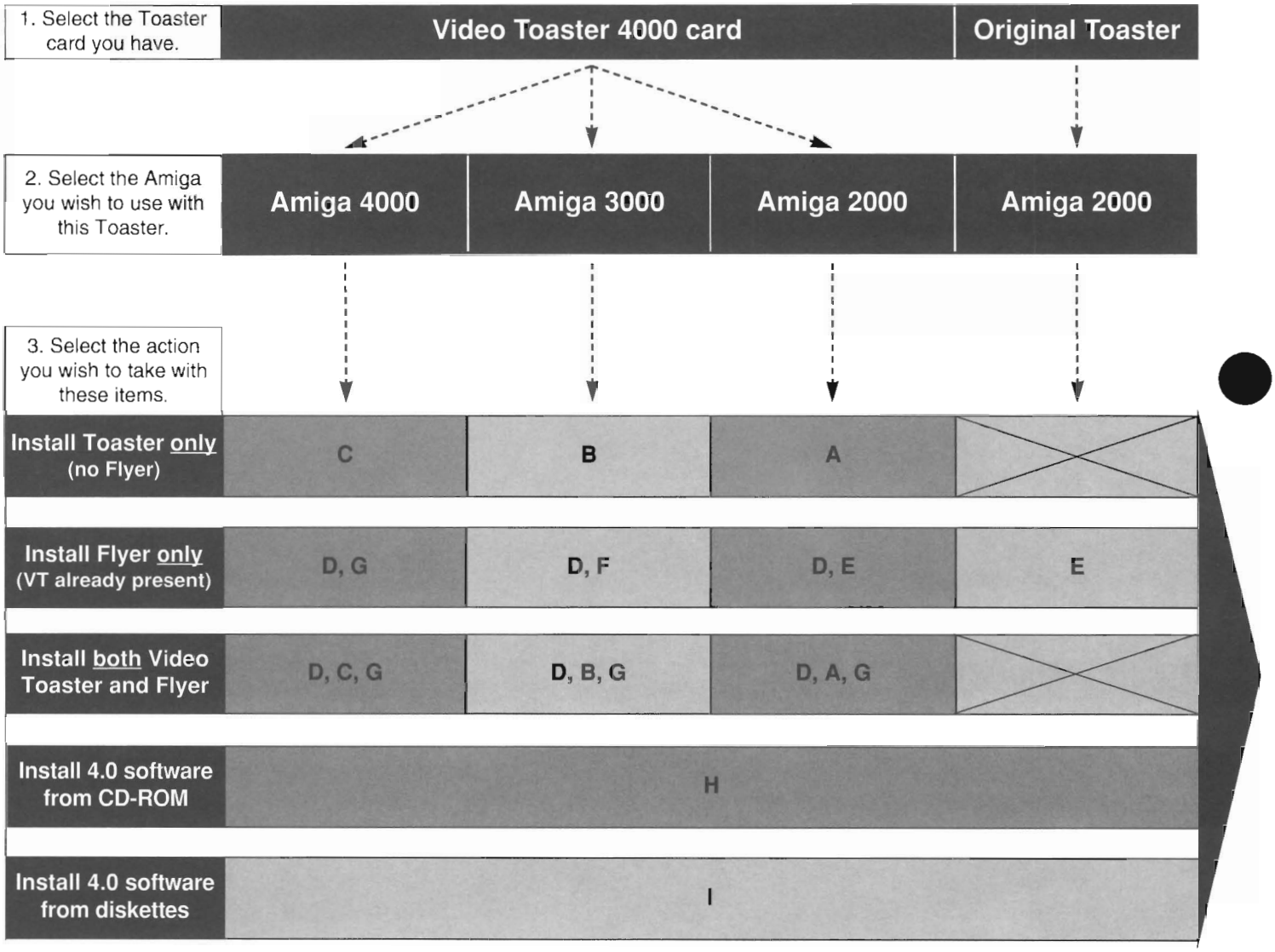
Because of the variety of Amigas, Toasters, and SCSI Hard Drives in use, these installation instructions (and the Flyer installation program) assume that you are installing a basic Flyer system. The definition of a basic Flyer system is: an Amiga computer, a Video Toaster, a Flyer, two video hard drives, one audio hard drive, and one CD-ROM drive.

Warning!
If you are **not** installing the basic system configuration described above, you may need to take additional steps after the standard installation to ensure that your system will function properly. See **Appendix 2: Non-Standard Installations**, for further information.

Installation: Determining What to Install

WARNING!
Do not perform every one of these installation procedures! Find out which installation steps you need to follow:

Use the chart below to (1) select your Toaster card, (2) the computer you plan to use with it, and (3) the action you wish to take. By matching these items, you'll find out the installation procedure(s) you should follow (4), listed on the facing page.



Installation, continued
The Installation Procedures

4. Where to turn

Installation Procedures

A, page 20
Configure/Install the Video Toaster 4000 card for the Amiga 2000

B, page 22
Configure/Install the Video Toaster 4000 card for the Amiga 3000

C, page 24
Configure/Install the Video Toaster 4000 card for the Amiga 4000

D, page 26
Configuring the Video Toaster 4000 card for the Flyer

E, page 28
Installing cables, drives, and the Flyer in the Amiga 2000

F, page 32
Installing cables, drives, and the Flyer in the Amiga 3000

G, page 36
Installing cables, drives, and the Flyer in the Amiga 4000

H, page 40
Installing the software from the CD-ROM disc

I, page 46
Formatting Your Hard Drives for the Flyer

Procedure A

Configuration/Installation of the Toaster card for the Amiga 2000

Follow these procedures whether you are **(a) installing the Toaster card only, or**
(b) the Toaster card and then the Flyer card.

Tools needed: #2 Phillips screwdriver
#6-8 Slotted screwdriver

Overview: The Toaster 4000 hardware is configured at the factory for the Amiga 4000. You will need to reconfigure it for the Amiga 2000 (this involves changing jumper settings), move the BNC connector card to the "2000" position, and exchange

Procedure

1 Unplug the system from AC power.

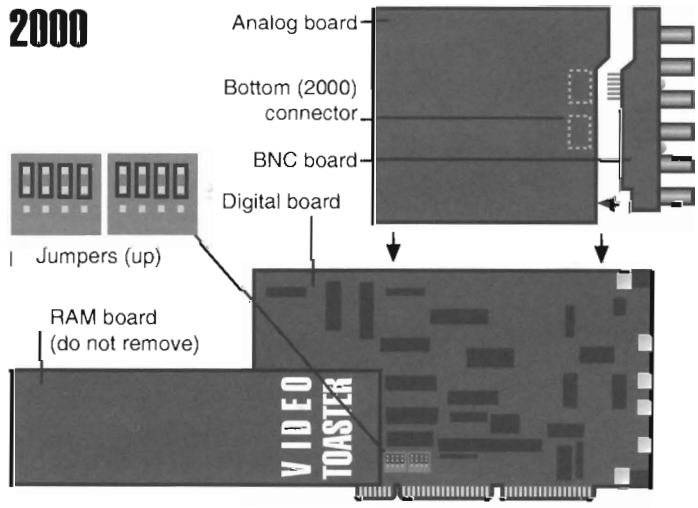
2 Remove the cover. Refer to your owner's manual or to your dealer for specific information on removing the cover from your system.

3 Locate and identify the video expansion slot. On the Amiga 2000, it is on the far edge of the motherboard, beside the power supply. You will need to remove the power supply first in order to install the Video Toaster 4000 Card. There are three screws in the front of the chassis, and four in the back.

4 Attach the enclosed rubber spacers (feet) to the end of the card so that the card cannot move to the left or the right and come into contact with the power chassis or outer cover. The feet should be attached to the smaller end of the Video Toaster card (the end opposite the BNC connections).

IMPORTANT: The Toaster 4000 card is a static-sensitive electronic device. Before you remove it from its sleeve, stand beside the Amiga and touch the metal casing on the power supply. This will drain any static charge you may retain so that you can handle the card safely.

5 Carefully remove the Toaster 4000 card from its sleeve, and configure the card for your system as described in the steps that follow.



For reference, the front of the Video Toaster 4000 card is the side with the printing "Video Toaster 4000." The largest of the cards that make up the Toaster is the Digital card, the next largest is the Analog card, the third largest is the RAM card, and the smallest is the BNC connector card.

5a Remove the (L-shaped) Amiga 3000/4000 mounting bracket. You will not need it for Amiga 2000 installation.

5b Unscrew the 2 screws on the back of the small BNC card, and place the card aside. Notice it was connected to the Analog card beside the tiny label "3000/4000." When you reattach the BNC card, you will connect it to the other position, beside the "2000" label.

5c Unscrew the 2 screws on the front of the Analog card, and carefully separate it from the Digital card.

5d By the edge connector you will see 8 jumpers (they look like gold pins, with small black connectors across them). Remove these, then replace them in the upper position (they are shipped in the lower position for the Amiga 4000).

5e Replace the Analog card and screw it into place.

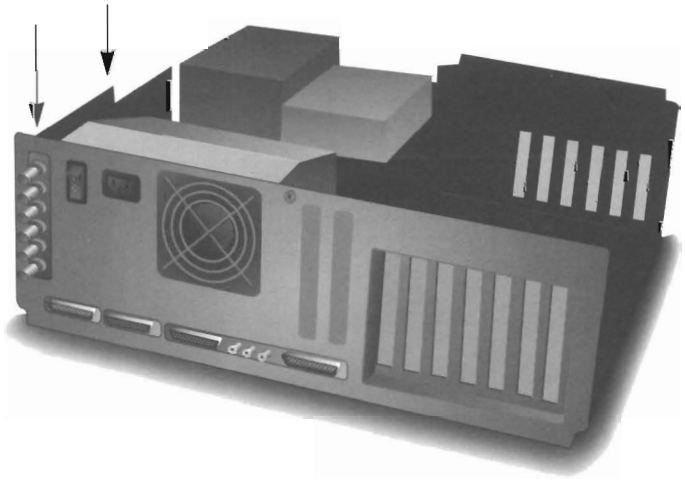
STOP.
If you are also installing a Video Toaster Flyer, turn now to
Procedure D: Configuring the Toaster 4000 Card for use with the Flyer.

If you are not installing a Flyer, continue with Step 5f (below).

5f (Skip this step if you are installing the Flyer with the Toaster.) Replace the original BNC connector card. Attach the original BNC connector card to the upper connector, marked "2000," and screw it into place.

5g Screw the Amiga 2000 mounting bracket into place. This is the flat bracket.

6 Insert the card into the system. The card stands upright, with the words Video Toaster facing away from the power supply.



7 Secure the card in place. There are two screws, one at the top of the card and one at the bottom, that hold it to the back of the A2000.

8 Replace the power supply and secure it with its screws. Make certain that all cables are secure before you close up the system.

9 If you removed any other cards or peripherals, reinstall them now before closing up the system. Close the cover. Replace the case and secure it with its screws.

This completes this procedure.

Return to the Installation Chart to select your next action.

Procedure B

Configuration/Installation of the Toaster card for the Amiga 3000

Follow these procedures whether you are **(a) installing the Toaster card only, or**
(b) the Toaster card and then the Flyer card.

Tools needed: #2 Phillips screwdriver
#6-8 Slotted screwdriver

Overview: The Toaster 4000 hardware is configured at the factory for the Amiga 4000. You will need to reconfigure it for the Amiga 3000 (this involves changing jumper settings), move the BNC connector card to the "2000" position, and exchange mounting brackets to secure it to the Amiga computer.

Procedure

1. Unplug the system from AC power.

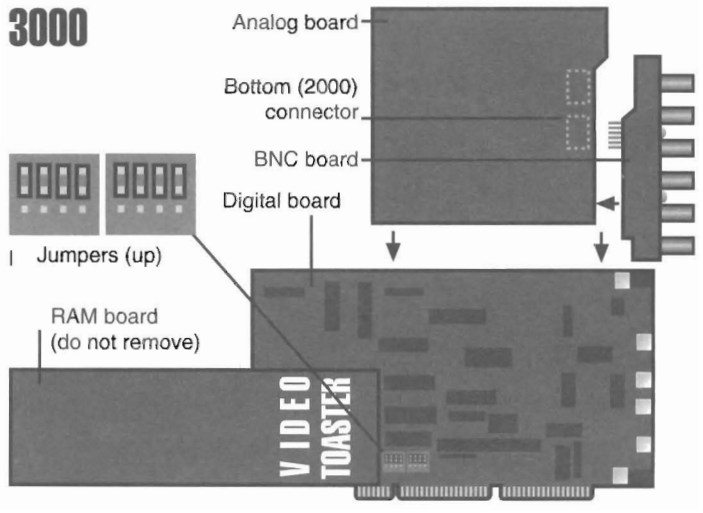
2. Remove the cover. Refer to your owner's manual or to your dealer for specific information on removing the cover from your system.

3. Attach the included plastic shield to the inside of the 3000's cover. This shield protects the Toaster card from coming into contact with the cover and shorting the system. Make certain you align this shield correctly so that no part of the VT 4000 hardware can touch the inside cover of the Amiga 3000.

4. Locate and identify the video expansion slot. On the Amiga 3000, it is the topmost slot of the expansion board in the center. Remove the mounting bracket that covers the video slot expansion hole in the back of the Amiga.

IMPORTANT: The Toaster 4000 card is a static-sensitive electronic device. Before you remove it from its sleeve, stand beside the Amiga and touch the metal casing on the power supply. This will drain any static charge you may retain so that you can handle the card safely.

5. Remove the Toaster 4000 card from its sleeve and configure the card for your system following the steps below.



For reference, the front of the Video Toaster 4000 card is the side with the printing "Video Toaster 4000." The largest of the cards that make up the Toaster is the Digital card, the next largest is the Analog card, the third largest is the RAM card, and the smallest is the BNC connector card.

5a Remove the (L-shaped) Amiga 3000/4000 mounting bracket.

5b Unscrew the 2 screws on the back of the small BNC connector card. Remove the card and place it aside.

5c Unscrew the 2 screws on the front of the Analog card, and carefully separate the Analog card from the Digital card.

5d Near the edge connector you will see 8 jumpers (they look like 2 rows of gold pins with small black connectors across them). These need to be moved to the upper position for the Amiga 3000 (they are shipped in the lower position for the Amiga 4000).

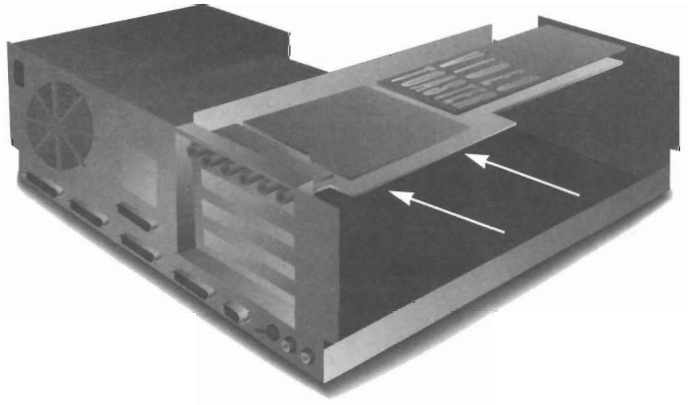
5e Replace the Analog card and secure it with 2 screws.

STOP.
If you are also installing a Video Toaster Flyer, turn now to
Procedure D: Configuring the Toaster 4000 Card for use with the Flyer.

If you are not installing a Flyer, continue with Step 5f (below).

5f (Skip this step if you are installing the Flyer with the Toaster.) Replace the original BNC connector card and secure it with 2 screws.

5g Secure the Amiga 3000/4000 mounting bracket into place with 2 screws. This is the L-shaped bracket.



6 Insert the card into the system. The card lies on its side with the words Video Toaster facing up.

7 Secure the card in place with 1 screw.

8 If you removed any other cards or peripherals, reinstall them before closing up the system. Close the cover. Replace the case screws.

This completes this procedure.

Return to the Installation Chart to select your next action.

Important Notice

When you restart your computer after a Video Toaster 4000 card has been installed in the 3000 or 3000T model Amigas, you may notice that the screen colors have changed.

A hardware difference between the Toaster4000 and the 3000 is at fault.

To correct this, after the entire installation is complete, go into the Toaster software drawer and double-click the icon **Patch3000**. This will restore the correct color scheme. If you would like Patch3000 to be run automatically every time you start the Amiga, drag the icon into the WBStartup drawer instead.

Procedure C

Configuration/Installation of the Toaster card for the Amiga 4000

Follow these procedures whether you are **(a) installing the Toaster card only, or**
(b) the Toaster card and then the Flyer card.

Tools needed: #2 Phillips screwdriver
#5-6 or 6-8 Slotted screwdriver

Overview: The Toaster 4000 hardware is configured at the factory for the Amiga 4000. If you have just purchased a new Video Toaster 4000, see the gray box below for an important notice. If you are removing a Video Toaster 4000 card from an Amiga 2000 or 3000 with the intention of installing it in the Amiga 4000 then follow these steps.

STOP.
The Video Toaster 4000 card is shipped preconfigured for use in the Amiga 4000.

(A) If this card is newly purchased and you are **not** installing the Flyer with it, it is ready to install. Skip Step 1 and begin with Step 2 (opposite page).

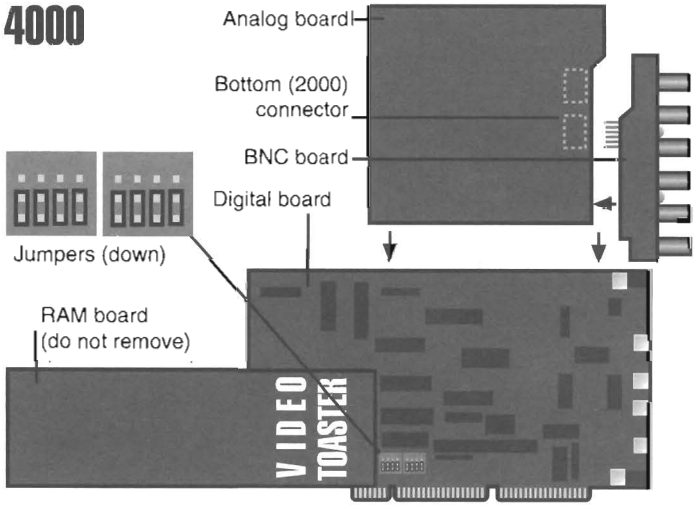
(B) If this card is newly purchased and you are installing the Flyer with it, turn now to **Procedure D: Configuring the Video Toaster4000 Card for the Flyer,** then return here and continue with Step 2 (opposite page).

(C) If this card was previously installed in an Amiga 2000 or Amiga 3000, it must be configured for the Amiga 4000 first. Begin with Step 1 (below).

Procedure

IMPORTANT: The Toaster 4000 card is a static-sensitive electronic device. Before you remove it from its sleeve, stand beside the Amiga and touch the metal casing on the power supply. This will drain any static charge you may retain so that you can handle the card safely.

1 Remove the Toaster 4000 card from its sleeve (or from the previous computer in which it was installed) and configure the card for the Amiga 4000 following the steps below.



For reference, the front of the Video Toaster 4000 card is the side with the printing "Video Toaster 4000." The largest of the cards that make up the Toaster is the Digital card, the next largest is the Analog card, the third largest is the RAM card, and the smallest is the BNC connector card.

1a Remove the (L-shaped) Amiga 3000/4000 mounting bracket. There are 2 screws to remove.

1b Unscrew the 2 screws on the back of the small BNC connector card. Remove the card and place it aside.

1c Unscrew the 2 screws on the front of the Analog card, and carefully separate the Analog card from the Digital card.

1d Near the edge connector you will see 8 jumpers (they look like 2 rows of gold pins with small black connectors across them). These need to be moved to the lower position for the Amiga 4000.

1e Replace the Analog card and secure it with 2 screws.

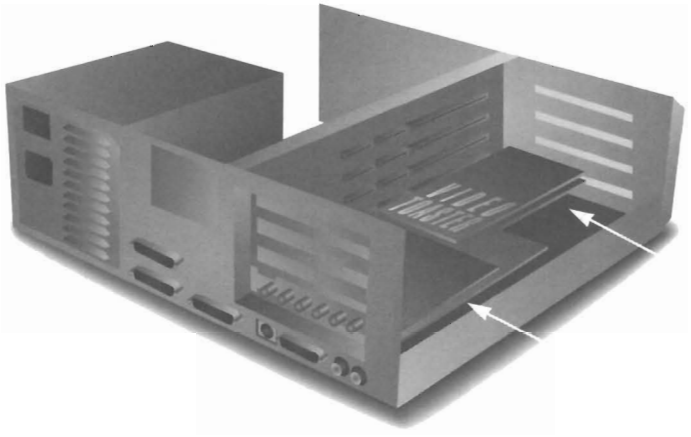
STOP.

If you are also installing a Video Toaster Flyer, turn now to
Procedure D: Configuring the Toaster 4000 Card for use with the Flyer.

If you are not installing a Flyer, continue with Step 1f (below).

1f (Skip this step if you are the Flyer with the Toaster.) Replace the original BNC connector card and secure it with 2 screws.

2 Remove the cover from the Amiga 4000 and locate the video slot (this is the topmost slot on the upright expansion card).



3 Insert the card into the system. The card lies on its side with the words Video Toaster facing up.

4 Secure the card in place with 1 screw.

5 If you removed any other cards or peripherals, reinstall them before closing up the system. Close the cover. Replace the case screws.

This completes this procedure.

Return to the Installation Chart to select your next action.

Procedure D

Configuring the Video Toaster 4000 card for use with the Flyer

Procedure

1 Lay the Flyer BNC connector flat on a static-free surface. See Figure 1.

2 Folder the ribbon cable so that it crosses over itself and lies on top of the multi-pin connector beside it. Press the ribbon cable flat at the point where it bends. See Figure 2.

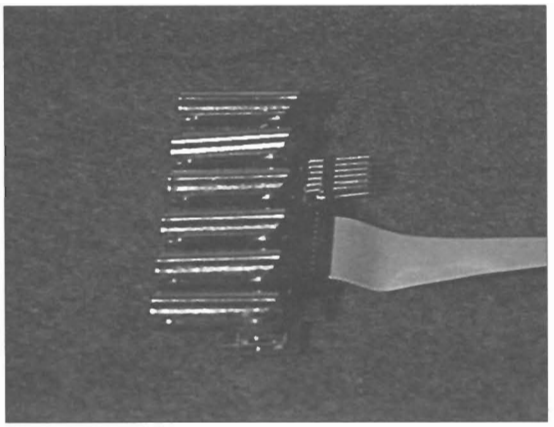


Figure 1

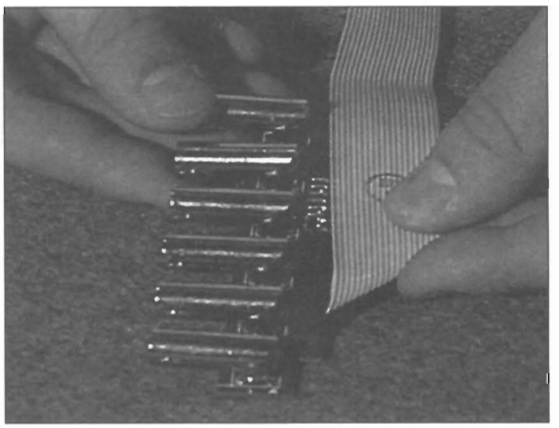


Figure 2

3 Fold the ribbon cable in half lengthwise so that it folds on top of itself for a distance of about 6 inches. Press it flat along the fold. See Figure 3.

4 Remove the spacer posts from the original BNC board that came with the Toaster card. Re-attach them to the Flyer BNC board instead. See Figure 4.

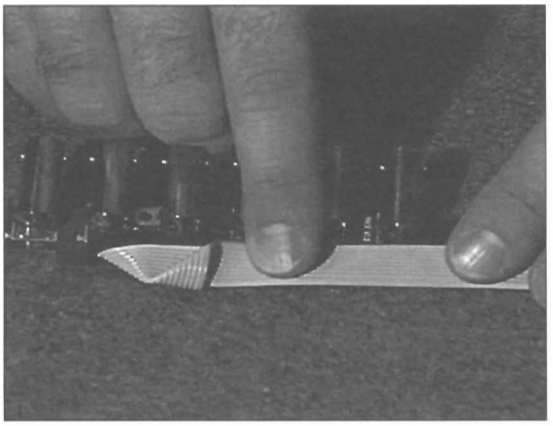


Figure 3

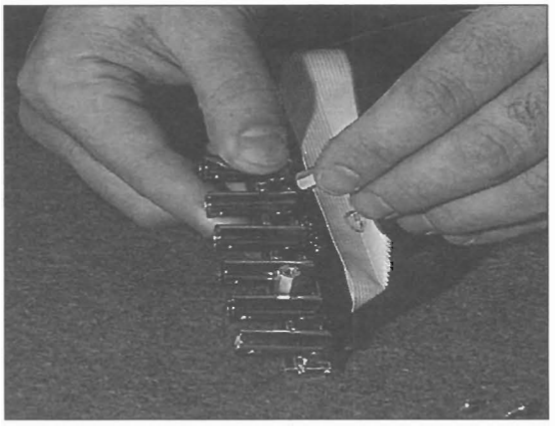


Figure 4

5 Attach the Flyer BNC connector board to back of the Video Toaster 4000. The ribbon cable will stick out the top of the Toaster, between the back of the Toaster card and the mounting bracket. Secure the BNC card in place with its 2 screws. See Figures 5 and 6.

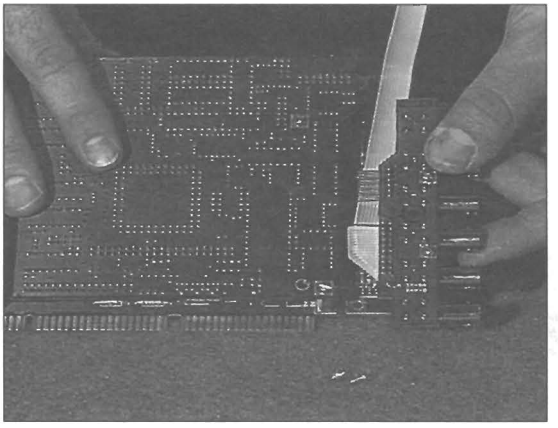


Figure 5

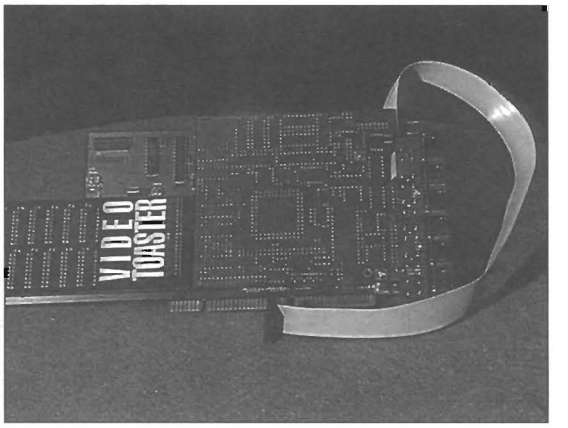


Figure 6

STOP.
At this point, return to the previous installation procedure that diverted you here, and continue installing the Video Toaster 4000 card in your Amiga.

Procedure E

Installing Cables, the Flyer, and Drives in the Amiga 2000

IMPORTANT.

The SCSI cabling you use to install the Flyer may not match the cable shown in these photos. The cable shown here is an optional Flyer accessory that you may purchase from your dealer. Any quality standard SCSI cable should work with the Flyer (it will need an internal connector at one end and an external Centronics-type connector at the other end). Ask your dealer if you have questions.

NewTek's custom-designed cable features 3 SCSI channels, 2 serial channels, and a built-in mounting bracket for maximum cable integrity and stability. See your dealer for more information.

1 Determine the best choice of expansion slots for the SCSI/serial cable run and the Flyer in your computer. See Figure 1 for your options.

The Toaster slot is on the far end of the motherboard, beside the power supply. Count the Toaster slot as slot 1. Near the middle of the Amiga motherboard is slot 2, the CPU/accelerator slot. Install the Flyer in slots 3, 4, 5, 6 or 7. Whichever you choose, the next higher slot number should be used for the cable assembly.

See Figure 1.

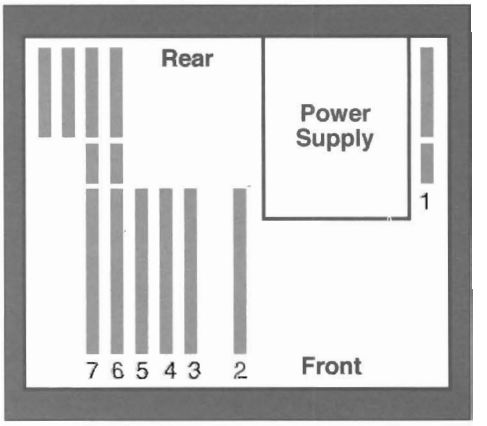


Figure 1.
The Amiga 2000 motherboard and its expansion slots as viewed from above.

2 Thread the internal connectors of three SCSI cables and the two serial cables through the Amiga expansion cover slot that is nearest to the Video Toaster card. (Note: serial cables are **only** required for SMPTE time code support, and external control. They are not required for basic Flyer operation.)

If you are using NewTek's SCSI accessory cable, make sure you hold the cable correctly before inserting the connectors (the metal tab sticking out of the molded plastic block should aim toward the motherboard expansions slots). It helps to fold the strain relief tabs over the exposed wiring as you tuck each connector through the Amiga slot. See Figure 1.

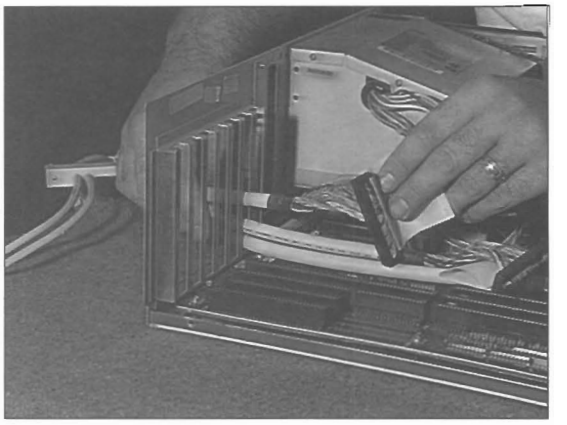


Figure 2.

3 (Skip this step if you are **not** using NewTek's SCSI accessory cable.)

Thread the SCSI accessory cable fully into the Amiga until the squarish, molded plastic block touches the back of the computer. Insert the metal tab at the base of the plastic block into the slot in the Amiga. See Figure 4..

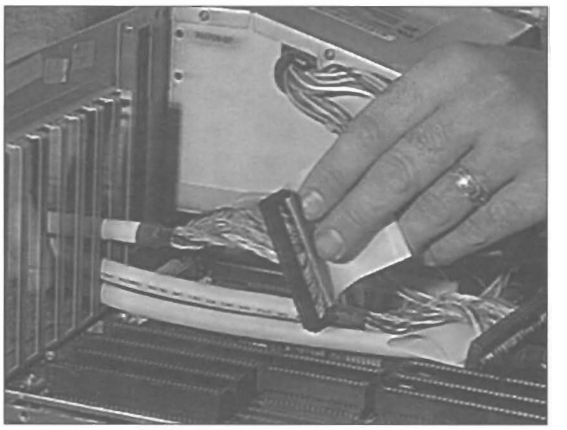


Figure 3.

4 (Skip this step if you are **not** using NewTek's SCSI accessory cable.)

Now attach the small angled bracket to the molded plastic block (the screw for this is built in to the block). The lip of the bracket should overlap the back ledge of the Amiga (and its hole should line up with a hole there). See Figure 5.

When the bracket is secure, use the Phillips screwdriver and install the screw. This secures the entire cable assembly to the Amiga.



Figure 4.



Figure 5.

5 Hold the Flyer's mounting bracket over its connectors and insert the Flyer card into the Amiga. Secure the mounting bracket with one of the screws from the slot covers removed earlier. Make sure you have access to the 5 internal cables from the cable assembly so you can hook them up. See Figure 6.

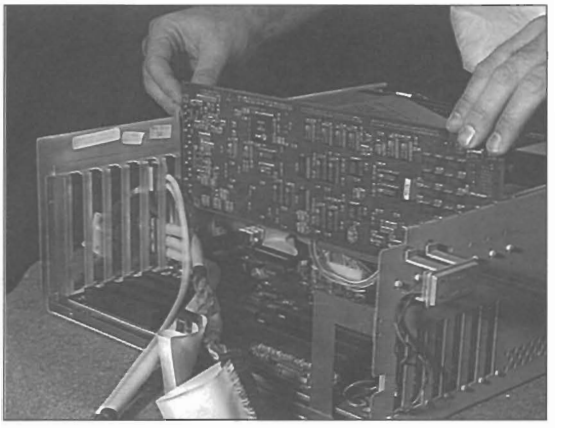


Figure 6.

6 The 2 serial cables on NewTek's SCSI cable assembly are labeled A and B. The Flyer card has two serial connections labeled Serial A and Serial B.

If you have serial cables, attach them as follows:

- Cable A to Serial A, and
- Cable B to Serial B.

The connectors are "keyed," or notched, so they can be attached the correct way only. Also, they have a few extra inches of flexible exposed wiring so that they can attach to the edge connectors without stressing the cable.

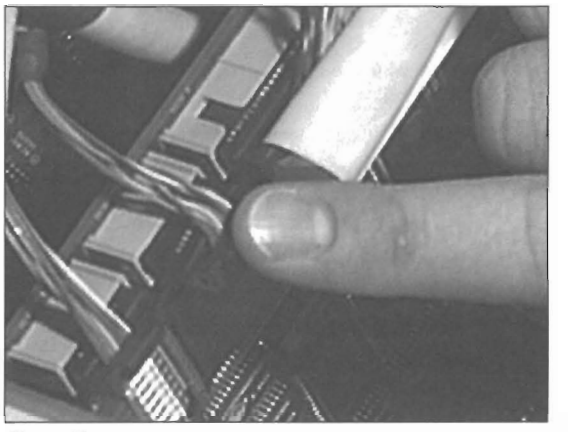


Figure 7.

7 The 3 SCSI cables on NewTek's cable are of different lengths so that they can reach different connections. They are labeled (from longest to shortest) **A**, **B**, or **C**, at both ends. The Flyer card has three SCSI connections labeled **SCSI0**, **SCSI1**, **SCSI2**.

- Attach cable A to SCSI0.
- Attach cable B to SCSI1.
- Attach cable C to SCSI2.

The connectors are keyed so they can be attached the correct way only.

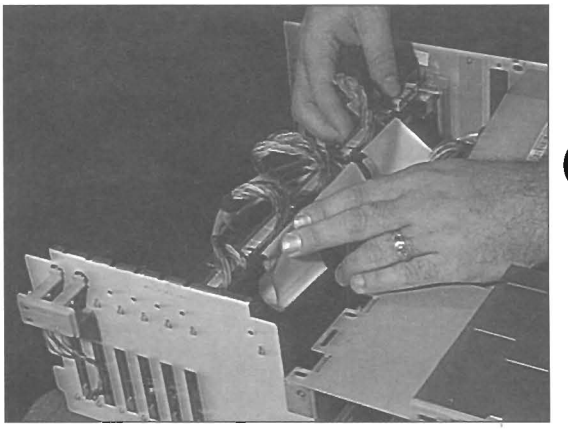


Figure 8.

8 Attach the Toaster-to-Flyer internal ribbon cable to the top edge of the rear of the Video Toaster card.

There is a 16-pin header at the top rear of the Toaster card with the label JP2 beside it. The red stripe on the cable should line up with the pin marked 1 (so that the stripe should lie toward the back of the Amiga).

Note to Y/C Plus owners
Contact Y/C Plus, Inc., for a modified cable in order to use the Video Toaster 2000, the Flyer, and the Y/C Plus.

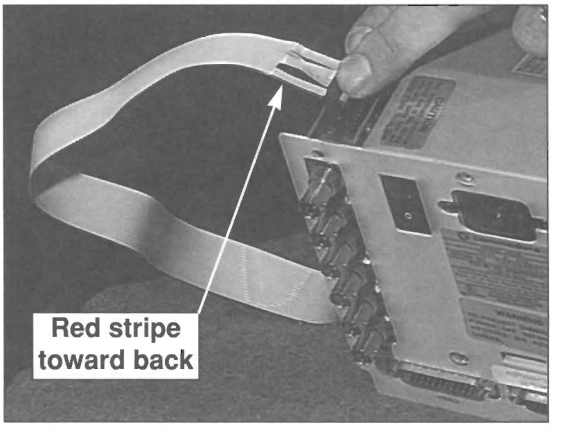


Figure 9.

9 Attach the other end of the Toaster-to-Flyer cable to the top rear connector on the Flyer card.

See Figure 10.

There is a 20-pin header at the top rear of the Flyer card with the label Toaster I/O beside it. Attach the cable so that the red stripe should lie toward the front of the Amiga. The cable will have to twist or fold in order to achieve this.

Tuck any excess cable out of way.

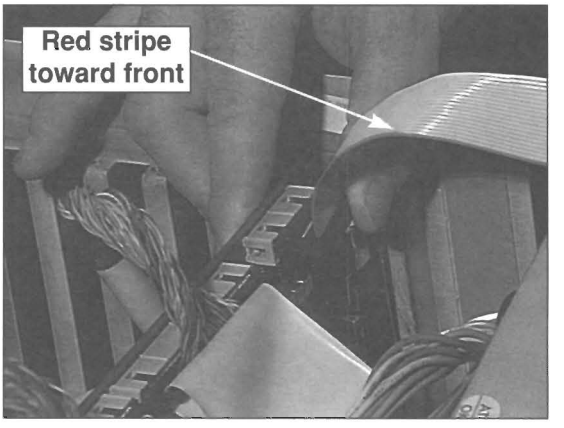


Figure 10.

10 Place your video hard drives near the Amiga, within reach of the SCSI cables. Make sure that it is not plugged in to an AC power outlet yet, and that your drives are set to SCSI ID 0.

The Flyer installation program sets up for a system with three drives: FA0:, FB0:, and FC0:. The first letter refers to the Flyer, the second to the SCSI chain, and the number refers to the SCSI ID number.

- Attach cable A to the first drive.
- Attach cable B to the second drive.
- Do not attach cable C to any drive yet.

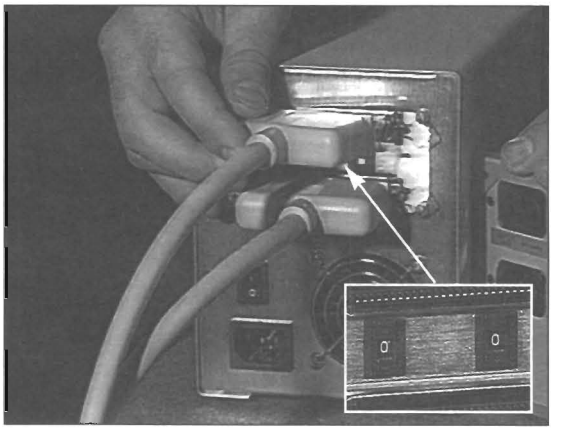


Figure 11.

11 Place your CD-ROM drive near the hard drive enclosure, within reach of the SCSI cables. Make sure that it is not plugged in to an AC power outlet yet. Set its SCSI ID to 6.

Attach the CD-ROM and your third drive to SCSI channel C using one of the following methods:

(a) Run Flyer SCSI cable C from the Amiga to the CD-ROM, and then connect a SCSI pass-through cable from the CD-ROM to the drive. (This option requires that your CD-ROM has a pass-through connection, like the lower connection shown in Figure 12.)

or

(b) Run Flyer SCSI cable C from the Amiga to the drive, and then connect a SCSI pass-through cable from the drive to the CD-ROM. (This option requires that your drive, or its enclosure, has the ability to continue the daisy-chain from the external drive.)

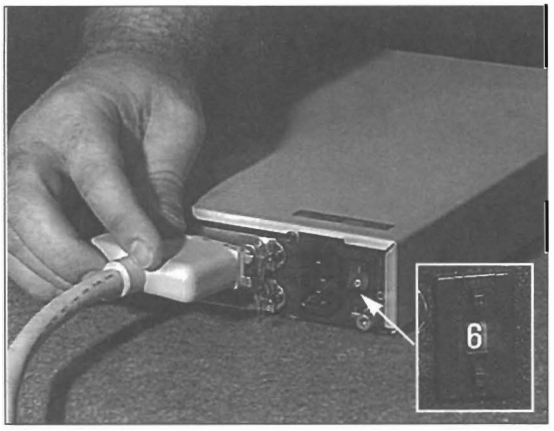


Figure 12.

This ends this procedure.

Return to the Installation Chart to select your next action.

Procedure F

Installing Cables, the Flyer, and Drives in the Amiga 3000

IMPORTANT.

The SCSI cabling you use to install the Flyer may not match the cable shown in these photos. The cable shown here is an optional Flyer accessory that you may purchase from your dealer. Any quality standard SCSI cable should work with the Flyer (it will need an internal connector at one end and an external Centronics-type connector at the other end). Ask your dealer if you have questions.

NewTek's custom-designed cable features 3 built-in SCSI channels, 2 built-in serial channels, and a built-in bracket for maximum integrity and stability. See your dealer for more information.

Procedure

1 Determine the best choice of expansion slots for the SCSI/serial cables and the Flyer in your computer.

For recommendations, see Figure 1 if you're using the Amiga 3000, or Figure 2 if you're using the Amiga 3000T.

Important Note:
It is easiest if you remove your Video Toaster card from the Amiga 3000 (not the 3000T) in order to install the Flyer and its cables. Later, the instructions will inform you when to reinstall the Toaster card and connect it to the Flyer.

Note:
The steps shown reflect the Amiga 3000 installation only, not the Amiga 3000T.

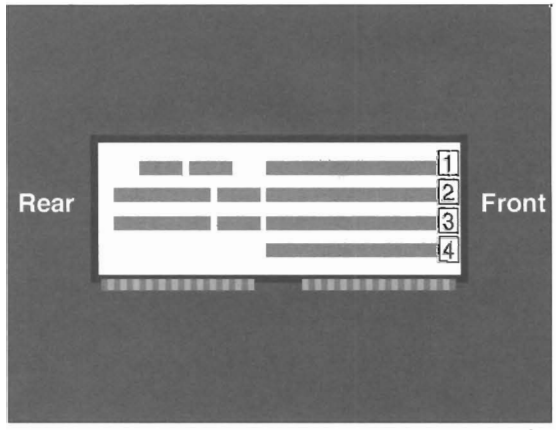


Figure 1.
The Amiga 3000 daughterboard and its expansion slots as viewed from the side.

Slot 1, the topmost slot, is for the Toaster. You may use either slots 2 and 3 for the Flyer card and its cabling, or slots 3 and 4.

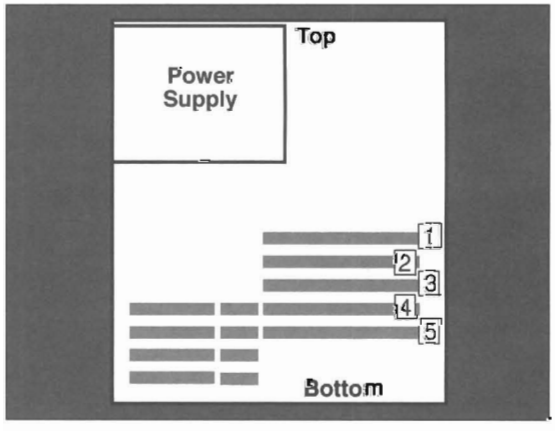


Figure 2.
The Amiga 3000T motherboard and its expansion slots as viewed from the side.

The Toaster slot is slot 1, nearest the center of the motherboard. Use any two remaining adjacent slots for the Flyer and its cabling.

2 Thread the internal connectors of three SCSI cables and the two serial cables through the Amiga expansion cover slot nearest to the Video Toaster card. (Note: serial cables are only required for SMPTE time code support, and external control. They are not required for basic Flyer operation.)

If you are using NewTek's SCSI accessory cable, make sure you hold the cable correctly before inserting the connectors (the metal tab sticking out of the molded plastic block should aim toward the expansion slots). It helps to fold the strain relief tabs over the exposed wiring as you tuck each connector through the Amiga slot. See Figure 3.

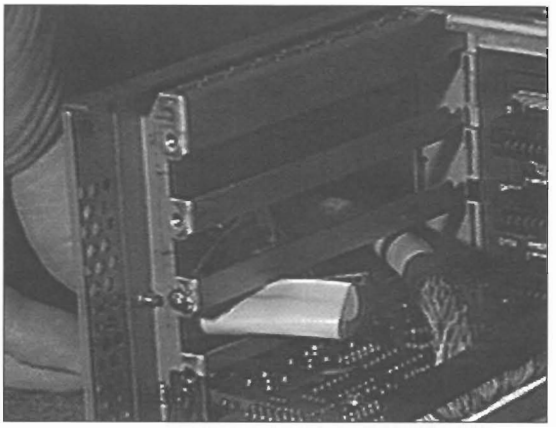


Figure 3.

3 (Skip this step if you are **not** using NewTek's SCSI accessory cable.) Thread the SCSI accessory cable fully into the Amiga until the squarish, molded plastic block touches the back of the computer. Insert the metal tab at the base of the plastic block into the slot in the Amiga.

See Figure 4.

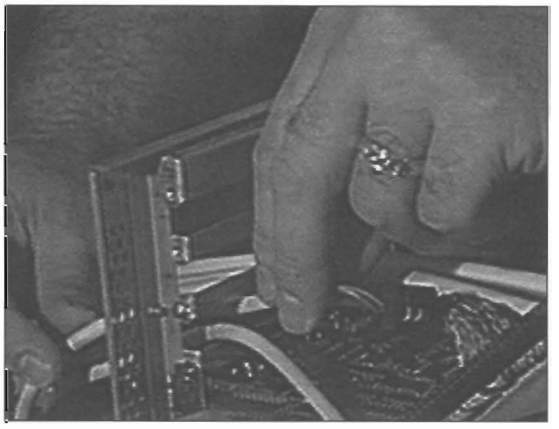


Figure 4.

4 (Skip this step if you are **not** using NewTek's SCSI accessory cable.) Now attach the small angled bracket to the molded plastic block (the screw for this is built in to the block). The lip of the bracket should overlap the back ledge of the Amiga (and its hole should line up with a hole there). When the bracket is secure, use the Phillips screwdriver and install the screw. This secures the entire cable assembly to the Amiga.

See Figure 5.

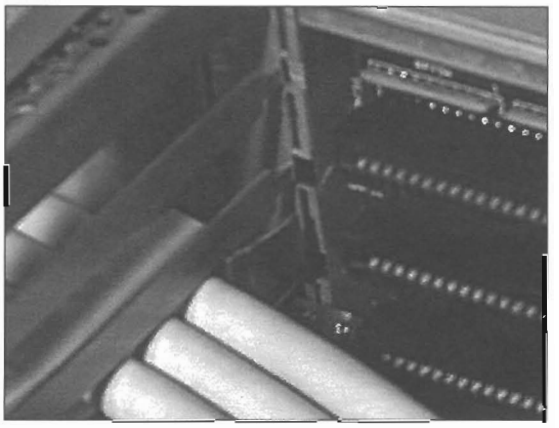


Figure 5.

5 Hold the Flyer's mounting bracket over its connectors and insert the Flyer card into the Amiga. Secure the mounting bracket with one of the screws from the slot covers removed earlier. Make sure you have access to the 5 internal cables from the cable assembly so you can hook them up. See Figure 6.

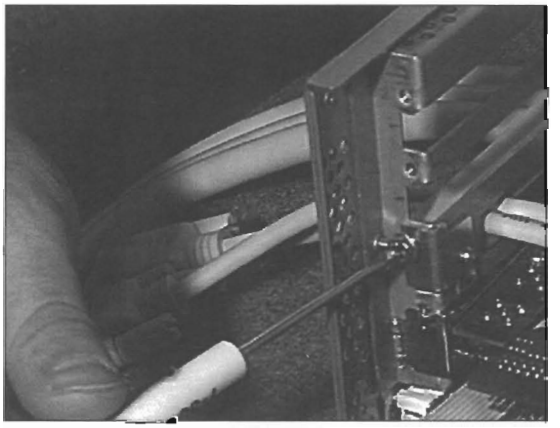


Figure 6.

6 The 2 serial cables on NewTek's SCSI cable assembly are labeled A and B. The Flyer card has two serial connections labeled Serial A and Serial B.

If you have serial cables:

- Attach serial cable A to Serial A, and
- Attach serial cable B to Serial B.

The connectors are "keyed," or notched, so they can be attached the correct way only. Also, they have a few extra inches of flexible exposed wiring so that they can attach to the edge connectors without stressing the cable.

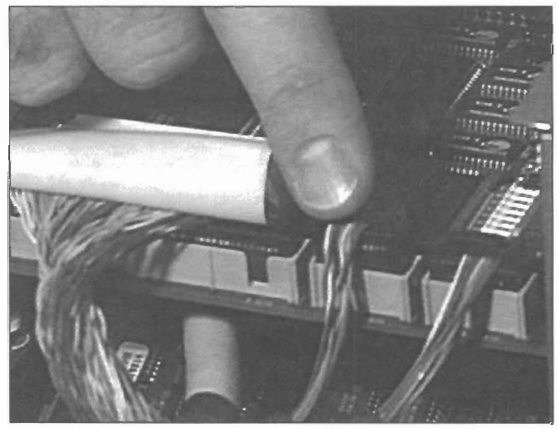


Figure 7.

7 The 3 SCSI cables on the cable assembly are of different lengths so that they can reach different connections. They are labeled (from longest to shortest) A, B, or C, at both ends. The Flyer card has three SCSI connections labeled SCSI0, SCSI1, SCSI2.

- Attach cable A to SCSI0.
- Attach cable B to SCSI1.
- Attach cable C to SCSI2.

The connectors are keyed so they can be attached the correct way only.

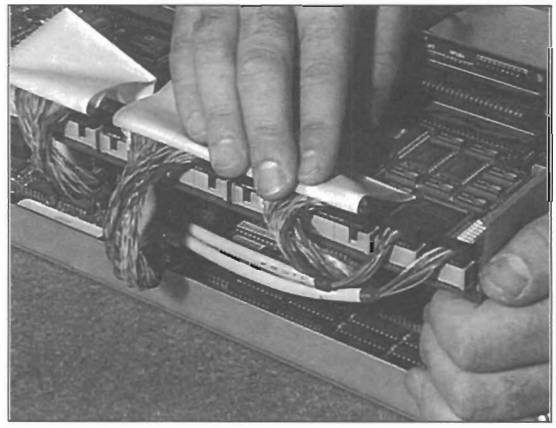


Figure 8.

8 This step refers to the Amiga 3000 only. Skip this step if you are installing the Flyer in an A3000T.

If you removed the Video Toaster from the Amiga 3000 in order to make installation easier, go ahead and reinsert the Toaster card now.

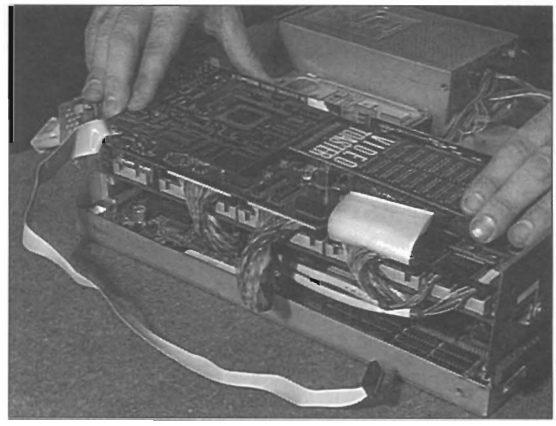


Figure 9.

9 Connect the other end of the Toaster-to-Flyer internal ribbon cable to the Flyer card (one end is already connected to the Toaster). It connects to a 20-pin header on the edge of the card at the back of the computer, labeled Toaster I/O.

Tuck any excess ribbon cable between the two cards, out of the way.

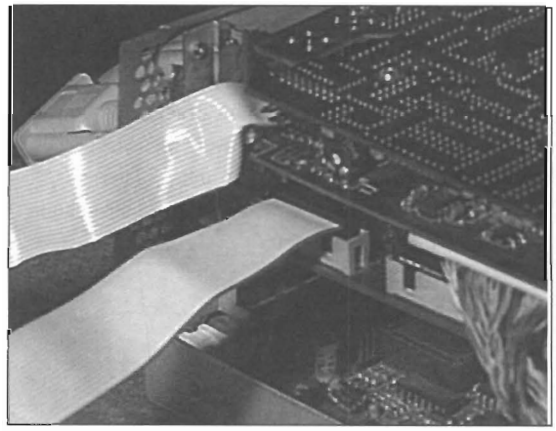


Figure 10.

10 Place the enclosure containing your video hard drives within reach of the SCSI cables. Make sure that it is not plugged in to an AC power outlet yet.

The Flyer installation program sets up for a system with three drives: FA0:, FB0:, and FC0:. The first letter refers to the Flyer, the second letter to the SCSI chain, and the number refers to the SCSI ID number. Make sure your drives are set to SCSI ID 0.

- Attach cable A to the first drive.
- Attach cable B to the second drive.

Do not attach cable C to the third drive yet.

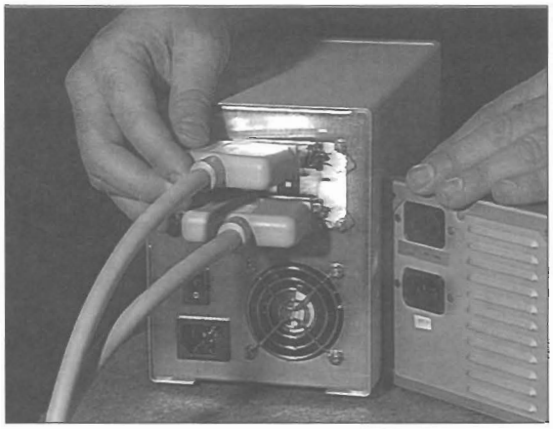


Figure 11.

11 Place your CD-ROM drive near the hard drive enclosure, within reach of the SCSI cables. Make sure that it is not plugged in to an AC power outlet yet. Set its SCSI ID to 6.

Attach the CD-ROM and your third drive to SCSI channel C using one of the following methods:

(a) Run Flyer SCSI cable C from the Amiga to the CD-ROM, and then connect a SCSI pass-through cable from the CD-ROM to the drive. (This option requires that your CD-ROM has a pass-through connection, like the one shown in Figure 12.)

or

(b) Run Flyer SCSI cable C from the Amiga to the drive, and then connect a SCSI pass-through cable from the drive to the CD-ROM. (This option requires that you have the ability to continue the daisy-chain from the external drive.)

When you are finished, your system should look something like the one shown in Figure 13 (although the third drive is not shown, note that the CD-ROM drive is used in daisy-chain fashion; the Flyer connects to it, and it continues the connection on to the third drive).

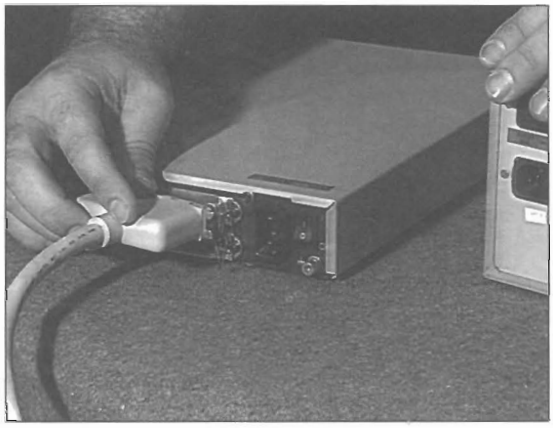


Figure 12.

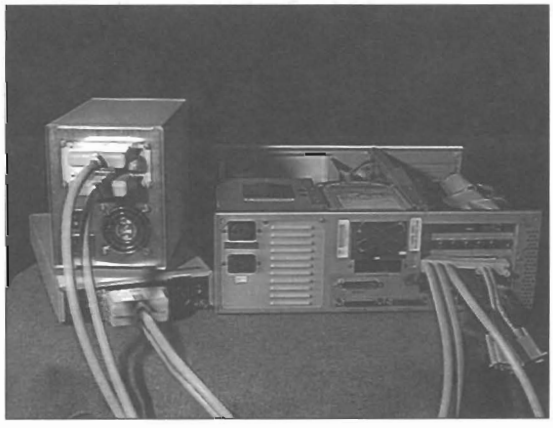


Figure 13.

This ends this procedure.

Return to the Installation Chart to select your next action.

Procedure G

Installing Cables, the Flyer, and Drives in the Amiga 4000

IMPORTANT.

The SCSI cabling you use to install the Flyer may not match the cable shown in these photos. The cable shown here is an optional Flyer accessory that you may purchase from your dealer. Any quality standard SCSI cable should work with the Flyer (it will need an internal connector at one end and an external Centronics-type connector at the other end). Ask your dealer if you have questions.

NewTek's custom-designed cable features 3 built-in SCSI channels, 2 built-in serial channels, and a built-in bracket for maximum integrity and stability. See your dealer for more information.

1 Determine the best possible expansion slot for the cable run in your Amiga 4000, see the notes below.

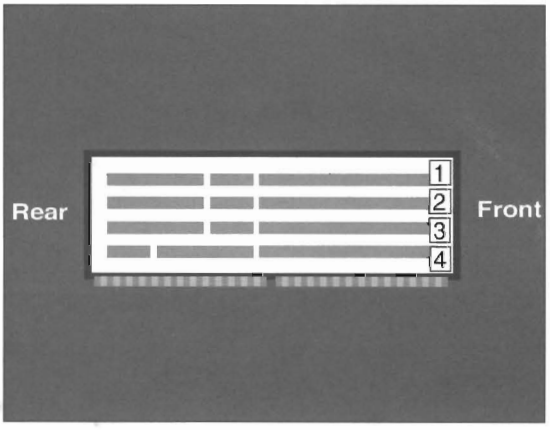


Figure 1.
The Amiga 4000 motherboard and its expansion slots as viewed from the side.

The Toaster slot is the expansion slot on the bottom, slot 4. The next slot above it, slot 3, should be empty (since the Toaster partially blocks it); use it for the cable assembly. Use slot 2 for the Flyer card.

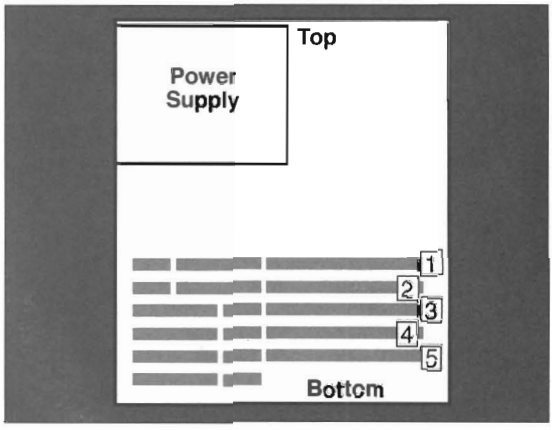


Figure 2.
The Amiga 4000T motherboard and its expansion slots as seen from the side.

*There are two video slots in the center of the motherboard on the 4000T. Because of the expansion slot layout, the Toaster works best in slot 2**. We recommend you place the Toaster in slot 2, then use slots 3 and 4 (or 4 and 5) for the Flyer and its cables.*

Optionally, you could utilize the unused port hole of slot 1 to run the cable assembly. It might make for a messy cable appearance coming from this direction, but it does keep one expansion slot free.

***If you use slot 1 the Toaster overlaps a memory expansion slot, so you can't have the full amount of RAM. If you use slot 2 the Toaster overlaps the first video slot, so you can't use another video slot card. In most cases, you'll probably want as much RAM as possible since most users don't use two video card devices in the A4000T.*

2 Thread the internal connectors of three SCSI cables and the two serial cables through the Amiga expansion cover slot that is nearest to the Video Toaster card. (Note: serial cables are **only** required for SMPTE time code support, and external control. They are not required for basic Flyer operation.)

If you are using NewTek's SCSI accessory cable, make sure you hold the cable correctly before inserting the connectors (the metal tab sticking out of the molded plastic block should aim toward the motherboard expansions slots). It helps to fold the strain relief tabs over the exposed wiring as you tuck each connector through the Amiga slot. See Figures 3 and 4.

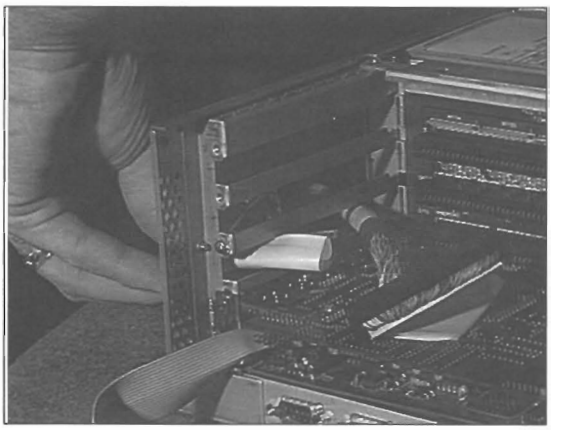


Figure 3.

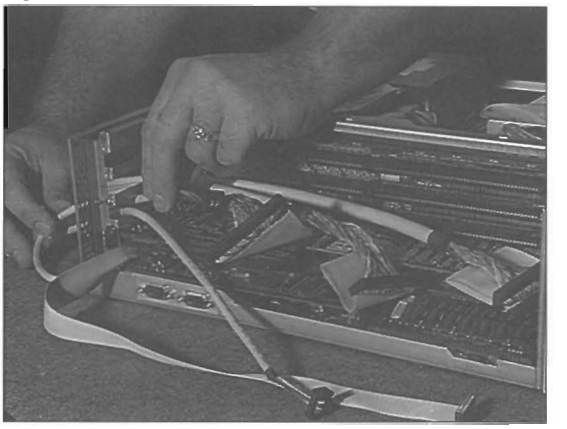


Figure 4.

3 (Skip this step if you are **not** using NewTek's SCSI accessory cable.) Push the entire SCSI accessory cable fully into the Amiga until the squarish, molded plastic block touches the back of the computer. Insert the metal tab at the base of the plastic block into the slot in the Amiga. See Figure 5.

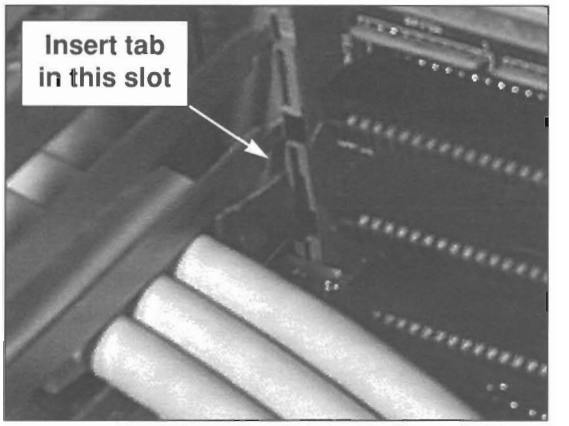


Figure 5.

4 (Skip this step if you are **not** using NewTek's SCSI accessory cable.) Now attach the small angled bracket to the molded plastic block (the screw for this is built in to the block). The lip of the bracket should overlap the back ledge of the Amiga (and its hole should line up with a hole there). When the bracket is secure, use the Phillips screwdriver and install the screw. This secures the entire cable assembly to the Amiga. See Figure 6.

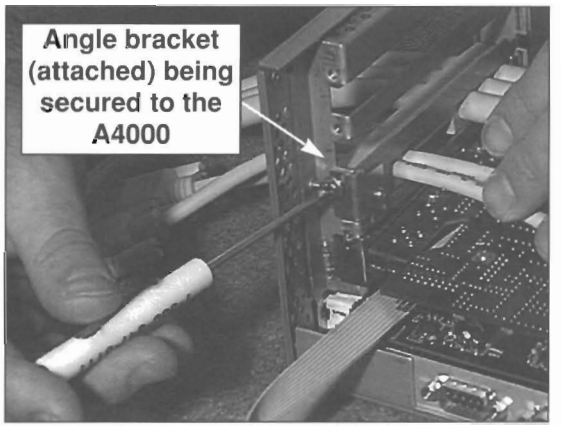


Figure 6.

5 Hold the Flyer's mounting bracket over its connectors and insert the Flyer card into the Amiga. Secure the mounting bracket with one of the screws from the slot covers removed earlier. Make sure you have access to the 5 internal cables from the cable assembly so you can hook them up. See Figure 7.

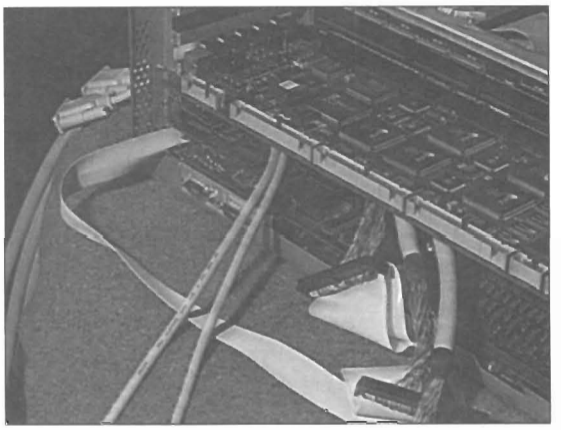


Figure 7.

6 The 2 serial cables on NewTek's SCSI cable assembly are labeled A and B. The Flyer card has two serial connections labeled Serial A and Serial B.

If you have serial cables:

- Attach serial cable A to Serial A, and
- Attach serial cable B to Serial B.

See figure 8.

The connectors are "keyed," or notched, so they can be attached the correct way only.

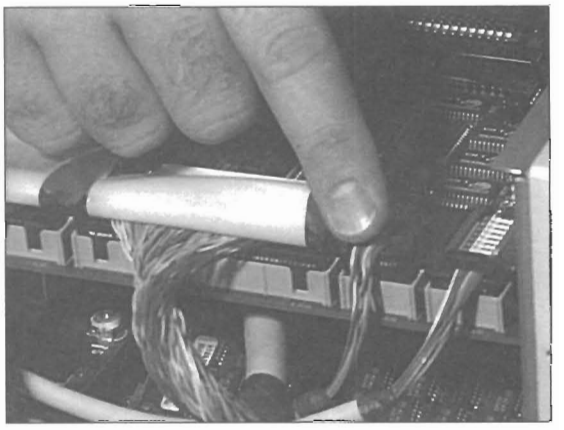


Figure 8.

7 The 3 SCSI cables on the cable assembly are of different lengths so that they can reach different connections. They are labeled (from longest to shortest) **A**, **B**, or **C**, at both ends. The Flyer card has three SCSI connections labeled **SCSI0**, **SCSI1**, **SCSI2**. See figure 9.

- Attach cable A to SCSI0.
- Attach cable B to SCSI1.
- Attach cable C to SCSI2.

Connectors are keyed. They can be attached the correct way only.

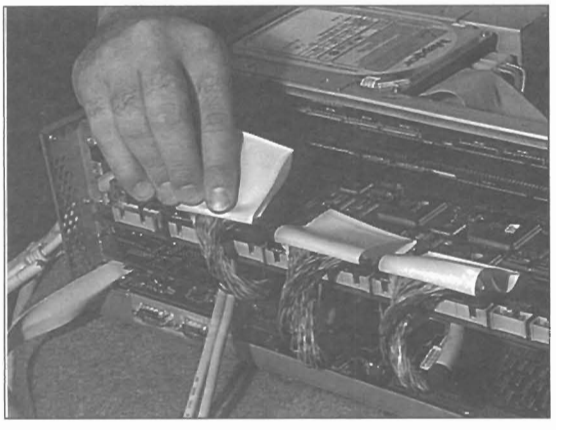


Figure 9.

8 Connect the other end of the Toaster-to-Flyer internal ribbon cable to the Flyer card (one end is already connected to the Toaster). It connects to a 20-pin header on the edge of the card at the back of the computer, labeled **Toaster I/O**.

See Figure 10.

Tuck any excess ribbon cable between the two cards, out of the way.

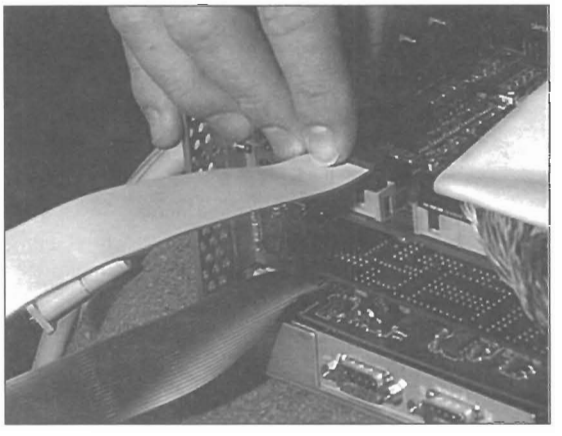


Figure 10.

9 Place the enclosure containing video hard drives near the Amiga. Make sure that it is not plugged into an AC power outlet yet.

- Attach cable A to the first drive.
- Attach cable B to the second drive.

Do **not** attach cable C to the third drive yet.

The Flyer installation program sets up for a system with three drives: **FA0:**, **FB0:**, and **FC0:**. The first letter refers to the Flyer, the second letter to the SCSI chain, and the number refers to the SCSI ID number. Make sure your drives are set to SCSI ID 0.

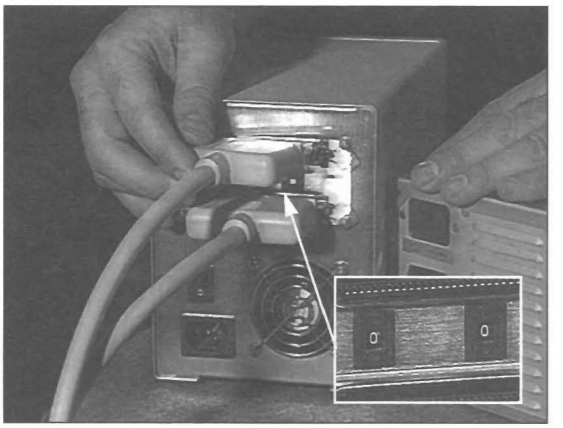


Figure 11.

10 Place your CD-ROM drive near the hard drive enclosure, within reach of the SCSI cables. Make sure that it is not plugged in to an AC power outlet yet. Set its SCSI ID to 6.

Attach the CD-ROM and your third drive to SCSI channel C using one of the following methods:

(a) Run Flyer SCSI cable C from the Amiga to the CD-ROM, and then connect a SCSI pass-through cable from the CD-ROM to the drive. (This option requires that your CD-ROM has a pass-through connection, like the one shown in Figure 12.)

or

(b) Run Flyer SCSI cable C from the Amiga to the drive, and then connect a SCSI pass-through cable from the drive to the CD-ROM. (This option requires that the drive, or its enclosure, has the ability to continue the daisy-chain from the external drive.)

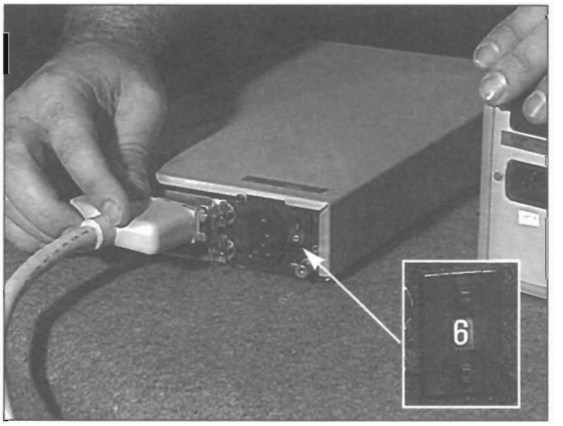


Figure 12.

When you are finished, your system should look something like the one shown in Figure 13 (although the third drive is not shown, note that the CD-ROM drive is used in daisy-chain fashion; the Flyer connects to it, and it continues the connection on to the third drive).

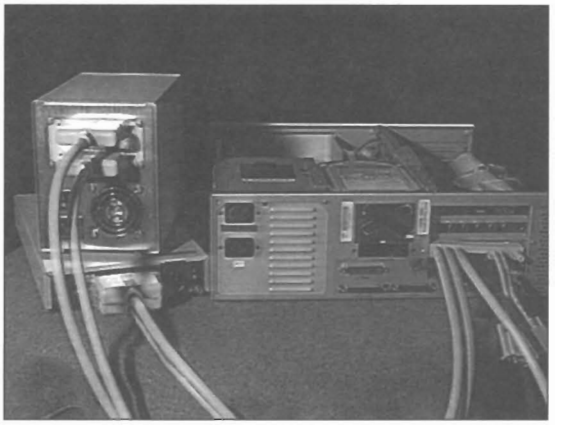


Figure 13.

This ends this procedure.

Return to the Installation Chart to select your next action.

Procedure H

Installing the Software from the CD-ROM Disc

What you need for this step

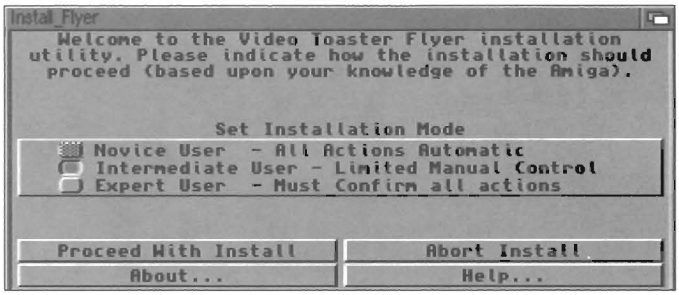
CD-ROM disc of Toaster/Flyer software
Flyer software installation diskettes

1 Plug in all AC power cables (Amiga, drive case, CD-ROM, and anything else that is part of your system).

2 Turn on all of your system equipment, the Amiga last.

3 Insert the installation diskette in your main floppy drive. Insert the CD-ROM in your CD-ROM drive.

4 Double-click on the icon for the floppy disk, then double-click on the icon labeled Install_Flyer. You should see a window something like the one shown below.



The vast majority of Toaster users will find the default values for each step are appropriate for their system.

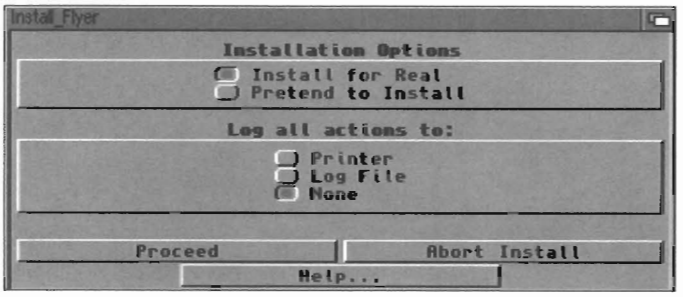
Set Installation Mode refers to the manner in which the installation should take place. Most users should go with the default setting, **Intermediate User**, unless you wish to know more about each step of the installation before it happens.

- **Novice User** is not available.
- **Intermediate User** ... .
- **Expert User** ... .

Select the next action for the installer to take. Most users should select **Proceed with Install** at this point.

- **Proceed With Install** continues with the next step of the installation.
- **Abort Install** cancels the install program.
- **About...** displays information about this version of the install.
- **Help...** displays basic help information if you are unsure of what action to take.

5 Here you must choose among two different installation options before proceeding.



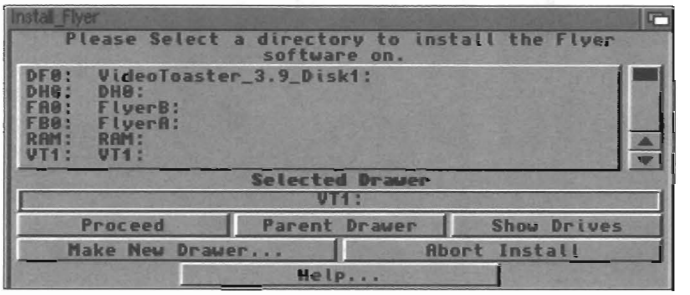
Installation Options

- **Install for Real** will take you to the next step of installation.
- **Pretend to Install** will continue as if the installation were actually occurring, but it will ***not*** install any files to your system. This option is useful if you want to find out if your hard disk has enough space (a later step allows you to choose which software to install if you do not have room for a full installation).

Log all actions to:

- **Printer** will send a copy of all the installer's actions to the parallel port. Your printer must be turned on already, and your system's printer settings correct for this to work.
- **Log File** will start a text file of all the installer's actions. If you select Log File, a requester will ask where you wish to have the file saved.
- **None** will not create a log file of any kind.

6 Here you will select the location on your computer system where you want the Toaster software installed.



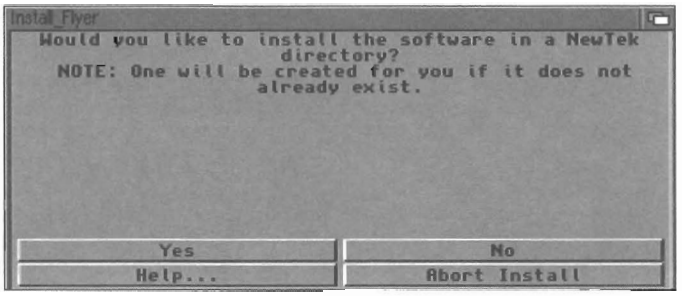
This step is asking you for two pieces of information: the **hard disk** where you want the software installed, and (optionally) the **drawer** in which you would like it installed. If you select a hard disk (for example, VT1: from the list shown above), then click **Proceed**, the software will be installed on that drive. If you further select a drawer (directory) on that drive, the software will be installed within that directory.

Important!

In the next stage of installation, the install program will ask if you wish to install all of the Flyer software in a drawer named "NewTek" (which will be placed on the drive, optionally in the directory, you choose here). If you wish to replace all of your previous Toaster software, select the drive *and* the Toaster drawer before continuing. If you wish to leave your original Toaster software untouched and place the new software in the separate NewTek drawer, select just the drive where you want the software installed.

Proceed will accept your drive/directory current selection and continue with the next step of the installation.
Parent Drawer will take you back up one step (or one level) if you have entered too many sub-directories.
Show Drives will display all of the disk drives currently available.
Make New Drawer... will create a new drawer (directory) at the selected location.

7 Choose whether you would like the Flyer software installed in a drawer named NewTek. Choose **Yes** or **No.**

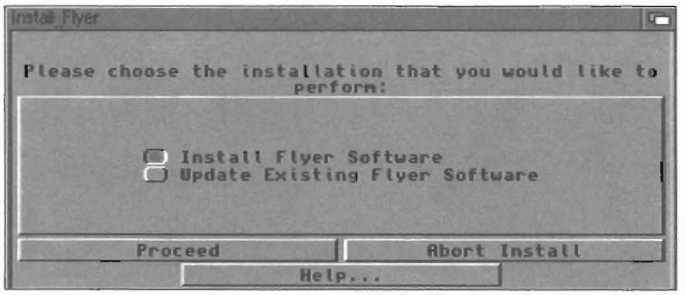


The original Toaster software was installed in a drawer named **Toaster**. In an attempt to incorporate the Flyer with the Toaster, we have opted to install all new software in a drawer named **NewTek**.

Wherever you choose to install the new software, **all** of the graphics you have ever created with the previous Toaster software will remain unchanged. The install program will only install the new software, it will not remove any previous software.

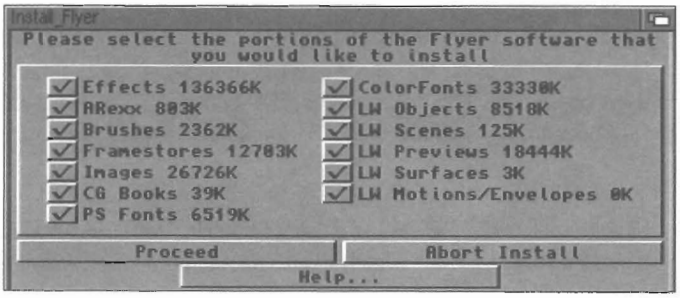
There is one caveat to this: certain system files (certain fonts in the **fonts:** directory and library files in the **libs:** directory) used by your previous Toaster software will be overwritten with new font and library files. You will *not* be able to run the old Toaster software once these have been changed unless you copy the fonts: and libs: directories to a separate location prior to running the installation in order to keep these older files aside for safekeeping.

8 Here you can select whether to simply update your existing Flyer software or go with the entire installation. Select an option then click on **Proceed.**



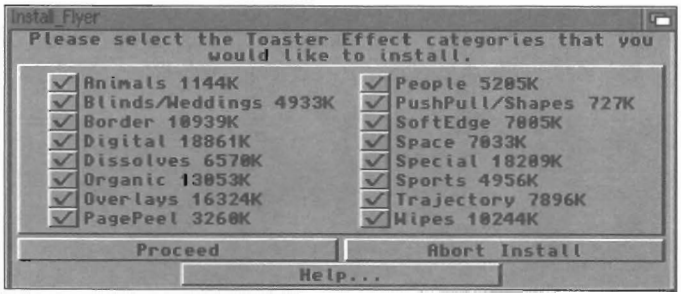
Install Flyer Software will install the full set of Flyer software. If you receive update disks from your dealer or from NewTek, you would select this option.
Update Existing Flyer Software will install only the basic Flyer operating system (i.e., about 10 MB worth of data required for the Flyer to run, but none of the supporting graphics files, PS fonts, or LightWave objects and scenes, for example). If you have just received an all-new set of Flyer, or this is your first-time installation, select this option.

9 Select which items are to be installed (the basic software is always installed, here you are selecting the additional/optional items), then click on **Proceed.**

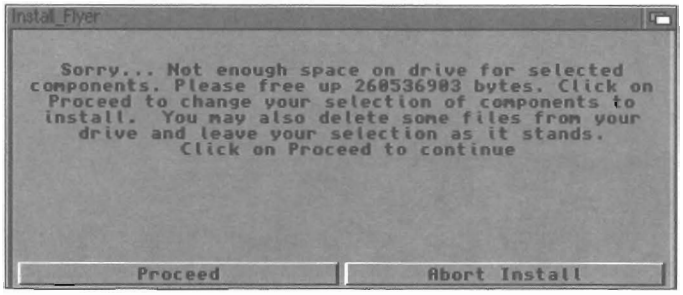


Here you can choose which items are installed. By default, all items **will** be installed. Click on a checkbox to deselect an item. Note that if you choose to install Effects, you will have another step, that of selecting which types of effects should be installed. Most users will probably choose to install everything for the first-time installation.

10 Select which effects are to be installed , then click **Proceed.**

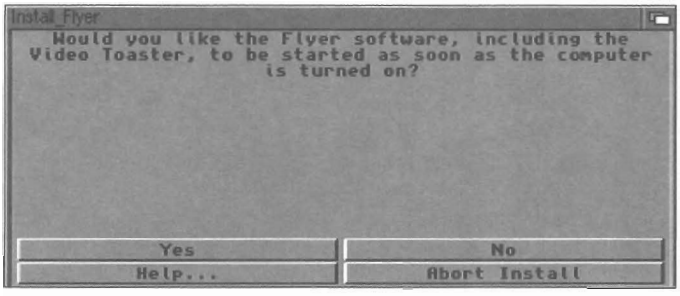


11 **You may or may not see this window.** If your system does not have enough space to accept the selected software, the install program will inform you. Otherwise, the install program will ask you the question shown in Step 12. Skip to step 12.



Proceed will return you to Step 9 where you may deselect additional items in order to install the Flyer software.

12 Here you can choose whether you would like the Toaster/Flyer to start up immediately, as soon as you start the computer. Choose Yes to install the Flyer software. Choose No otherwise.



If you choose **Yes**, an icon will be placed in the Amiga's WBStartup drawer that interrupts the final stage of the normal computer startup and, instead of starting the Workbench, starts up the Toaster/Flyer. You will still be able to get to the Workbench, but only after you quit the Toaster/Flyer program. The Amiga WorkBench will not be available until then.

If you choose **Yes**, but later change your mind, you can remove an icon called **StartToaster** from the WBStartup drawer to keep the Toaster/Flyer from starting automatically. Place the icon anywhere that's handy (leave it out on the Workbench, or return it to the NewTek drawer.

If you choose **No**, but later change your mind, simply drag an icon called **StartToaster** from the NewTek drawer into the WBStartup drawer. The presence of this icon in the WBStartup drawer will cause the Toaster/Flyer software to automatically start when the system is turned on.

12 **You may or may not see this window.** If you are installing to an AMiga 4000 or 4000T, skip this step. You will not see this window. If you are installing the software to an Amiga 2000, 3000, or 3000T, the install program will ask you to specify which model of Video Toaster card you have (either the original card for the Amiga 2000, or the newer card that fits all Amigas which we refer to as the Video Toaster 4000 card). Select the appropriate card and click Proceed.



13 The installation will now proceed from the install diskette and the CD-ROM with no further input required from you. When the install is complete, remember to remove the install disk and CD-ROM disc.

STOP.
Do **not** attempt to start the Toaster/Flyer software at this time!

Turn to **Procedure I: Formatting Your Hard Drives for Flyer Use.**

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Procedure I

Formatting Your Hard Drives for Flyer Use

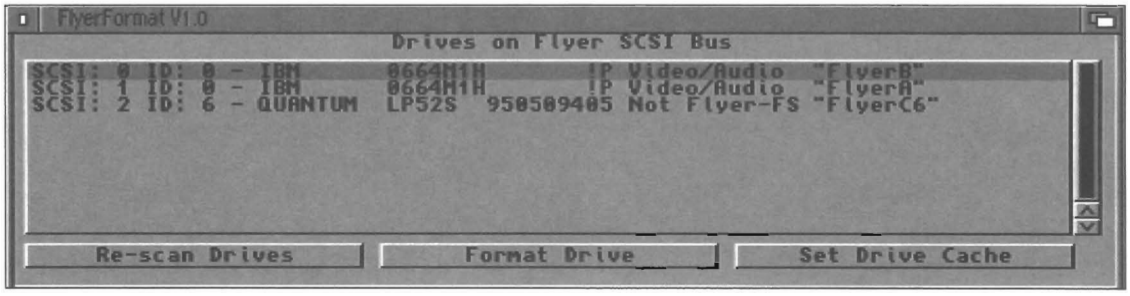
Overview

The FlyerFormat program is used for the following purposes:

- To format hard drives that have been added to the system
- To reformat a corrupted hard drive (rare, but it can happen)
- To update hard drive cache settings (which can affect drive video performance).

The format process is a simple one. Start FlyerFormat, select the drive, select the format type, and let the program do the rest.

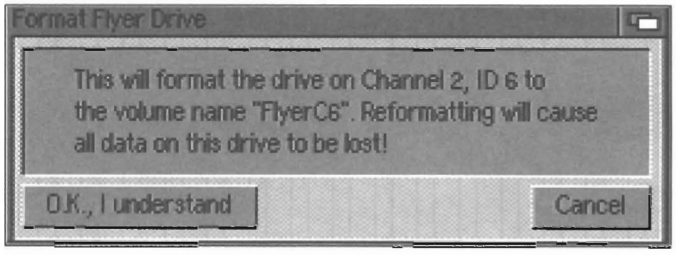
1 Locate the icon for **FlyerFormat** in the installed software drawer and double-click it to start. After a moment's delay while it reads the SCSI drive chains, it will look something like this.



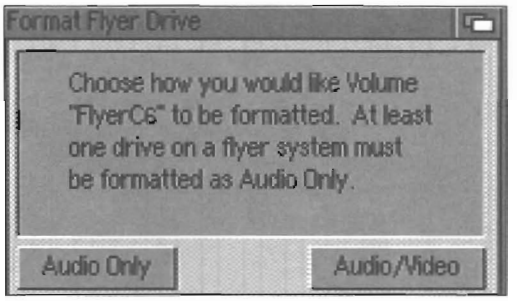
All of the drives connected to the Flyer will appear in the list window. (If a drive does not appear, double check that it has in fact powered up and that the SCSI cable is properly connected.) Follow the steps below to format a new drive.

2 From the list of available drives you should see your newly added drive with the comment "Not Flyer-FS" on its status line. Select this drive by clicking on it. The entire line will highlight (shown above).

3 Click on the button labeled **Format Drive**. You should see a message similar to the one below:



4 Click **Cancel** if for any reason you do not want to format this drive. Otherwise, click **OK** to proceed to the next step. You should see a message similar to the one below:



Click on the appropriate button for the type of data you will put on selected drive:

- **Audio Only** is intended for standard SCSI hard drives on SCSI channel C that will be used for additional audio tracks (see note below).
- **Audio/Video** is intended for hard drives on SCSI channels A and B that will be used to record video clips along with their accompanying audio.

After a few moments the process will be completed. The drive will be formatted and its cache settings updated. The list window will be cleared and updated with new status information. (For example, formatting a 2 gigabyte video hard drive takes about 20 seconds.) You can be certain the process was successfully completed by looking at the status line for the newly-formatted drive. It should indicate either "Video/Audio" or "Audio" now rather than "Not Flyer FS.")

This drive is now ready to use.

WARNING.

Do not mix Audio-Only and Audio/Video hard drives on the Flyer's SCSI chains. Always use Audio/Video drives on SCSI chains A or B. Always use Audio-only drives on SCSI chain C.

5 If you have additional drives to format for Flyer use, repeat steps 2 through 4 as necessary until all drives have been formatted. Remember to select the correct data type (Audio only or Audio/Video) for each drive.

6 When you are finished, click the close box in the upper left-hand corner of the FlyerFormat window to exit the program.

Congratulations, you are now ready to run the Video Toaster Flyer software!

When all formatting is complete, you may we recommend that you power off your system before attempting to start the software. This ensures that the computer starts from a clean boot.

Turn to the tutorial titled "Starting Up for the First Time" to get a short introduction to the Toaster/Flyer software.

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Tutorials

Tutorials

Table of Contents

The tutorials in this section include step-by-step instructions detailing many of the new functions within System 4.0.

Due to space (and time) considerations, the tutorials in this section are primarily concerned with the newer features of System 4.0, and are not necessarily intended for first-time users. The majority of the tutorials assume that you have a basic understanding of operating the videographic applications that are included with the Toaster.

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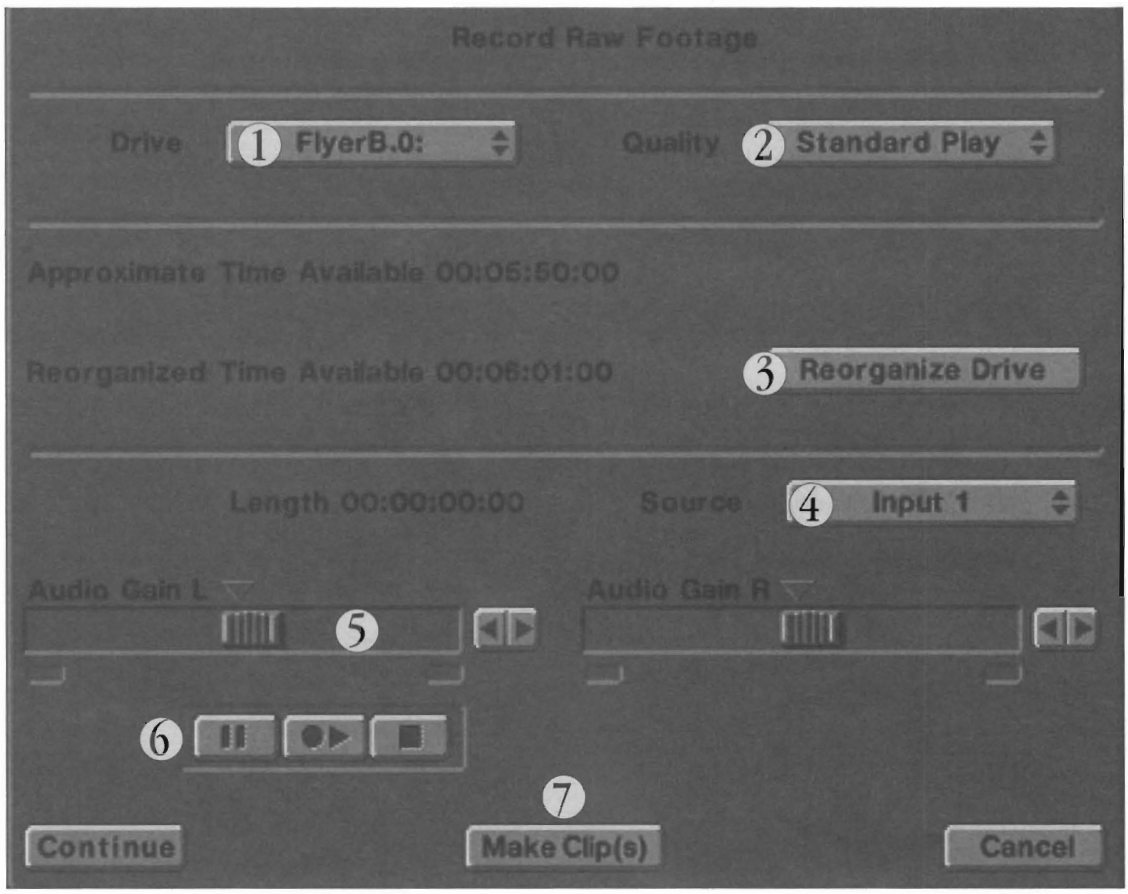
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How to Record a Video Clip

Recording video to the Flyer is a simple process, a lot like making a copy of a video tape. After you connect the video and audio outputs of the playback machine to the video and audio inputs on the Flyer, you're ready to go. If you haven't yet hooked up the Flyer, see the Installation section for instructions.

Follow the numbered steps below to record video footage into the Flyer.



1

Select the Flyer drive that will store this clip.

This pop-up contains the name of all of the active Flyer drives that can record video or audio clips. When you select a drive from this pop-up, the Approximate Time Available and Reorganized Time Available displays will be updated to give you a rough idea of how much footage you can record to this drive.

Note that these figures are also affected by the next step, where you select the recording level quality you want.

2

Select the video quality level which you would like for this clip.

There are two settings for the recording quality of video clips (Standard Play and Extended Play) and one setting for an audio clip (Audio Only). Standard Play and Extended Play are similar to the controls you'd find on a consumer VCR, where the standard speed gives you the best image quality but less overall recording time while Extended Play provides slightly lesser quality with longer recording time. (Audio quality remains at 16-bit CD quality for either reocrding mode.)

Try out both video modes (record the same video segment twice, each time with the alternate setting, then play them back) to see if you notice a discernable difference. If you do see one, you may prefer to use Standard Play for all your work. If you don't see a difference, use Extended Play for maximum record time.

For audio only clips, select Audio Only. This activates the audio input connections on the back of the Flyer and ignores all video inputs. (Note that if you are recording an audio clip from a video tape, you will not be able to see the video while you record the audio only. The Toaster's output will be black while you record audio clips.)

3 Decide whether you wish to reorganize the files on this Flyer drive. If so, select the Reorganize Drive button. If not, skip this step.

Reorganization can free up additional space on the selected drive so that you may be able to record longer clips. Since Flyer video clips are just "files" to the computer, sometimes they can be better organized on the hard disk, which can increase your usable recording space on the drive. However, the process can take up quite a bit of time. If you do not need to reorganize the drive, don't take the time to do so.

4 Select the input source. Once you choose a source, you will see it on the Toaster's main output (and hear its audio, if any, on the Flyer's audio outputs).

The Flyer can record video from several different connections. For video clips, you can select from Toaster inputs 1-4, the Flyer's composite input, the Flyer's Y/C input, or the Toaster's main output. (Why the main output? See the note at the end of this tutorial.)

Important!
Remember that the Flyer, like the Toaster, requires a clean video source in order to record rock-solid video. VCRs or camcorders in playback mode will need their video signal time-base corrected first. Otherwise, generally a live camera or a laserdisc player is acceptable.

5 Check that your audio levels are correct for recording.

While you view the video passing through the Flyer, listen to the audio and look at the audio lamps below each of the Audio Gain sliders. If everything is set correctly, you'll be able to hear clear audio through your speaker setup and you'll be able to see that both of these lamps are not lit. Ideally neither lamp will ever light.

How the lamps work
The lamp on the left lights whenever the audio input level is too high to record a clear signal (this is referred to as *clipping*). It will light momentarily each time the signal clips, then dim after the peak has passed. The lamp on the right will also light up when the audio level clips, but it will remain solidly lit. It will reset when you adjust the its audio slider. This lamps stays on to let you know the clipping has occurred just in case you were not paying attention when it happened. You may wish to adjust your audio sliders until you see a tiny bit of clipping, then bring them down slightly until the lamps no longer light. This will set the optimum level for audio recording.

6 Click on the Record button to begin recording video to the Flyer. Select Pause if you wish to pause recording for a moment and cue up another segment of video, or select Stop when you are done recording.

You can use the Pause button to halt recording while you ready another video clip. This allows you to record a number of different segments in one recording session, because your next duty will be to splice them into separate clips at the Make Clips panel.

As a shortcut, you can use the Spacebar on the keyboard to Start and Stop recording.

7 Select Make Clips to continue to the clip splicing control panel.

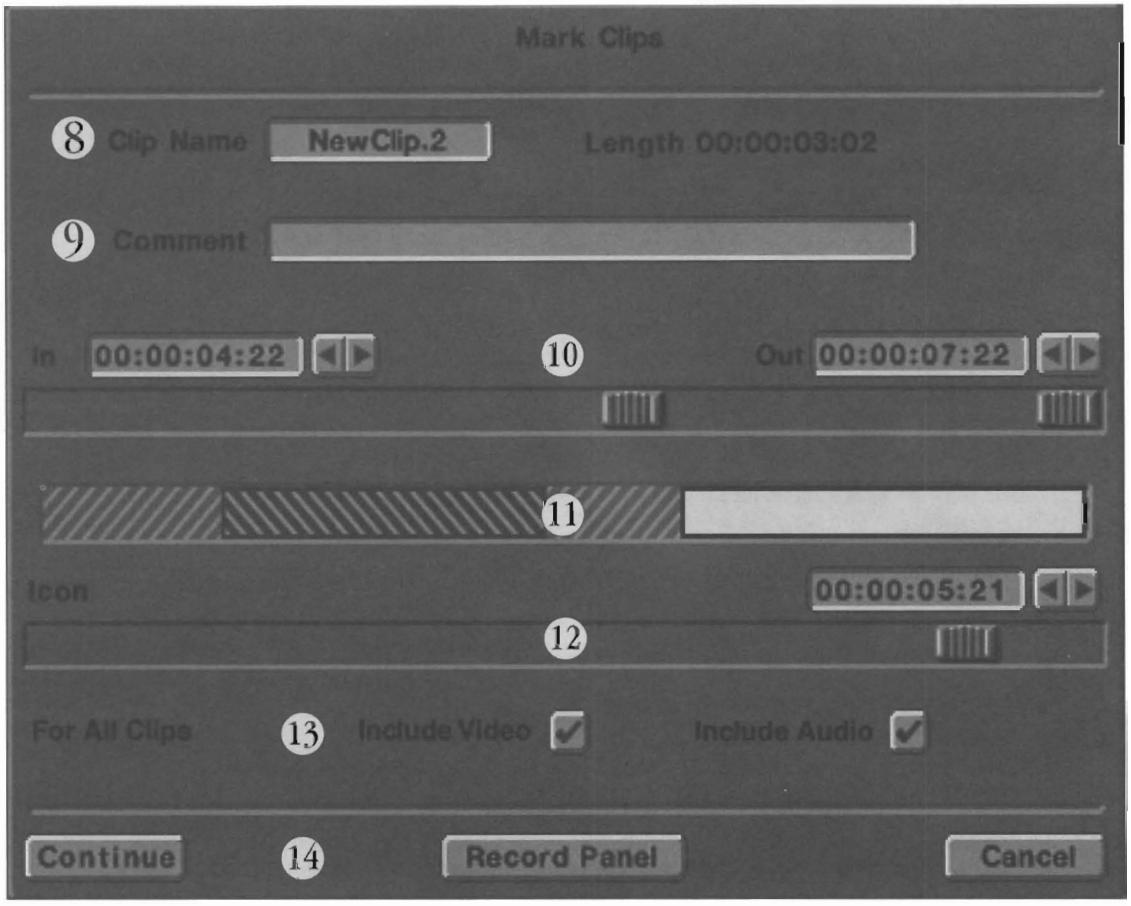
8 Enter a name for this video clip. Press Return to accept the name and jump the text cursor to the next field.

Clip names may be any reasonable length. However, since the editor's display icons are not very wide, we recommend that you use short names wherever possible. This will make it easier to identify clips when editing.

9 **(Optional)** Enter a description that can serve as a reminder for this clip. Press Return to accept this comment.

Future versions of the Flyer software (or third-party editing packages) may take advantage of the comment/description field, allowing you to "search" for clips based on the commentary. You may find it useful to get in the habit of adding comments to clips.

10 Drag the In and Out sliders to determine the start and end points for the current clip.



As you drag the sliders, you will shorten the yellow bar across the center of the panel (Amiga 2000 or 3000 owners will see a white bar). This bar indicates the entire length of the raw footage that you just recorded to the Flyer drive. Once you define one clip, you can click inside the non-highlighted portion to start defining a second clip. A new bar will appear where you click, and the sliders will jump to new in and out positions at either end of it.

The image above shows two clips that have been defined out of raw footage. You can click on either highlight bar and adjust the in and out points as much as you wish before actually creating clips. Don't forget to enter a separate name for each clip at the top of each panel!

11 **(Optional)** If you recorded more footage than you wish to include in a single clip, click elsewhere on the bar to create a new clip (whose in and out points you can define).

The video bar represents all of the recorded video from this recording session. When you first enter this panel, the entire bar is selected as a single clip. You can drag the sliders to define a shorter clip, then click in the unused section of the bar to highlight and define a second. third, and more clips, each of which has its own in and out point. (Note that clips can have overlapping in and out points, allowing you to leave a little excess lead-in and trail-out time at each end of a clip for transitions when sequencing.)

12 **(Optional)** For each clip, drag the Icon slider to select the icon image that will appear on a video clip's crouton. As you drag the slider, you can see the recorded video on the main output.

This allows you to choose an image that best represents the clip, and will remind you most of its content when you are editing.It's best to set the icon for each clip as you define the clip, so that you don't forget to do so (and end up with an image you don't want).

13 Select the appropriate items that should be saved for all of the clips created in this session.

Most of the time, the boxes for both Include Video and Include Audio should be checked, since you are probably working with video imagery. For audio only clips, just check the Audio box.

> **Important!**
> The settings for Include Video and Include Audio will affect *all* clips that are created. Unlike the other controls on this panel, such as Clip Name which refers to only the currently highlighted clip, these two checkboxes refer to all clips made from this raw footage. They do *not* indicate which items to save on a clip-by-clip basis.

14 When you are finished and all clips are marked to your liking, exit the panel via the Continue button. The clips you just defined will be created, the excess unused footage will be deleted, and you will be returned to the editor.

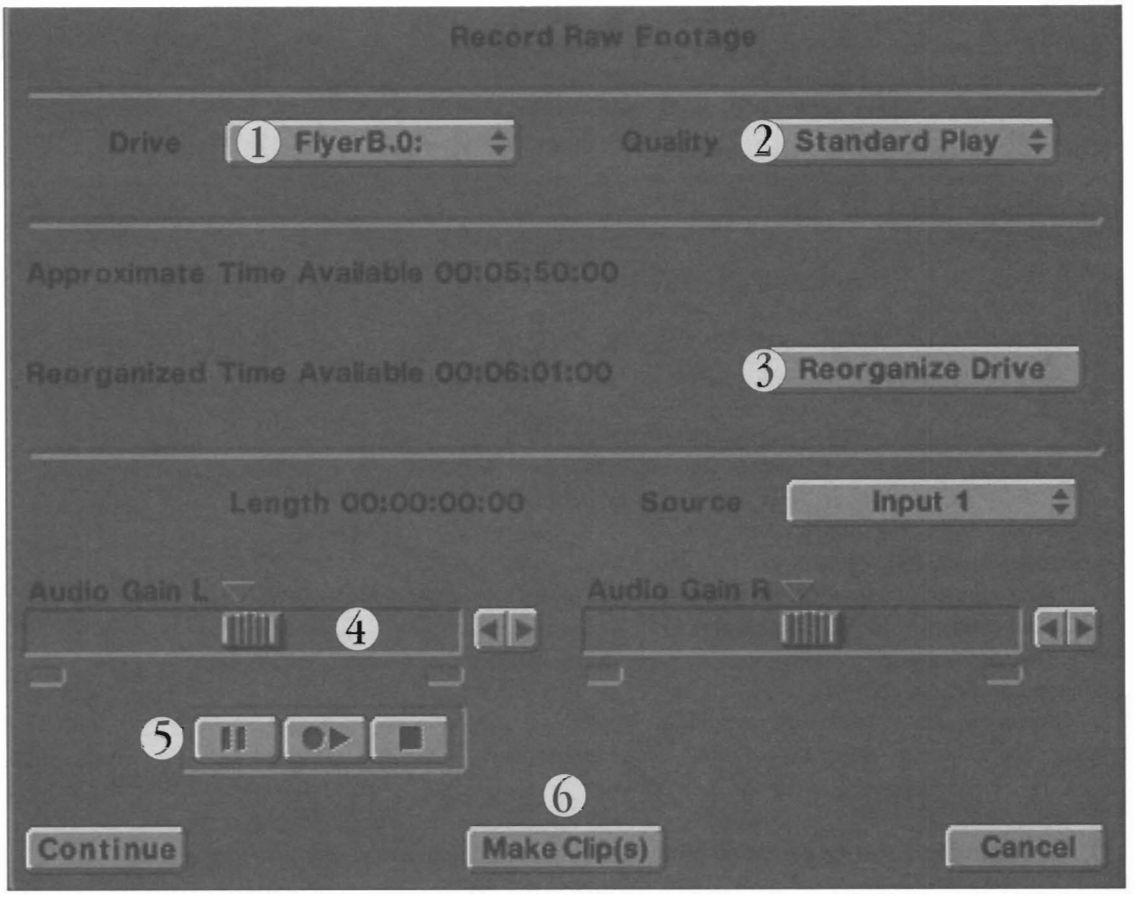
If you decide to continue recording footage, select the Record Panel button to return to the previous panel. The clips you just recorded and marked will be created, the excess unused footage will be deleted, and you will be ready to record again.

If for any reason you do not wish to keep anything that you have just recorded or marked, exit the panel via the Cancel button. All footage will be deleted from the hard drive and you will be returned to the editor.

How to Record an Audio Clip

Recording audio to the Flyer is a lot like making a copy of a favorite song. After you connect the audio outputs of the playback machine to the audio inputs on the Flyer, you're ready to go. If you haven't yet hooked up the Flyer, see the Installation section for instructions.

Follow the numbered steps below to record audio clips into the Flyer. These steps must be followed for *every* clip you record to the Flyer.



1 Select the Flyer drive that will store this audio clip.

This pop-up contains the name of all of the active Flyer drives that can record video or audio clips. Audio drives show up with a tiny speaker icon next to their name. When you select a drive from this pop-up, the Approximate Time Available and Reorganized Time Available displays will be updated to give you a rough idea of how much audio you can record to this drive.

2 Make sure this pop-up shows Audio Only (the other two settings are for video recording). This activates the audio input connections on the back of the Flyer and ignores all video inputs.

Note 1:
If you are recording audio from a video tape, you will not need a time-base corrector hooked up between the VCR and the Flyer. Simply make sure that only the audio connectors are hooked up to the FLyer, and you'll be able to record audio. (If you leave the video hooked up, you'll need to make sure the video signal is clean in order for the Flyer to record a proper clip.)

Note 2:
If you are recording an audio clip from a video tape, you will not be able to see the video while you record the audio. The Toaster's output will be black while you record audio clips. To help you locate a portion of audio that you wish to record from a video tape, leave this set to one of the Video modes whiole you cue up the tape, then set it to Audio Only for the recording process.

3 Decide whether you wish to reorganize the files on this Flyer drive. If so, select the Reorganize Drive button. If not, skip this step.

Reorganization can free up additional space on the selected drive so that you may be able to record longer clips. Since Flyer clips are just "files" to the computer, sometimes they can be better organized on the hard disk, which can increase your usable recording space on the drive. However, the process can take up quite a bit of time. If you do not need to reorganize the drive, don't take the time to do so.

4 Check that your audio levels are correct for recording..

Listen to the audio and look at the audio lamps below each of the Audio Gain sliders. If everything is set correctly, you'll be able to hear clear audio through your speaker setup and you'll be able to see that both of these lamps are not lit. Ideally neither lamp will ever light.

How the lamps work
The lamp on the left lights whenever the audio input level is too high to record a clear signal (this is referred to as *clipping*). It will light momentarily each time the signal clips, then dim after the peak has passed. The lamp on the right will also light up when the audio level clips, but it will remain solidly lit. It will reset when you adjust the its audio slider. This lamps stays on to let you know the clipping has occurred just in case you were not paying attention when it happened. You may wish to adjust your audio sliders until you see a tiny bit of clipping, then bring them down slightly until the lamps no longer light. This will set the optimum level for audio recording.

5 Click on the Record button to begin recording audio to the Flyer. Select Pause if you wish to pause recording for a moment and cue up another audio segment, or select Stop when you are done recording.

You can use the Pause button to halt recording while you ready another audio clip. This allows you to record a number of different segments in one recording session, because your next duty will be to splice them into separate clips at the Make Clips panel.

As a shortcut, you can use the Spacebar on the keyboard to Start and Stop recording.

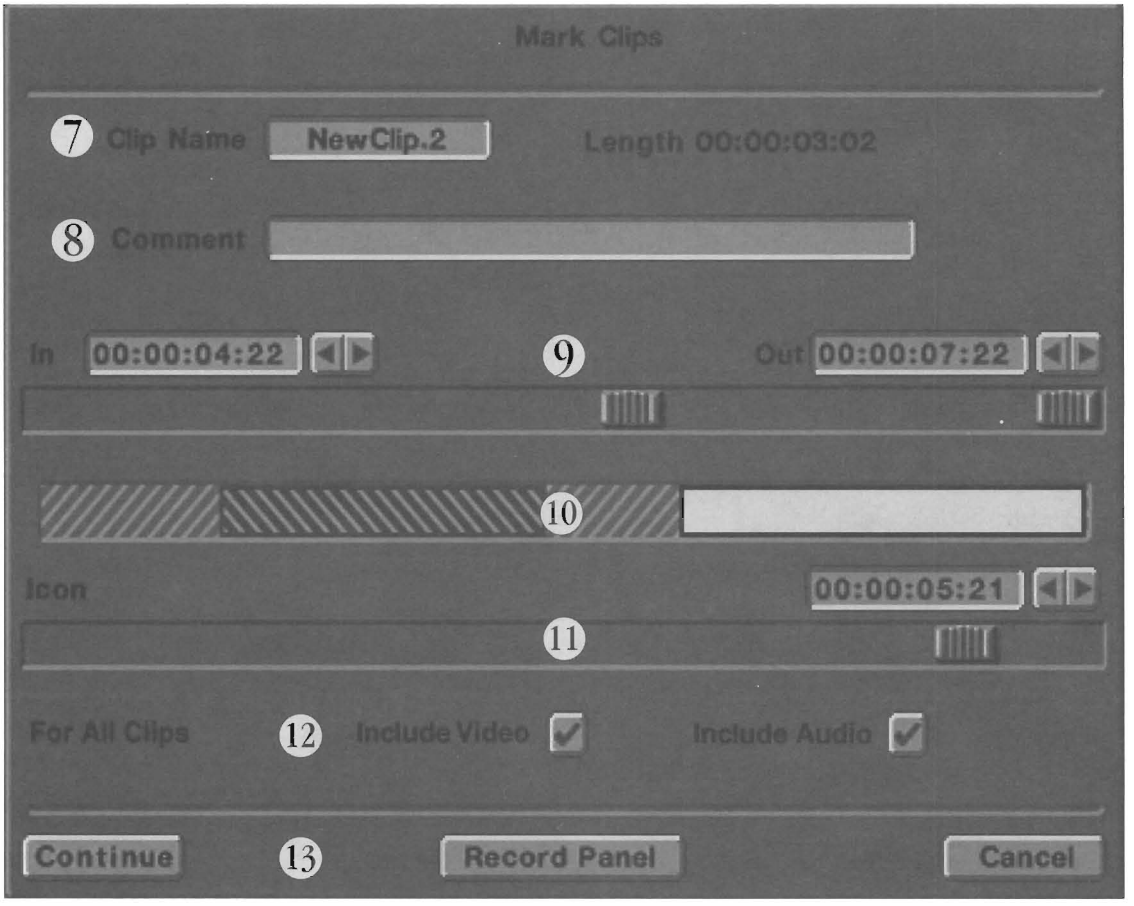
6 Select Make Clips to continue to the clip splicing control pane (and turn to the next page)l.

7 Enter a name for this audio clip. Press Return to accept the name. The text cursor will jump to the next field.

Clip names may be any reasonable length. However, since the editor's display icons are not very wide, we recommend that you use short names wherever possible. This will make it easier to identify clips when editing.

8 **(Optional)** Enter a description that can serve as a reminder for this clip. Press Return to accept this comment.

Future versions of the Flyer software (or third-party editing packages) may take advantage of the comment/description field, allowing you to "search" for clips based on the commentary. You may find it useful to get in the habit of adding comments to clips.



9 Drag the In and Out sliders to determine the start and end points for the current clip. You will hear the audio play as you drag the sliders.

When you drag the sliders, you will shorten the yellow bar across the center of the panel (Amiga 2000 or 3000 owners will see a white bar). This bar indicates the entire length of the raw footage that you just recorded to the Flyer drive. Once you define one clip, you can click inside the non-highlighted portion to start defining a second clip. A new bar will appear where you click, and the sliders will jump to new in and out positions at either end of it.

The image above shows two clips that have been defined out of raw footage. You can click on either highlight bar and adjust the in and out points as much as you wish before actually creating clips. Don't forget to enter a separate name for each clip at the top of each panel!

10 **(Optional)** If you recorded more footage than you wish to include in a single clip, click elsewhere on the bar to create a new clip (whose in and out points you can define).

The bar across the center of the screen represents all of the recorded audio from this recording session. When you first enter this panel, the entire bar is selected as a single clip. You can drag the sliders to define a shorter clip, then click in the unused section of the bar to highlight and define a second, third, and more clips, each of which has its own in and out point. (Note that clips can have overlapping in and out points, allowing you to leave a little excess lead-in and trail-out time at each end of a clip for transitions when sequencing.)

11 The Icon slider appears whether you record a video clip or an audio clip. However, it has no effect for audio clips since the Flyer creates a generic audio clip crouton image for you. Leave this slider as is.

12 Doublecheck that the Include Audio box is the only box checked.

It makes no sense creating an audio only clip and selecting the Include Video checkbox, since only black is recorded using the Audio Only setting. Besides, an audio only clip takes up less space on your hard drive than a video clip that shows black and has an audio track with it. The audio quality is the same, except that the file with black video is much larger.

> **Important!**
> The settings for Include Video and Include Audio will affect *all* clips that are created. Unlike the other controls on this panel, such as Clip Name which refers to only the currently highlighted clip, these two checkboxes refer to all clips made from this raw footage. They do *not* indicate which items to save on a clip-by-clip basis.

13 When you are finished and all clips are marked to your liking, exit the panel via the Continue button. The clips you just defined will be created, the excess unused footage will be deleted, and you will be returned to the editor.

If you decide to continue recording footage, select the Record Panel button to return to the previous panel. The clips you just recorded and marked will be created, the excess unused footage will be deleted, and you will be ready to record again.

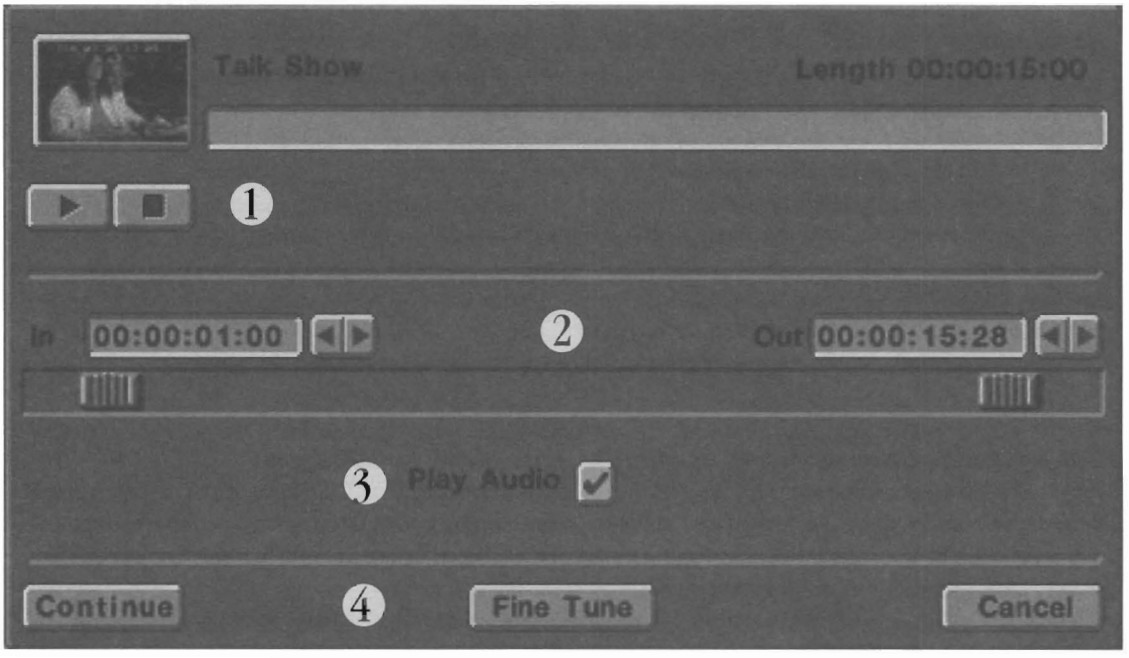
If for any reason you do not wish to keep anything that you have just recorded or marked, exit the panel via the Cancel button. All footage will be deleted from the hard drive and you will be returned to the editor.

How to Edit a Video Clip using the Quick Tune Panel

Editing a clip, whether audio or video, is easy with the Flyer. Each clip represents a video (or audio) segment of a given length. Using the control panel, you mark the start and end points for each individual clip with an easy-to-use slider (these are typically known as the *in point* and the *out point*). These allow you to determine just how much of the clip to use when it is shown. Whenever you play this clip the Flyer will only "roll video" from the in point to out point.

The Flyer normally displays the Quick Tune version of a control panel when you open it up. For most video editing, you should find that the controls here are sufficient for your needs. However, when you need finer control, or if you wish to create a split edit, you'll need to click on the Fine Tune button to access the expanded control panel. To use the advanced control panel, see the **How to Edit a Video Clip (Fine Tune panel)**.

Follow the numbered steps below to learn how to edit a Flyer clip from the Quick Tune panel.



1 Use the Play and Stop buttons at any time to view the clip (from in point to out point) in case you wish to check your editing.

If you wish to view the entire clip, you will have to move the in and out sliders to their outermost positions. The Play button will only play the video segment from the in point to the out point. Excess footage is ignored.

2 Set the in point (the starting point) for this clip, and the out point (the ending point).

You can drag the slider, click or drag over the double-arrow gadget, or enter a time code value in the numeric window. Remember, the in point marks the beginning of the footage you wish to use when the Flyer plays this clip. The in point may fall anywhere in the clip.

3 Decide whether you want to hear the audio portion of this clip.

If you are performing a split edit, you may or may not want to hear the audio from the cutaway shots. When this box is checked, the audio for this clip will be heard at the default (70%) volume level.

4 Exit the panel.

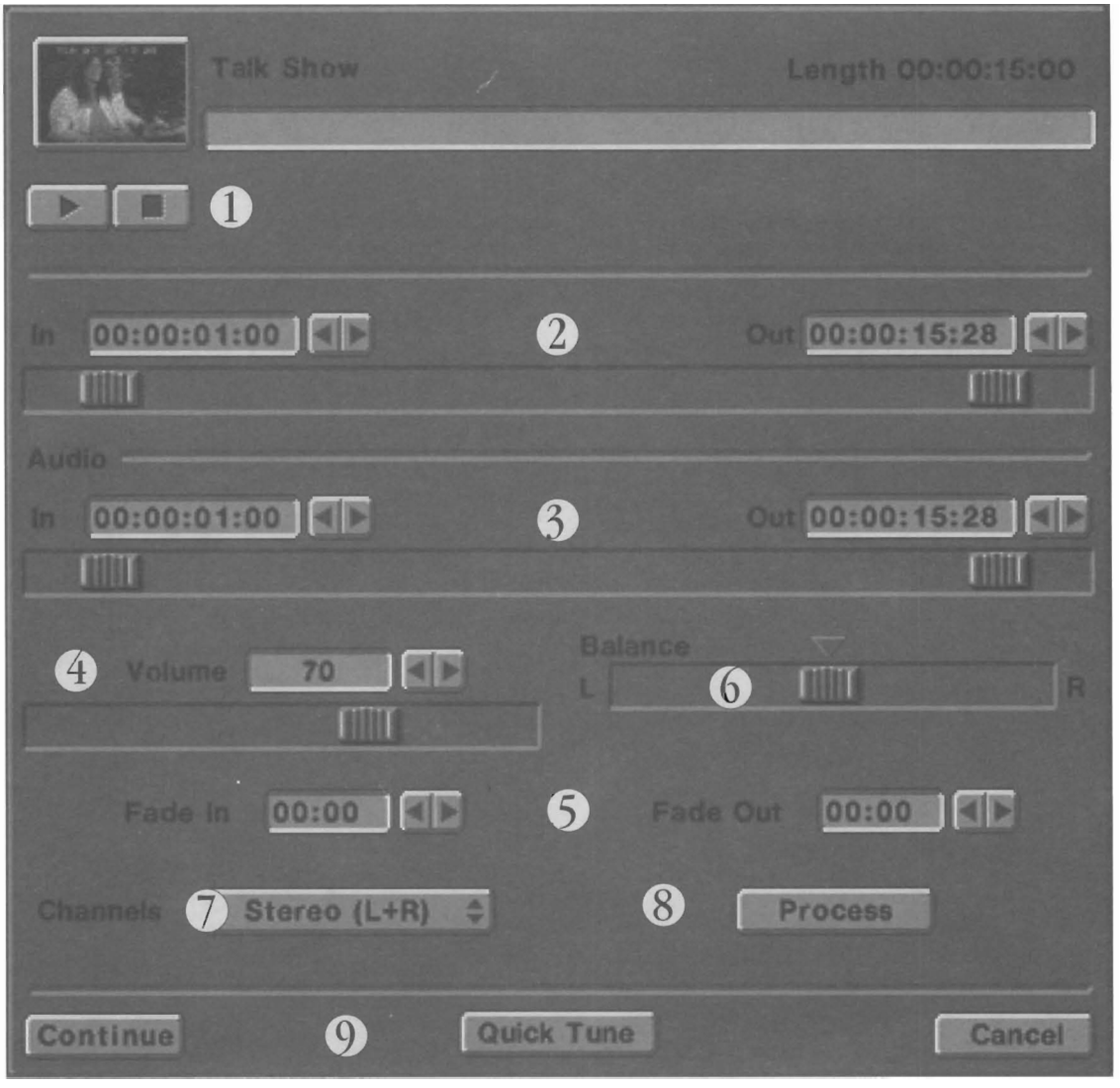
Click **Continue** to accept your edit point settings and close the panel. Click **Cancel** to exit the panel and ignore any changes made while it was open. Click **Fine Tune** to expand the panel and gain access to additional editing controls (see following pages).

Audio Note:
If you record audio with the Audio Gain slider at the default position on the recording panel, and you wish to have the audio play back at that exact level (often referred to as *unity gain*), you will achieve a very close match in playback by setting the audio playback level to 95%.

The Flyer defaults to 70% volume level on playback, leaving you a degree of "headroom" for mixig multiple audio tracks during sequencing. In other words, if you have two video clips and two stereo audio clips playing back at one time and you want to make one slightly louder than the rest, it's much simpler to enter one of those four panels and raise its volume level a bit than it is to enter three panels and lower three volume levels a bit.

How to Edit a Video Clip using the Fine Tune Panel

Follow the numbered steps below to learn how to edit a Flyer clip. ("Fine Tune Panel" refers to **Fine Tune** button, which accesses the advanced version of the control panel that contains additional controls for timing and audio. If you don't need these additional controls, use the simple version of a clip's control panel, shown on the facing page.)



1 Use the Play and Stop buttons at any time to view the clip (from in point to out point) in case you wish to check your editing.

If you wish to view the entire clip, you will have to move the in and out sliders to their outermost positions. The Play button will only play the video segment from the in point to the out point. Excess footage is ignored.

2 Set the in point (the starting point) for this clip, and the out point (the ending point).

You can drag the slider, click or drag over the double-arrow gadget, or enter a time code value in the numeric window. Remember, the in point marks the beginning of the footage you wish to use when the Flyer plays this clip. The in point may fall anywhere in the clip. You'll see the video and hear the audio as you drag the slider.

3 Set the in point (the starting point) for the audio portion of this clip. Default is 1 second from the actual beginning of the clip. Also, set the out point (the ending point).

You can drag the slider, or drag the double-arrow gadget, or enter a time code value from the keyboard. You'll see the video and hear the audio as you drag the slider.

4 Set the volume level for this clip. Default is about 70%.

The Flyer defaults to 70% volume level on playback, leaving you a degree of "headroom" for mixig multiple audio tracks during sequencing. In other words, if you have two video clips and two stereo audio clips playing back at one time and you want to make one slightly louder than the rest, it's much simpler to enter one of those four panels and raise its volume level a bit than it is to enter three panels and lower three volume levels a bit.

Note:
If you record audio with the Audio Gain slider at the default position on the recording panel, and you wish to have the audio play back at that exact level (often referred to as *unity gain*), you will achieve a very close match in playback by setting the audio playback level to 95%.

Tip:
Set the volume level low for background sound, such as 10-30%. Natural sound is sometimes recorded on location and added to the program back at the studio to enhance the atmosphere or mood of the program rather than compete for attention. You wouldn't want to mix the sounds of a waterfall in the distance louder than the dialog of the actors standing in front of it!

5 Set the Fade In and Fade Out values. Default is 00:00, (no fade).

The fade controls allow you to fade the audio portion of the clip at the front of the clip (Fade In), the back of the clip (Fade Out), or both ends of the clip. The display shows values of seconds and frames (ss:ff) only. (For example, if you want the audio to fade in over the course of 5 seconds, set Fade In to 05:00. If , you want it to fade out over 3 and one-half seconds, set Fade Out to 03:15).

6 Determine the balance of the audio output. Default is center.

You can shift the audio that plays with this clip all the way to the left or the right, or set it somewhere in between to shift its "center". To center the audio exactly, or to reset the audio to center, click on the triangle button above the slider.

7 Select the audio channel to use for playback. Default is stereo.

If you want a specific voice, sound, or music track to come from one channel or another, select it here.

8 **(Optional)** If you wish to make a copy of this clip, or of some portion of this clip, or make an audio0only track from its audio, select the Process button. See the Process panel for details.

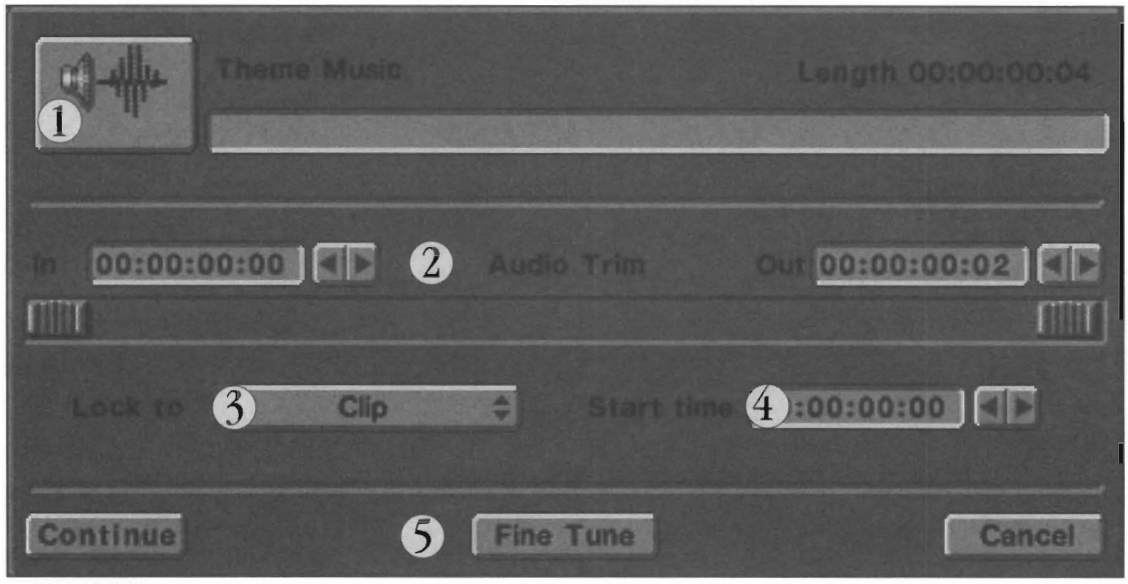
9 Exit the panel.

Click **Continue** to accept your edit point settings and close the panel. Click **Cancel** to exit the panel and ignore any changes made while it was open. Click **Quick Tune** to reset the panel to the simplified display (Quick Tune).

How to Edit an Audio Clip using the Quick Tune Panel

Editing an audio clip is easy with the Flyer. Simply select the icon that represents the clip, then click on the **Controls** button to access its control panel. Use the control panel the starting and end points for the clip, typically referred to as the *in point* and the *out point*. These allow you to determine just how much of the clip to use when it is played. Whenever you use this clip the Flyer will only play audio from the defined points.

Follow the numbered steps below to learn how to edit a Flyer clip. ("Quick Tune Panel" refers to the simple version of a clip's control panel, its default appearance. To use the advanced control panel, see the **Fine Tune** button and the next page.)



1 Click the audio clip icon at any time to hear the clip (from in point to out point) in case you wish to check your editing. This button is a Play/Stop toggle.

If you wish to hear the entire clip, you will have to move the in and out sliders to their outermost positions. The Play/Stop button will only play the audio segment from the in point to the out point. Excess audio is ignored.

2 Set the in point (the starting point) for this clip, and the out point (the ending point).

You can drag either slider, click or drag over a double-arrow gadget, or enter a time code value in the numeric window. Remember, the in point marks the beginning of the footage you wish to use when the Flyer plays this clip. The in point may fall anywhere in the clip. You'll see the hear the audio as you drag the slider.

3 Set the Lock To event to either Clip or In Point.

About the Lock To pop-up

In a project sequence, an audio clip begins playing at the same moment as the video clip that precedes it. The Lock To event is a way for you to determine which moment the audio should be tied to—the in point that has been set for the previous crouton, or the previous clip's actual starting point (including the excess footage prior to the in point).

- For most audio tracks, you will probably use the In Point setting for Lock To. This synchronizes the starting of this audio clip to the in point of the video event that precedes it.
- For special use like syncronizing sound effects, it's easier to use the Clip setting for Lock To. See the use of Start Time (below) for more information.

4 Set the Start Time.

About Start Time
Start Time allows you to delay the playback of the audio track for a period of time following the Lock To event.

You'll find examples of using Lock To and Start Time in later tutorials.

5 Exit the panel.

Click **Continue** to accept your edit point settings and close the panel. Click **Cancel** to exit the panel and ignore any changes made while it was open. Click **Fine Tune** to expand the panel and gain access to additional editing controls (see following pages).

General Information About Lock To and Start Time
Think of Lock To and Start Time as setting a countdown timer: you want the countdown to last for a set period of time (Start Time), and you want the countdown to begin counting at a certain point (Lock To). You use these two gadgets to control when the Flyer begins counting down to the playback of the audio clip, and for how long that countdown lasts before playback begins. In all cases, these two things relate to the previous video event (a video clip, or a still image).

Example 1:
To have the audio clip start at the same moment as the previous video event starts...
Set Lock To to In Point and Start Time to 00:00:00:00.

Example 2:
To have the audio clip start 5 seconds after the previous video event has started...
Set Lock To to In Point and Start Time to 00:00:05:00.

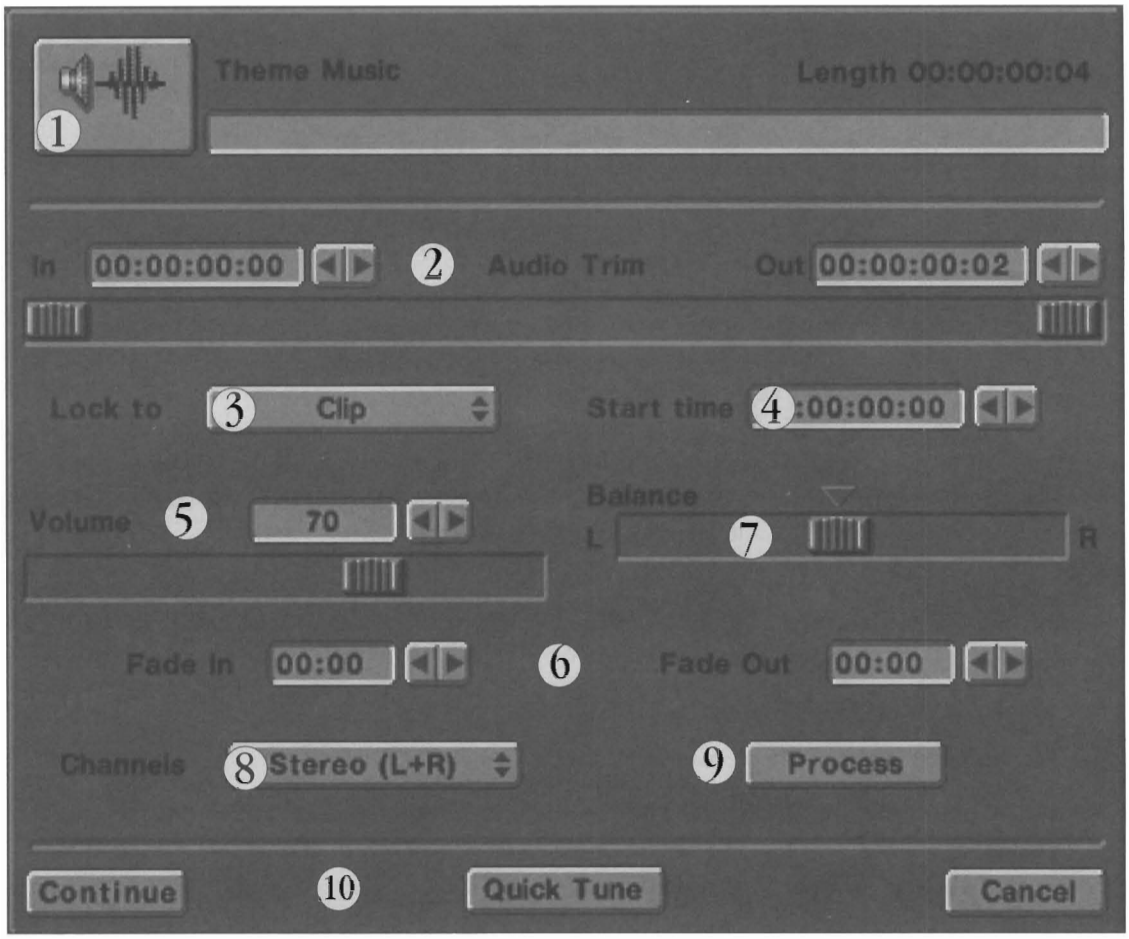
Example 3:
To have a sound effect start at a specific moment during a video clip...
Set Lock To to Clip, and set Start Time to that time code value where the sound effect should be heard. (Otherwise, if Lock To were tied to In Point, you would have to figure out the actual time code value that you might have to set for Start Time. This method is simpler.)

Suppose you have a video clip of someone swinging a golf clip and an audio clip sound effect of rushing air. You watch the video clip and notice that the golfer begins to swing his club at 3 seconds, 11 frames. You place the audio clip after the video clip in the storyboard sequence, set its Lock To event to Clip, and its Start Time to 00:00:03:11. When you play the project, the sound effect will occur exactly as the golfer swings his club.

Note:
When Lock To is set to Clip, the Start Time relates to the *entire length* of the video clip that precedes it (in other words, it **ignores** the in and out points, looking instead at the entire clip). This way you can be sure that the Start Time value you choose for the audio clip relates directly to the same value you saw in the time code display for the video clip. In other words, a Start Time value of 04:12 (4 seconds, 12 frames) means that the audio begins 04:12 into the clip, counting from the beginning of the clip itself, not counting from the in point of the clip. (Otherwise, you'd have to calculate the time difference between the clip's in point and your desired audio start point, which would be not only confusing but also difficult!)

How to Edit an Audio Clip using the Fine Tune panel

Follow the numbered steps below to learn how to edit a Flyer audio clip. ("Fine Tune panel" refers to **Fine Tune** button, which accesses the advanced version of the control panel that contains additional controls for timing and audio. If you don't need these additional controls, use the simple version of a clip's control panel, shown on the facing page.)



1-4 Steps 1 through 4 for the Fine Tune Audio Panel are exactly the same as steps 1 through 4 for the Quick Tune audio panel. Follow the steps below to learn about the additional controls on the expanded panel.

5 Set the volume level for this clip. Default is about 70%.

The Flyer defaults to 70% volume level on playback, leaving you a degree of "headroom" for mixing multiple audio tracks during sequencing. In other words, if you have two video clips and two stereo audio clips playing back at one time and you want to make one slightly louder than the rest, it's much simpler to enter one of those four panels and raise its volume level a bit than it is to enter three panels and lower three volume levels a bit.

Note:
If you record audio with the Audio Gain slider at the default position on the recording panel, and you wish to have the audio play back at that exact level (often referred to as *unity gain*), you will achieve a very close match in playback by setting the audio playback level to 95%.

Tip:
Set the volume level low for background sound, such as 10-30%. Natural sound is sometimes recorded on location and added to the program back at the studio to enhance the atmosphere or mood of the program rather than compete for attention. You wouldn't want to mix the sounds of a waterfall in the distance louder than the dialog of the actors standing in front of it!

6 Set the Fade In and Fade Out values. Default is 00:00, (no fade).

The fade controls allow you to fade the audio portion of the clip at the front of the clip (Fade In), the back of the clip (Fade Out), or both ends of the clip. The display shows values of seconds and frames (ss:ff) only. (For example, if you want the audio to fade in over the course of 5 seconds, set Fade In to 05:00. If , you want it to fade out over 3 and one-half seconds, set Fade Out to 03:15).

7 Determine the balance of the audio output. Default is center.

You can shift the audio that plays with this clip all the way to the left or the right, or set it somewhere in between to shift its "center." To center the audio exactly, or to reset the audio to center, click on the triangle button above the slider.

8 Select the audio channel to use for playback. Default is stereo.

If you want a specific voice, sound, or music track to come from one channel or another, select it here.

Important:
Note that setting the playback channel to left only or right only does not free up the unused audio channel. With two or more video drives and a dedicated audio drive, the Flyer can handle 8 pairs of audio whether you use them as pairs or individual channels. At any moment in time, each video clip that is playing counts as one stereo pair. The same is true for each audio clip. Therefore, you cannot have eight clips playing at once, with each clip using only one channel.

9 **(Optional)** If you wish to make a copy of this clip, or of some portion of this clip, or make an audio-only track from its audio, select the Process button. See the Process panel for details.

10 Exit the panel.

Click **Continue** to accept your edit point settings and close the panel. Click **Cancel** to exit the panel and ignore any changes made while it was open. Click **Quick** Tune to reset the panel to the simplified display (Quick Tune).

How to Set up a Cut (or Take) Between Clips

The cut, or take, is the basic transition in television and film.

Whenever you place a pair of video croutons side by side, the automatic transition between them is a cut. Therefore, setting up a cut (or a series of cuts) is simple. There really is nothing more you need do than place clips in the project window.

1 Drag a video crouton (a clip or a still image) into the project window.

2 Drag another video crouton (a clip or a still image) into the project window and drop it beside the first.

The project window will look something like this, at this stage.



3 Click on the Play button, the first clip will run, then cut to the second clip.

You may want to practice placing clips and still images in the project window. Here are some tips to keep in mind:

- Drop a crouton in the "open space" of the project window and it will take its place at the end of the current project automatically.
- Drop a crouton between any other two croutons to insert it there. You'll see a "hole" open up as you hold a crouton between two others. All of the croutons after the inserted one will move one space over to accommodate it.
- Hold the Shift key when you want to select more than one crouton. With each click of the mouse, you can select additional croutons all in one operation, and then drag them into the project at once.

How to Set up an Effect Between Clips

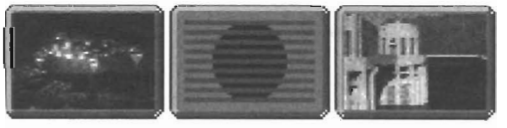
Whenever you insert a special effect crouton between a pair of video croutons, you have set up a transition between the two. That's all there is to it.

1 Drag a video crouton (a clip or a still image) into the project window. Check its control panel and make sure that the clip lasts for at least 3 seconds, with about 1 second of unused footage at each end.

2 Do the same with another video crouton.

3 Go to the Effects folder, locate the Smooth Fade effect, and drop it in between the two clips.

The project window will look something like this, at this stage.



4 Click on the Play button, the first clip will run, then dissolve to the second clip.

The majority of video programming consists of cuts, some dissolves,and a few effects. With the steps you've just learned (setting up cuts and effects between video), you've learned a great deal of what you need to know in order to use the Flyer and edit video.

You may want to practice using a variety of effects. Here are some tips to keep in mind:

- Don't put two effects side-by-side. An effect must sit between a pair of video events, because you can't use an effect to transition to an effect! The Flyer will warn you if you do this by accident.
- Transitions offer a way to "stitch together" two video segments so that they overlap for a period of time (as the transition brings one video source on screen over the other). Therefore, make sure that there's some "extra" footage at the beginning and the ending of each clip to allow for this.
- Over 95% of the time, using transitions does not increase the length of your program. The transition itself simply causes the croutons to overlap for a brief period of time without increasing their duration.
- Get creative. Open up the control panel for the effects you use and try different speeds. Use effects that enhance the action in your video clips, such as the Page Peel when someone on screen is opening a book.

Note:
In most cases, transitions will automatically "work" when going from one clip to the next. Sometimes, however, you may need to adjust the in point or the out point of one of the clips in order to allow enough spare footage for the transition to take place.

How to Set up Audio Soundtracks and Effects

Often you need a background music track to accompany the program content. It's pretty easy setting up a music track in this manner. Here are three variations. The first version has the music start at the same moment as the first video clip. The second version has the music start while the screen is still black, just before the first video clip appears. The third version has the music kick in a few seconds after the first video clip appears.

Version 1: Simultaneous Audio Start

1 For this example, the video croutons have already been placed in the proper order. They are:
(a) Video black crouton (set for 10 seconds via its control panel)
(b) Video clip crouton (set for 20 seconds via its control panel)
(c) Audio soundtrack crouton (lasts for 2 minutes)
(d) Other video croutons follow, but they're not important to show for this example.

Here's what the top row if the project looks like.



Audio clips *always* begin simultaneous to the video event that is in front of them. Therefore, for this example, your work is done once you arrange the croutons!

If you played this program, the soundtrack would begin at the same moment as the video clip in front of it, which is exactly what we want. Of course, you may want to fine tune the manner in which the audio plays. For ideas, see the tips below.

Fine Tuning Points
This is merely an example of how start an audio clip at the same moment as a separate video clip. Other points you might consider if you use this technique include:

- Keep the audio track's volume level low, say around 15-25%, so that it will not compete with any audio that is part of the opening video clip.
- Fade the audio in over a period of several seconds at the beginning so that it does not suddenly surprise the viewer. Of course, if this is what you want, leave it as-is!
- Fade the audio track out toward its end in order to make its exit less noticeable to the viewer. You may need to fade it out gradually, or sometimes you can simply let it cut out when a major transition or change in the action occurs.

Version 2: Leading Audio Start

1 For this example, the video croutons have already been placed in the proper order. They are:
(a) Video black crouton (set for 10 seconds via its control panel)
(b) Audio soundtrack crouton (lasts for 2 minutes)
(c) Video clip crouton (set for 20 seconds via its control panel)
(d) Other video croutons follow, but they're not important to show for this example.

Here's what the project looks like so far.



Audio clips always begin simultaneously with the video event that is in front of them. At this point, if you played the program, the soundtrack would begin at the same moment that the video black started. This is not what we want.

2 The audio soundtrack should begin 5 seconds into the black. Open the control panel for the audio clip and set its Start Time to 00:00:05:00 (5 seconds). Doublecheck that the Lock To event setting shows In Point.

Lock To defaults to In Point, and Start Time defaults to 00:00:00:00. This means that the audio clip begins at the same moment that the video event in front of it begins. Any other value that entered for Start Time will cause the start of the audio track to be delayed for that period of time into the previous clip.

3 We also want the audio to fade in gradually over that 5 second lead-in. So, set the Fade In value to 05:00.

4 Play the project. If things were set correctly, you saw 10 seconds of black with the soundtrack gradually fading up for the last 5 seconds. Then the video clip started (with its own audio) and the soundtrack continued.

Fine Tuning Points

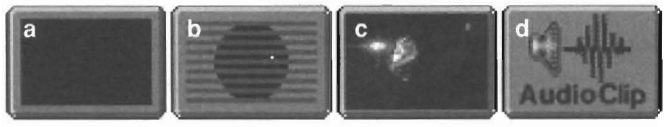
This is merely an example of how to have audio start before your program material begins. Other points you might consider if you use this technique include:

- Keep the audio track's volume level low, say around 15-25%, so that it will not compete with any audio that is part of the opening video clip.
- If the audio track begins on or near a beat of music, it's often less jarring to the viewer if you set Fade In value of 1-4 frames. This fades in the attack of the audio very slightly, but results in a noticeable difference you might prefer.
- Fade the audio track out toward its end in order to make its exit less noticeable to the viewer. You may need to fade it out gradually, or sometimes you can simply let it cut out when a major transition or change in the action occurs.

Version 3: Delayed Audio Start

1 For this example, the video croutons have already been placed in the proper order. They are:
(a) Video black crouton (set for 10 seconds via its control panel)
(b) Smooth Fade crouton (speed set to Medium via its control panel)
(c) Video clip crouton (set for 30 seconds via its control panel)
(d) Audio soundtrack crouton (lasts for 2 minutes, so it will continue into the next clips)
(e) Other video croutons follow, but they're not important to show for this example.

Here's what the project looks like so far.



Once again, audio clips begin simultaneous to the video event that is in front of them, so we need to adjust the timing of the audio clip. If you played the program at this point, the soundtrack would begin at the same moment that the video footage started fading up. This is not what we want.

2 The audio soundtrack should begin 10 seconds after the video footage has started. Open the control panel for the audio clip and set its Start Time to 00:00:10:00 (10 seconds). Make sure the Lock To event is set to In Point.

3 Play the project. If things were set correctly, you saw 10 seconds of black, then the video faded in, and 10 seconds later the audio clip began playing.

Other factors come into play that you might want to adjust for "the perfect edit." You might want to set the volume level of the audio clip to a lower level so that it does not compete with the audio that is part of the video clip. You might also use fade settings to bring the audio up over time or fade it out near the end.

This example has been pretty simple, but you should begin to understand the concept of using the Lock To and Start Time gadgets to adjust audio and video timing. The next tutorial (How to Synchronize Sound Effects) will give you an example of when to use the Clip setting for the Lock To event.

Fine Tuning Points

This is merely an example of how to have audio start a little ways into the beginning of a program. Other points you might consider if you use this technique include:

- Keep the audio track's Volume level low, say around 15-25%, so that it will not compete with any audio that is part of the opening video clip.
- Fade the audio in over a period of several seconds at the beginning so that it does not suddenly surprise the viewer. Of course, if this is what you want, leave it as-is!
- Fade the audio track out toward the end in order to make its exit less noticeable to the viewer. You may need to fade it out gradually, or sometimes you can simply let it cut out when a major transition or change in the action occurs.
- If the audio track begins on or near a beat of music, it's often less jarring to the viewer if you set Fade In value of 1-4 frames. This fades in the attack of the audio very slightly, but results in a noticeable difference you might prefer.

How to Synchronize Sound Effects

At first glance it may seem hard to synchronize sound effects with video or special effects, but in fact it's pretty simple to do. Here are some examples showing you how to use sound effects.

Example 1: Synchronizing a Sound Effect to a Video Clip

Let's assume you have a couple of clips of people teeing off at an 18-hole golf course. Each clip was shot from a distance, so you did not pick up the "swoosh" of the club swinging through the air. However, you have a sound effect that fits perfectly. You want to sync it to the video.

1 We've placed the video croutons in this order. They are:
(a) Video clip crouton (panning from clubhouse to golfer, we used about 8 seconds, from 00:00:13:16 to 00:00:21:23 on the time code gadgets)
(b) Smooth Fade crouton (speed set to Fast via its control panel)
(c) Video clip crouton (announcer commentary, about 5 seconds)
(d) Video clip crouton (a golfer at another hole teeing off; the clip is set for about 8 seconds, from 00:01:15:12 to 00:01:23:28. The swing occurs at 00:01:18:27.)
(e) Audio soundtrack crouton (rushing air "swoosh" sound effect)

Here's what the project looks like at this point.



Since audio clips begin with the video event that is in front of them, we need to fix this situation! If you played the program at this point, the swoosh sound effect would begin at the start of the golfer's tee-off clip, which is several seconds before he swings his club. This is a case where the audio clip (the sound effect) being tied to the in point of the previous clip just doesn't work. The sound effect will occur right away whereas his swing occurs 3 seconds, 15 frames later. What we want to do is to delay it so that it starts when the golfer tees off.

2 Open the audio clip's control panel and set the Lock To pop-up to Clip. Exit the panel.

This means that the Start Time number must now be a frame number that falls within the time code range of the previous clip. The value you now enter for Start Time will be synchronized to that frame, and the audio clip will play at that moment during the previous clip.

3 Open the video clip with the tee-off, clip d. Click and hold the mouse over the double-arrow gadget beside In Point. The video will play at normal speed. Let go when the golfer begins his swing. If necessary, use the slider or the double-arrow gadget to move forward or backward until you find the exact frame you want.

We could have you try to memorize this number (or maybe make you write it down), then go to the audio clip and enter it as the Start Time. But here's a nifty shortcut instead.

4 Click in the box that contains the numeric time code display for In Point. Now press the letter c on the keyboard. You have just copied this time code number into the time code clipboard. Make sure you use the Cancel button to exit this panel (so the in point remains as it was).

The ability to scan through a marked clip, find and copy a specific frame number, then exit the panel without changing the in or out point in a useful tip.

5 Open the audio clip's control panel, click inside the time code gadget for Start Time, and press v on the keyboard. You have just copied this time code number from the time code clipboard into the Start Time gadget.

6 Play the sequence. At the moment the golfer swings is club, you should hear the sound effect of rushing air. You've done it.

In most cases, you'll find that the audio effect will match the video effect quite well. In some cases, you may hear the audio effect occur slightly before or slightly after the moment you wanted. To correct this, re-enter the audio panel and adjust the Start Time value a frame sooner or a frame later, then play the sequence again. Usually, a one or two frame adjustment is all you'll need to synchronize the playback.

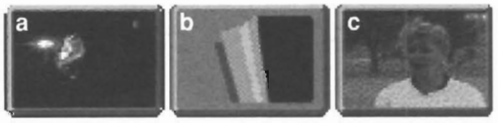
Example 2: Synchronizing a Sound Effect to a Toaster Effect

Synchronizing a sound effect with a Toaster effect is similar to the process described above. You should be able to synchronize a sound effect to a Toaster effect with minimal adjustment.

Toaster effects occur over a span of time that encompasses the tail end of one video clip and the head end of the next, so you can time your audio effect clip to one of the two video clips. With the proper timing, it will occur just as the transition does.

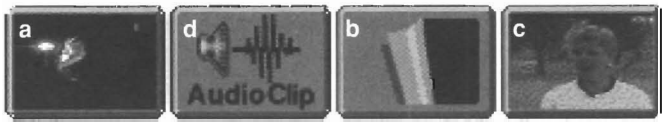
Keep in mind that a Toaster effect is *not* a video clip, so you cannot place an audio clip after an effect with the idea that it will occur just as the effect occurs. Rather, it will occur as the video clip occurs (remember, audio clips are tied to the previous video event, either a video clip or video still).

1 We have four clips. The first three are arranged in this order (from left to right):
(a) Crouton a is a video clip that is 35 seconds long. We set its in point to 5 seconds and its out point to 20 seconds.
(b) Crouton b is a Toaster effect. The Page Peel, set to its Fast speed, which takes 1 second.
(c) Crouton c is a video clip that is 27 seconds long, and we're using 20 seconds of it.



2 We also have:
(d) Crouton d, an audio clip that sounds like paper tearing in half.

Place crouton d after crouton a in the sequence, as shown below.



3 Open the control panel for the audio crouton (d). Set the Lock To event to Clip. Set the Start Time to 19 seconds, 15 frames (notice that this is almost the out point of crouton a).

Why Lock To/Clip, and why 19 seconds, 15 frames? If you have recently read through the previous example on synchronizing an audio effect to a moment in a video clip, you should recall that the easiest way to match these two items is to relate them to a single common reference point. Lock To/Clip ensures that the timing of the two croutons matches (it locks the audio clip to the time code range of the video clip). Once the timing is locked, all you need do is set the time value for the moment you want to hear the effect.

But wait—there's more.

We arrived at the number 19 seconds, 15 frames for the Start Time by considering the following information:

- The first clip's out point is set at 00:00:20:00, or 20 seconds.
- The page peel effect lasts for 1 second.
- Transitions add no time to the project (they knit together the end of one clip to the beginning of the next clip by overlapping them slightly). This 1 second transition will be split equally over the end of clip a and the beginning of clip b.
- Therefore, the Page Peel effect will begin 1/2 second before the end of clip a—at around 19 seconds, 15 frames.

This means that we should use this number as the Start Time for the audio effect.

6 Play the sequence. At the moment the page peel occurs,you should hear the sound effect of paper tearing.

In most cases, you'll find that the audio effect will match the video effect quite well. In some cases, you may hear the audio effect occur slightly before or slightly after the moment you wanted. To correct this, re-enter the audio panel and adjust the Start Time value a frame sooner or a frame later, then play the sequence again. Usually, a one or two frame adjustment is all you'll need to synchronize the playback.

Note 1: Using Lock To/In Point instead of Lock To/Clip

You could use Lock To/In Point, and set the Start Time value to (the number of seconds that the clip lasts) minus (one-half of the effect time). In this example, that value would be (15 seconds) minus (15 frames), giving you a Start Time of 00:00:14:15, or 14 and one-half seconds. Both methods will work to synchronize the sound effect with the special effect.

Note 2: Proper Sequence Order

You could argue that the page peel technically occurs over two different clips, and that you should be able to place the sound effect after the second clip (crouton C) and set the appropriate timing to make it work. However, experience with the Flyer shows that only the method described above will work reliably.

How to Set up a Split Edit

First, what is a Split-Edit?

A split edit is a simple concept that is difficult to explain! The term *split edit* refers to a very effective method of storytelling where the viewer sees a sequence of video imagery while listening to a constant soundtrack. There are several kinds of split edit. We'll show you how to set up each one.

You often see split edits on the news. At the beginning of most field stories, the reporter on the scene introduces the piece. As the reporter describes the incident, the picture cuts away to other video clips related to the story. (In Flyer terms, at the moment you are watching one video clip and listening to its audio.) Then, the picture cuts away to show different video clips, while you continue to listen to the audio from the opening clip. The audio remained while the video split off. This is a split-edit.(Again, in Flyer terms, you would have started watching and listening to one clip, then cut away to see other clips while still listening to the first clip's audio.)

Note that there are three ways to split an edit: either the audio may precede its matching video footage, or the audio may continue after its matched video has ended, or both may occur using the sound from a single clip with different footage before and after its matched video segment.

Here's how to set up the three kinds of split edits with the Flyer.

Split Edit, Version 1: Audio Precedes Video

Let's use a phoney news story as an example. Here are the clips we'll be working with. We dragged them into the project window and arranged them in this order.



Black *This is a still frame of video black. It's useful as a short lead-in.*	*Smooth Fade* *This is the dissolve transition.*	*Clip 1* *A wide shot of a Topeka hamburger stand.*	*Clip 2* *A close-up of a hamburger being cooked.*	*Clip 3* *A medium shot of the reporter telling the story.*

The game plan here is to use the audio from clip 3 throughout the entire story while viewing clips 1 and 2, and then finally clip 3 at the end. The reporter tells the entire piece in one take, clip 3. The story is a news filler about a new restaurant opening in Topeka, KS. (It may not seem like big news, but if you've ever eaten in Topeka, KS, a new restaurant is *big* news.)

1. In the control panel for the video black crouton, set **Duration** to 10 seconds.

2. In the control panel for the Smooth Fade effect, set **Speed** to Medium.

3. In the control panel for clip 1:
   - Adjust the in and out points so that you have 4 seconds of usable video.
   - Turn the audio playback off.

4. In the control panel for clip 2:
   - Adjust the in and out point so that you have 3 seconds of usable video.
   - Turn the audio playback off.

5 In the control panel for clip 3:

- Adjust the **video in point** to about one-half second *before* the reporter begins telling the story (you will need to play the clip in order to determine this location). It's okay if you're not exact.
- Adjust the **video out point** so that you leave about 2 seconds after the reporter finishes telling the story.
- Don't exit the panel yet.

(In the Quick Tune display, dragging the video sliders sets *both* the audio as well as the video to the point you set. In effect, the audio is locked to the video sliders when you are in this view.)

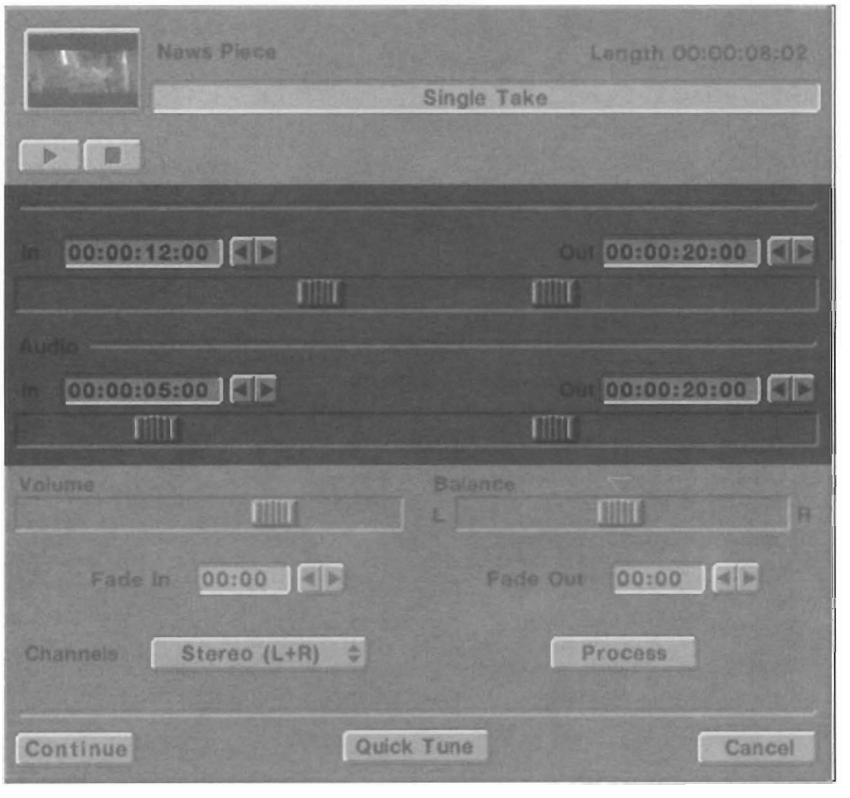
You've just set up the duration for both the video and audio portions of this clip to the same length of time. However, we want to hear audio for a longer duration, before we see the video. So:

6

- Select Fine Tune to expand the panel and to separate audio and video slider controls. (Now when you adjust either audio or video, in or out, the slider moves separately from its counterpart.)
- Adjust the **video in point** so that the video in point starts 7 seconds after the audio in point. This allows for the 7 seconds made up by the first two video clips. (In our example, the audio in point is at 5 seconds, so the video in point is set to 12 seconds.)

This sets up the 7 seconds of audio that will play while we see 7 seconds from the other video clips. Since this is a news story, we've left a few extra seconds at the end, so the reporter can finish her story and remain on camera for a moment before the station's technical director cuts back to the studio talent.

Your control panel should look something like the one below (the actual positions of some controls may differ, but the settings should appear similar).



Notice how the in and out points for the video sliders and the audio sliders are offset.

Even in a quick glance, you can see that the audio for this clip starts before its video does.

7 Click Play to play this project and see how well it performs.

Congratulations, you've just made a split edit where the audio precedes the video. Continue reading for tips on setting up the other two kinds of split edits.

Fine Tuning Points

- The audio from the two "cutaway" clips is not used in this example, but you could have used it if you wanted to. Simply leave the audio turned on in Steps 3 and 4, and adjust the Volume level to a setting that doesn't overpower the reporter's voice.
- You could also have used effects between any of the three clips, such as a dissolve from clip 1 to clip 2.

Split Edit, Version 2: Audio Extends Past Video

Let's continue to use our phoney news story (as used in the first example of a split edit). We've rearranged the order of the clips in the project window for this example, as shown below.



Black
This is a still frame of video black. It's useful as a short lead-in.

Smooth Fade
This is the dissolve transition.

Clip 3
A medium shot of the reporter telling the story.

Clip 1
A wide shot of a Topeka hamburger stand.

Clip 2
A close-up of a hamburger being cooked.

The game plan here is to use the audio from clip 3 throughout the entire story. We'll actually view the clips in this order: clip 3, clip 1, clip 2, while listening to the audio from clip 3 the entire time.

1 In the control panel for the video black crouton, set **Duration** to 10 seconds.

2 In the control panel for the Smooth Fade effect, set **Speed** to Medium.

3 In the control panel for clip 3:

- Make sure you are in the Quick Tune display.
- Adjust the **video in point** to about one-half second *before* the reporter begins telling the story (you will need to play the clip in order to determine this location). It's okay if you're not exact.
- Adjust the **video out point** so that you leave about 2 seconds after the reporter finishes telling the story.
- Don't exit the panel yet.

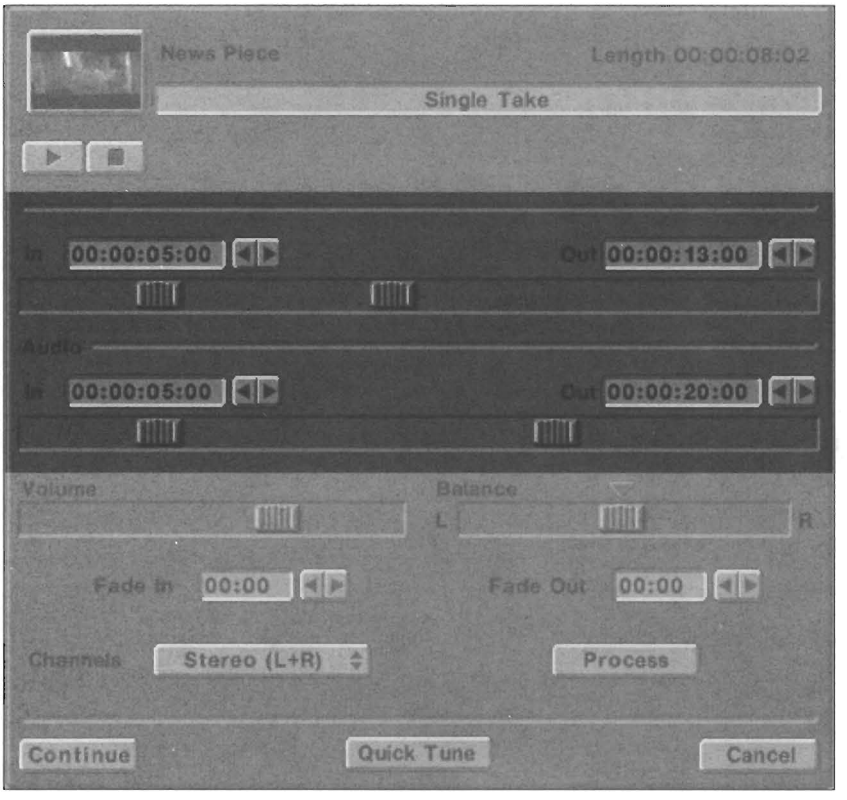
This sets up the duration of the entire story. It lasts for as long as the reporter relates the piece (in our control panel example, it runs for 15 seconds). Now let's shorten the amount of time during which we'll actually see the video.

4

- Select Fine Tune to expand the panel and to separate audio and video slider controls. (Now when you adjust audio or video, either in point or out point, the slider moves separately from its counterpart.)
- Adjust the **video out point** so that the video ends about 7 seconds *before* the audio out point. (Example: Our audio out point ends at 20 seconds, so we set the video out point to 13 seconds.)

This sets up the last 7 seconds of audio that will play while we see 7 seconds from the other video clips.

Your control panel should look something like the one below (the actual positions of some controls may differ, but the settings should appear similar).



Notice how the in and out points for the video sliders and the audio sliders are offset.

Even in a quick glance, you can see that the audio for this clip continues after its video ends.

5 In the control panel for clip 1:
- Adjust the in and out point so that you have 4 seconds of usable video

6 In the control panel for clip 2:
- Adjust the in and out point so that you have 3 seconds of usable video

7 Click Play to play this project and see how well it performs.

Congratulations, you've just made a split edit where the audio continues after the video.

Fine Tuning Points
- The audio from the two "cutaway" clips is not used in this example, but you could have used it if you wanted to. Simply leave the audio turned on in Steps 3 and 4, and adjust the Volume level to a setting that doesn't overpower the reporter's voice.
- You could also have used effects between any of the three clips, such as a dissolve from clip 1 to clip 2.

Split Edit, Version 3: Audio both Precedes and Extends Past Video

We'll use our mythical news story one more time. For this example, arrange the clips in the project window as shown below.



Black
This is a still frame of video black. It's useful as a short lead-in.

Smooth Fade
This is the dissolve transition.

Clip 1
A wide shot of a Topeka hamburger stand.

Clip 3
A medium shot of the reporter telling the story.

Clip 2
A close-up of a hamburger being cooked.

Once again the idea is to use the audio from clip 3 throughout the entire story. We'll view the clips in this order: clip 1, clip 3, clip 2, while listening to the audio from clip 3 the entire time.

1 In the control panel for the video black crouton, set **Duration** to 10 seconds.

2 In the control panel for the Smooth Fade effect, set **Speed** to Medium.

3 In the control panel for clip 1:
- Adjust the in and out point so that you have 4 seconds of usable video

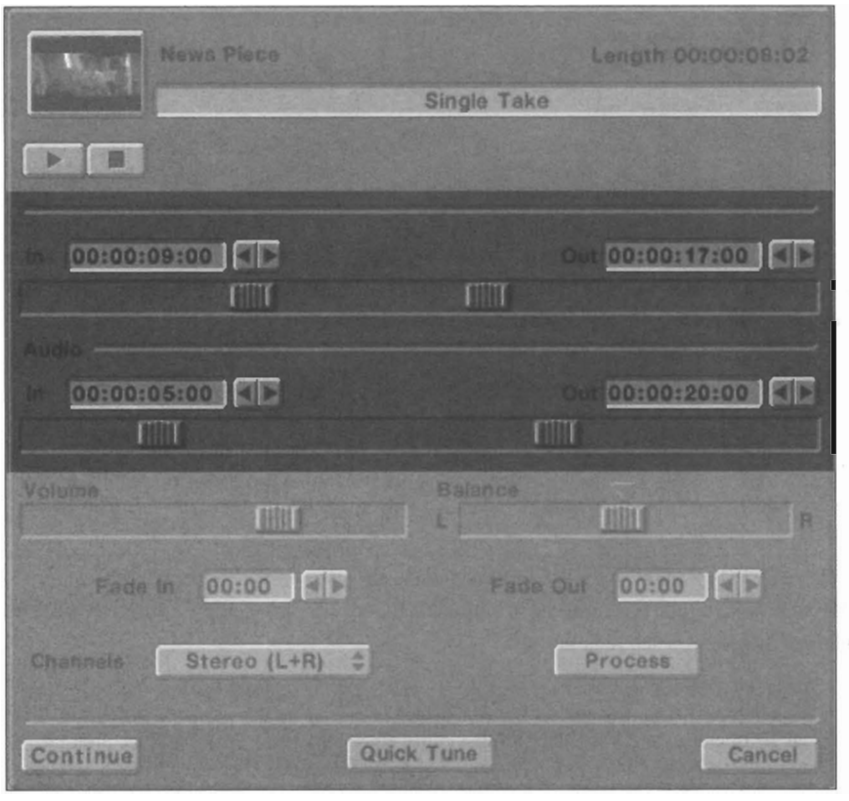
4 In the control panel for clip 3:
- Make sure you are in the Quick Tune display.
- Adjust the **video in point** to about one-half second *before* the reporter begins telling the story (you will need to play the clip in order to determine this location). It's okay if you're not exact.
- Adjust the **video out point** so that you leave about 2 seconds after the reporter finishes telling the story.
- Don't exit the panel yet.

This sets up the duration of the entire story. It lasts for as long as the reporter relates the piece (in our control panel example, it runs for 15 seconds). Now let's shorten the amount of time during which we'll actually see the video.

5
- Select Fine Tune to expand the panel and to separate audio and video slider controls. (Now when you adjust audio or video, either in point or out point, the slider moves separately from its counterpart.)
- Adjust the **video in point** so that the video starts about 4 seconds *after* the audio in point. (Example: Our audio in point is at 5 seconds, so our video in point is laced at 9 seconds.)
- Adjust the **video out point** so that the video ends about 3 seconds *before* the audio out point. (Example: Our audio out point is at 20 seconds, so our video out point is set at 17 seconds.)

6 In the control panel for clip 2:
- Adjust the in and out point so that you have 3 seconds of usable video

Your control panel should look something like the one at the top of the next page (the actual positions of some controls may differ, but the settings should appear similar).



Notice how the in and out points for the video sliders and the audio sliders are offset.

Even in a quick glance, you can see that the audio for this clip both starts before and ends after its video.

7 Click Play to play this project and see how well it performs.

Congratulations, you've just made a split edit where the audio both precedes the video and continues after it.

Fine Tuning Points

- The audio from the two "cutaway" clips is not used in this example, but you could have used it if you wanted to. Simply leave the audio turned on in Steps 3 and 4, and adjust the Volume level to a setting that doesn't overpower the reporter's voice.
- You could also have used effects between any of the three clips, such as a dissolve from clip 1 to clip 2.

Special Split Edit SItuations

How to Return to a Split Edit?

There is a situation where you might want to use a split edit in a manner that requires some thought.

Using the news story scenario, consider this: suppose you wanted to create a segment that opens with the reporter introducing the story, then cuts away to several other shots of supporting material, then returns to the reporter wrapping up the story, with the original audio track continuing throughout the entire piece? How would you achieve it?

Pretty easily, it turns out.

First, this kind of split edit was demonstrated earlier in the section called **Split Edit, Version 2: Audio Extends Past Video**. If you need a refresher, take a look at this section from a previous page. It's only about two pages long, and it shows how such an edit is set up.

In this variation on that form of split edit, (a) the audio and video begin simultaneously, (b) the video cuts away while the audio continues, and (c) the video returns later, still synchronized to the audio. The trick is how to achieve (c). Here's a short description of the technique, followed by a step-by-step walk-through.

In a Nutshell

You would set up the split edit so that the opening clip (with the reporter's entire narration) starts off the project. After the story has been introduced, the video ends. However, the narration continues while we view other segments that help tell the story visually. This follows the exact steps from the earlier tutorial on a split edit where the audio continues after the video has ended.

Now play the project (or, if it is part of a larger program, just play this segment using the Play From button). Listen closely to the audio track and make note of the word or phrase that the reporter is saying at the moment that the video should return for the wrap-up.

Next, duplicate the opening clip. Move the copy to the location in the storyboard sequence where the video should return to the reporter. Open up its control panel: turn off its audio (you don't need it), and set its video in point to that moment where the reporter said the word or phrase you noted earlier. Play the project and see how closely you timed it. You may need to shift the in point a few frames sooner or later in order to match it up perfectly.

Essentially, this is a split edit with audio and video starting together, the video stopping while the audio continues, followed by some number of video clips playing to the original soundtrack. The final video clip is simply a duplicate of the original, set up so that it appears to be a "return" to the original clip.

How to Load and Save a Project

How to Load a Project

1 From any files window, navigate to the Projects directory. Locate the project you want to load and double-click its icon. (If you have a directory tab set up for the Projects directory, just select it instead.)

In case a file cannot be found, the Flyer will notify you, then ask if you wish to continue loading the rest of project. Asnwer Yes or No. If you answer Yes, the project will finish loading. However, if any additional croutons cannot be found, you will not be notified.

Note 1:
At this time, there is no provision for notifying you what croutons are missing, or where in the project they are missing from. If you choose to work with the project in this manner, you may wish to save it under a new name in case the missing items can be restored to the original project at a later time.

Note 2:
Projects contain not only the croutons usd to make up the storyboard, they also contain the knowledge of the status of the Toaster application programs. Therefore, if you save a project while ToasterCG is active, when you later go to load this project ToasterCG will be active.

How to Save a Project

1 From any editor window, click on the Save button on the main button bar.

The screen will split into two halves: the upper half contains a control panel and the lower half contains a files window.

2 Use the files window to go to the Projects directory. (If you have a directory tab set up for the Projects directory, just select it instead.)

3 (a) If this is a new project (never before saved) enter a new name for it in the text field at the top of the screen.
(b) If this is a new version of an older project that you wish to save over, simply select its name from those that appear in the files window. The name will appear in the panel atop the screen.

4 Click on the Continue button to save the project and return to the editor.

Of the other two button options, Backup and Cancel, the Backup button will take you to the tape backup program, and the Cancel button will exit the panel without saving a project.

How to Back Up a Project (Archiving)

Why Back Up?

Once you've completed a project and created the master tape, there is probably no longer any reason to keep the master footage on your hard drives. The space they take up is likely to be needed for your next project. However, no one argue that you should simply erase this original material, it's too valuable. You need to be able to archive it, to back it up to another device or medium for storage so that you can retrieve later if need be.

A major benefit of digital recording with the Flyer is that you can back up video and audio clips (as well as the other croutons used in a project) with pristine quality. When a computer copies a file, it generates an exact duplicate. This is different from copying a video tape from one VCR to another, where the original is decoded from tape and recoded onto another tape. In the Flyer, clips are digital data which can be duplicated hundreds of times with no loss in quality. The files you archive today will look exactly the same when they are unarchived 5, 10 or more years from now.

What You Need in Order to Archive

- Any SCSI II tape drive, connected to one of the Flyer's SCSI II chains. For example, a **DAT tape drive** (1GB-2GB capacity or higher) or **Exabyte tape drive** (7GB-9GB capacity or higher). Unlike other Flyer devices, this drive does *not* need a DosDriver placed in the sys:devs/DosDrivers directory of the Amiga.

  Important!
  Unless you create clips that are consistently short in nature, you may find that a 2GB DAT drive cannot back up all of the material in your projects. The Flyer's built-in back up program will not break larger files into smaller ones for the purpose of backing up, therefore even a single file that is larger than the size of your DAT tape (say, 3GB) can not be archived since there is no mechanism for handling its large size. For this reason, based on your editing habits, you may wish to consider a large DAT drive, or an Exabyte type drive.

How to Archive a Project

Follow the steps below to save and archive a project in a few easy steps.

1 When you want to archive a project, insert a new blank tape into your backup drive.

The Flyer backup utility always archives one project per tape (or more tapes as necessary). Therefore, you should always have the first blank tape ready to go in the tape drive before you begin the archiving process.

2 Click the Save button on any editor screen (it's on the main button bar).

The screen will change to a control panel on top and a files window on the bottom.

3 Use the files window to go to the Projects directory.
   (a) If this is a new project (never before saved) enter a new name for it in the text field at the top of the screen.
   (b) If this is a new version of an older project, simply select its name from those that appear in the files window. The name will appear in the panel atop the screen.

4 Click on the Backup button.

The Flyer will perform several actions at this point. First, the project will be saved to your Projects directory. Second, it will scan the Flyer SCSI chains for a presence of a tape drive. If a drive is found, it will begin the third step, that of backing up aall of the files necessary to recreate the project.

5 If the Flyer backup program fills the tape and needs another, it will instruct the tape drive to eject the current tape and request that you insert a new tape. After you do so, click on the Continue button to continue archiving. Make sure to label and number each tape you use!

6 Once all of the items that make up the project have been archived, the Flyer will display a "Backup Complete!" message. At this point, you can quit the archive program.

Very Important Notes

- The backup program will automatically "span" the items in the project across as many tapes as are necessary in order to make a complete backup.
- If you use an automatic tape feeder (autoloader), you must still be present to confirm that a tape has been changed in order for the backup program to continue with each new tape. This is a limitation of tape drive communications.
- There is no compression option for backup. The backup program uses the drive's current compression settings. However, Flyer clips generally do not compress well so a "no compression" option is usually best.

What Gets Backed Up?

Every crouton that is part of the project, that may be needed in order to reload and run this project in the future, is copied to the backup tape. This includes video clips, audio clips, transitions, framestores, effects, and more.

The main reason is that you may use your Flyer system to create and archive the project, then travel to another facility and need to restore the project to their Flyer system. There is the chance that another facility's Flyer system has been configured differently, or incompletely installed, that they may be missing certain effects or other items that existed on your system. The Flyer backup program ensures that nothing is overlooked, and every item archived, so that you can restore this project to *any* other Flyer installation and have it run.

What do the Buttons do?

There are four buttons on the backup program panel: Quit, Pause, Continue, and Save Log. The first three of these buttons are self-explanatory. They do exactly what their label indicates (note that Quit and Pause are not "immediate" commands, if the Flyer is backing up a huge file when you select Quit, it will finish the file before it will actually quit).

The Save Log button, upon being selected, automatically saves a file to the t: directory of the Amiga. This log file contains all of the steps performed by the backup program and all of the files that it utilized to make the backup. If you are not familiar with the Amiga, you should know that the t: directory is in RAM:, and that if you wish to keep a copy of this file for future reference (or to make a printout to store with the backup tapes) you will need to copy it from RAM: to a safe location—either onto your hard drive or onto a floppy disk.

You may wish to create a directory folder within the NewTek/Toaster drawer called BackUpLogs and store all of your backups there. If you do so, rename the generic backup log name that the backup program uses to something more decriptive. For example, if you backup a project named MyVacation, rename the log as MyVacation.log for ease of use in finding it and knowing what it is at a glance.

How to Restore a Project (UnArchiving)

How to Restore a Project

Restoring an archived project is a simple process, but unless you understand some inportant aspects of what's going to happen you may be in for a surprise. Make certain you read through this material once before restoring a project so that you fully understand how the restore process works.

Important!
If your Flyer system is part of a networked group of computers, log out from the net before you attempt to restore a project! Network software can cause the Flyer restore program to restore to the incorrect drives. Make sure that you are logged out from any network before you run the restore program.

1 When you are ready to restore a project, insert the first backup tape from a previously backed up project into your tape drive.

2 In the Flyer, go to any files window, click on the Volumes button. Locate and double-click on the icon for the FLY_TAPE device.

The top half of the screen will change to show a new control panel. In this panel, you'll see a report on what the Flyer is doing to prepare for restoration. First, the Flyer scans for a tape drive. Once it finds the drive, it rewinds the tape that is in the drive. It then reads the backed up project header information and begins comparing the files that were backed up from this project to files on your hard drives.

- Any files in the backup that match those on your system will not be restored (because the file has not changed, therefore it does not need to be restored). The Flyer will list these as "Will not be restored because it hasn't changed."
- Any files that have been changed (if they have a different creation date, for example), the Flyer will list as "Will be restored."

After listing all files, the Flyer will pause and request that you select an action from the control panel.

3 Valid choices are listed below. Select one.

(a) Quit —Use this option if you just wanted to see what was on the backup tape, but you did not want top perform an actual restore.

(b) Continue —Use this option to continue with the restore process.

Although you could select Save Log, it would not be complete since it does not yet include the complete information on the restore process. At this stage, the Pause button has no effect.

4 Click on the Backup button.

The Flyer will run down the list of files, restoring those necessary and skipping those that are unnecessary.

5 If the Flyer backup program finishes this tape and needs the next, it will instruct the tape drive to eject the current tape and request that you insert a new tape. After you do so, click on the Continue button to continue archiving.

You do not need to insert tapes in the same order that they were backed up, the Flyer will continue asking for them until all files have been restored, no matter what the order.

6 Once all of the items that make up the project have been restored, the Flyer will display a "Restore Complete!" message. At this point, you can quit the archive program.

Very Important Notes

- The restore program will tell you if there is not enough room on your drives, so you can make sure that your system has enough room for the restored project. This includes your video drives, your audio drives, and your Amiga drives. If your drives are full, you will need to either (a) delete some unneeded clips to make room, or (b) archive the excess footage, and then delete the clips to make room.
- The restore program will attempt to restore all items to their original drives and directories. However, if you are restoring to a completely different Flyer system, the restore program will need to make adjustments since the original drive names and directories are no longer present.
  1) All files of the same type will be restored to the correct type of drive (i.e., video clips will be restored to video drives, audio clips to audio drives, and system files to a system drive). Note: the system must have an audio drive in order for audio clips to be restored.
  2) If a directory that existed for the backup does not exist for the restore, it will be created with the following name: **ProjectName.d** (the **d** stands for directory), and the appropriate files will be copied into this directory. For example, if your video clips came from a drive called FlyerA in a project called MyVacation, and you restore to a different system, the restore program will make a directory called **MyVacation.d** on the new system's video drive and place the restored video clips there.
  3) The original project itself, upon restoration to this new system, will be rewritten so that it now knows where to look for all of the files that had to have been placed in new drive/directory locations. In other words, once the restore is complete, you can go ahead and load the project and the Flyer will know where everything is already!
- If you use an automatic tape feeder (autoloader), you must still be present to confirm that a tape has been changed in order for the restore program to continue with each new tape. This is a limitation of tape drive communications.

What Gets Restored?

Everything. Every crouton that is part of the project, that is needed in order to load and run the project, is copied from the backup tape. This includes video clips, audio clips, transitions, framestores, effects, and more.

The main reason is that you may use your Flyer system to create and archive the project, then travel to another facility and need to restore the project to their Flyer system. There is the chance that another facility's Flyer system has been configured differently, or incompletely installed, that they may be missing certain effects or other items that existed on your system. The Flyer backup program ensures that nothing is overlooked, and every item archived, so that you can restore this project to *any* other Flyer installation and have it run.

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There are four buttons on the backup program panel: Quit, Pause, Continue, and Save Log. The first three of these buttons are self-explanatory. They do exactly what their label indicates (note that Quit and Pause are not "immediate" commands, if the Flyer is backing up a huge file when you select Quit, it will finish the file before it will actually quit).

The Save Log button, upon being selected, automatically saves a file to the t: directory of the Amiga. This log file contains all of the steps performed by the backup program and all of the files that it utilized to make the backup. If you are not familiar with the Amiga, you should know that the t: directory is in RAM:, and that if you wish to keep a copy of this file for future reference (or to make a printout to store with the backup tapes) you will need to copy it from RAM: to a safe location—either onto your hard drive or onto a floppy disk.

How to Remove Excess Footage from a Clip

You may find sometimes that you do not need the entire length of a clip in a video project. Perhaps you recorded more than you needed, or you just changed your mind about the footage and used less. This excess footage takes up space on the hard drive, and depending on your drive's capacity this space may be precious. In such a case it would be beneficial to be able to reduce the length of the clip, keeping the footage you want and rmving the footage you don't want, thus freeing up more space on the drive for a few more clips. Here's how.

1. Open up the control panel for the video clip in question.

2. Select the **Fine Tune** view (depending on what you've done in this panel before, it may open in the Fine Tune view already).

3. Click on the **Process** button. This takes you to the Process panel.

4. Enter a new name for the new clip (you cannot trim this clip and save it over the original). Optionally, enter a description for the clip.

5. Drag the in and out sliders to adjust the new beginning and ending for the clip.

Warning!
If you are planning on trimming the excess footage from this clip, make certain that you leave enough "transition" footage at the beginning and end of the clip for effects (3-5 seconds). If you trim a clip too short, you may not be able to sequence with it in place of the original.

6. Drag the **Icon** slider to select the frame on which to base the crouton image.

7. Select which items should be saved in this new clip with the Include gadgets (**Include Video**, **Include Audio**, or include both).

8. Click **Continue** to exit the panel and generate the new clip.

How to Extract a Still Frame from a Clip

If you find that you need to create a still frame or a graphic from an image within a video clip, you can use ToasterPaint to load a copy of any frame (or any number of frames) from inside the clip. This process does not remove any frames from the original clip. Actually, it loads a copy of the selected frame into ToasterPaint. From there, you can save the image as an RGB image, a framestore image, or even use it to start making a new clip.

1 At the editor, open up the control panel of the video clip.

2 Drag the in slider to locate the frame that you want to import into paint. Make note of its time code number. (Either memorize it for a moment, or write it down. Sorry, but there's no provision for cutting and pasting it from one application into another.) Exit the panel.

3 Enter ToasterPaint and go to the **Process** panel.

4 Click on the **Source Clip** pop-up button and use the file requester to locate and select the video clip that contains the imagery you want.

5 Now enter the time code number for the frame you want into the **Frame #** gadget below the Source Clip button. Once the number is entered, click on the **Load Frame** button.

After a moment, the image will load into ToasterPaint.

Note:
If the image has a great deal of motion jitter in it, it may not look good when imported to ToasterPaint. If so, try the **Load Field** button to obtain a better image.

That's it! From this point, you can modify the image at will, then save it as you need for your work.

How to Extract an Audio Only Clip from a Video Clip

Sometimes you have a terrific soundtrack of audio that accompanies some terrible (or otherwise unusable) video. If you decide that the video portion of a clip is not worth keeping, but the audio is, you might wish to make a copy of the clip's audio and save it as an audio-only clip. As always, the audio clip takes up much less space on the hard drive, so it's a smart decision. Here's how you do it.

1. Open up the control panel for the video clip.

2. Select the **Fine Tune** view (depending on what you've done in this panel before, it may open in the Fine Tune view already).

3. Click on the **Process** button. This takes you to the Process panel.

4. Enter a new name for the new audio clip. Optionally, enter a description for it.

5. Drag the in and out sliders and listen to the audio to determine just where the audio clip's beginning and end should be.

6. Make sure the **Include Audio** checkbox is turned on. (The Include Video checkbox should be turned off.)

7. Click **Continue** to exit the panel and generate the new audio clip.

The clip will be generated and saved to the same drive as the original video clip. You will need to move it over to one of your audio drives next, if you wish to use it in a project.

8. Go to the **Files/Files** display view. In the top window, select one of your audio drives. In the bottom window, select the video drive where the new audio clip was placed.

9. Drag the audio clip from the video drive to the audio drive. The Flyer will copy the file to the other drive.

10. If you no longer need the original clip, or the audio clip that was saved on the video drive, you can select either (or both) and use the **Delete** button to remove them.

That's all there is to it. You've just created an audio clip out of the soundtrack of a video clip.

Note:
The original video clip will remain unchanged, it's audio still in place. The Process panel, when accessed via a clip, never alters the original file.

How to Capture Freeze Frames

There are numerous situations in which you want to capture a frame. The two most prevalent would be (a) during post-production when you are creating graphics from the master footage, and (b) during a live production, when you want to capture something for whatever purpose you have in mind.

There is a different way to capture a freeze frame with the Toaster for each of these situations, depending whether you want to capture the image directly from the main output (so that the image you see is the image you grab, and the main output displays this frozen image once captured), or whether you wish to capture it on the preview bus, without interrupting the current program output. This is an important point to remember when using the Toaster for live production. If you wish to capture video "offline" so to speak, in a manner that does not interrupt program output, you'll want to use one of the "Live Production" methods.

Following are the ways to capture Toaster freeze frames.

Post Production and Live Production Method 1: Capturing Easy Freeze Frames

How to Capture a Still Frame on the Main Bus
This method for freezing a frame will interrupt the main output. The benefit of this method is that the moment you click Freeze, the freeze is instantly displayed by the framebuffers on main out, so that you immediately see the frozen image

1. The Freeze button should not be selected. If it is, click on it to turn it off.
2. Select the source you wish to grab on the main bus.
3. Still on the main bus, select either DV1 or DV2 (both will highlight).
4. Click on the Freeze button when you see the video you want to grab.

Instantly, DV1 and DV2 will each grab four fields of video, freezing the scene that was passing through them. Click on DV1 and DV2 alternately to see the frozen frame that each captured (they will be slightly different). If the image is jittery from motion that occurred between video fields when the image was frozen, see "How to Remove Jittery Motion from a Freeze Frame." To save this frame, see "How to Save a Still Frame."

Important!
When you use one of the 1, 2, 3, 4, buttons to capture a freeze frame, it is always frozen on the main bus and displayed immediately from there.

Post Production Method 2: Capturing a Freeze Frame from ToasterPaint

How to Capture a Still Frame from within ToasterPaint
This method for freezing a frame will also interrupt the main output. The benefit of this method is that the moment you click Freeze, the freeze is instantly displayed by the framebuffers on main out, so that you immediately see the frozen image.

1. Enter ToasterPaint.
2. Select the the **Disk** menu.
3. On the far right of the panel, click on the button whose number matches the input with the video you want to grab.

This will be one of the four input buttons (1, 2, 3, 4). Note that you canot see the input video until the moment you click on the grab button. If you wish to view the incoming video before you grab, or while you grab, you must connect your input source to a monitor than can pass the signal back out and over to the Toaster input. (A video distribution amplifier would also do the job.)

The input you select will be frozen in the framebuffer. If this is the image you want, continue with the next step. If not, re-grab as often as you wish until you freeze the image you desire.

4 Now select either Import Frame or Import Field to load the image from the framebuffer into ToasterPaint.

If the image has much motion or jitter in it, you will likely get a better image in ToasterPiant by seelcting the Import Field option. If the image is pretty stable already, use Import Frame. Whichever method you select, if the resulting image looks poor when loaded in ToasterPaint, simply select the other option and load the other format.

Live Production Method 3: Capturing a Freeze Frame on the Preview Output

How to Capture a Still Frame on the Preview Bus
This method is useful for grabbing a freeze frame without affecting the main output. You may see a shot on one of your cameras that you wish to freeze, but that you don't want frozen and displayed right away. In these cases, capture it on the preview bus using the steps below.

1 The Freeze button should not be selected. If it is, click on it to turn it off.

2 Select the source you wish to grab on the Preview bus.

3 Still on the Preview bus, select either DV1 or DV2 (both will highlight).

4 Click on the Freeze button when you see the video you want to grab.

Instantly, DV1 and DV2 will grab four fields of video, freezing the scene that was passing through them, and one of them will highlight on the preview bus. This indicates that the image was grabbed, and the buffer is ready to be "taken" or displayed on the main bus, if you wish.

Click on preview bus DV1 and DV2 alternately to see the frozen frame on your preview monitor. They will be slightly different, since each buffer has captured a four-field image, and one may be more to your liking than the other.

Note:
At this time, there is no way to save this image without interrupting the program output. This is the nature of the processing/conversion that needs to take place in order to save a freeze frame.

Summary Note

The technique presented in Live Production Method 3 will work on the main bus as well as the preview bus. All you would need to do is select the source and framebuffers on the main bus rather than on the preview bus, and then click the Freez button to capture that image on the main bus. However, since the shortcut buttons (1, 2, 3, 4) exist to do this automatically, it's not really necessary to do so.

Image Stabilization: How To Remove Jittery Motion from a Freeze Frame

Because the Toaster grabs a color frame of video consisting of four fields when it freezes the television signal, there may be motion jitter in the frozen image. This is the nature of the TV signal and the way that the Toaster works with it.

There are two methods of image stabilization available that you can employ to strip out the unwanted motion. They are **1 Field** and **2 Fields**, explained below.

When the Toaster captures a freeze frame, it grabs four successive moments in time from the incoming signal called *fields*. Two fields is generally considered a frame, and produces a sharp-looking image capture. Sometimes, if the video image were moving quickly at the moment of capture, you might see a slight shake or jitter to the two-field capture. Four fields is considered a full color frame, and produces an equally sharp picture that appears to contain motion—i.e., it must be processed down to a two field image to remain sharp and reduce undesirable motion.

The Toaster can process the four-field grab in two ways to give you a pleasing image. It can either reduce the image to a two-field frame, or reduce it to a single-field frame. There are drawbacks and benefits to both methods, so one may not always be better than the other. WIth both, at least you can experiment to find the best possible image.

About 1 Field Stabilization
This option is best for processing images containing a medium to large amount of motion in the original capture. The process basically takes one of the four captured fields and duplicates it over the other three fields. The result is a four-field image based on a single field of picture information. Since as field contains only half of the resolution of the video image, nearly-horizontal lines will appear more jagged-edged.

About 2 Field Stabilization
This option is best for processing images containing a small to medium amount of motion in the original capture. The process takes two of the four captured fields and duplicates them into two other fields. The result is a four-field image based on two successive fields of picture information. This image will appear slightly sharper than a single-field-based image, but it retains the chance of showing unwanted motion jitter. If you process an image and it displays too much shake, re-process it with the single-field option.

Here's how to use either method.

1 First, capture an image. See the tutorial on capturing an image for details. Once you've got it, proceed to step 2.

2 Compare DV1 and DV2 on the main output. One framebuffer will usually display a slightly sharper, clearer grab. Select that buffer on the Main bus (when the Toaster processes, it will use this one, the better image).

3 Select the other buffer on the Preview bus. This is the framebuffer into which the Toaster will place the processed image. (In case the process you run results in a poor image, you won't have overwritten the original image and you can try again with the other type of stabilization.)

Now choose one method or the other from the next step. Step 4A is for frame-based, or 2-field stabilziation. Step 4B is for single-field, or 1-field stabilization.

4a (Option A: 2-Field Processing) Press Alt + f for frame stabilize, or select the 2 Fields option from the Stabilize pop-up.

For most images, use frame removal first, which reduces the four field image to a two field image. If there is minimal jitter in the grab, the results will be excellent. Very jittery images process differently, depending on the type of motion. If frame stabilize does not work to your liking, try field stabilize.

If this image looks the way you want it to, proceed to the next tutorial to learn how to save it to a file on hard disk. If not, try the next step.

4a (Option B: 1-Field Processing) Press Alt + d for field stabilize, or select the 1 Field option from the Stabilize pop-up.

This is best for extremely jittery images, such as sports footage, which is reduced from a four-field image to a single-field image. Be forewarned, however, that a single field has less resolution, and the image may need to be touched up in ToasterPaint before you use it.

After the frame has been processed, take a look at the framebuffer that contains the processed image. Compare it with the original image from which it was derived.

If it is not what you would like, try the other method of stabilization. When the image is right, save the resulting image using the steps in the next tutorial.

How To Save a Frozen Still Frame

To save a frame of frozen video, the Toaster must interrupt the main output. For this reason, saving frames is considered an offline (or post-production) procedure. (If you attempt to save a frame during a live production, your main output will be interrupted by 10-20 seconds of screen flashing.)

Important!
When you save a freeze frame, the frame displayed on the main bus is always the one saved. If neither buffer is selected on the main bus, the Toaster will end up saving a blank, black image. Therefore, make certain that you are viewing the Main output of the Toaster, and that the image is correct, before you save the frame.

This tutorial assumes you have just frozen a frame of video and you are ready to save the image.

1 Make sure the framebuffer containing the image to be saved is selected on the main bus.

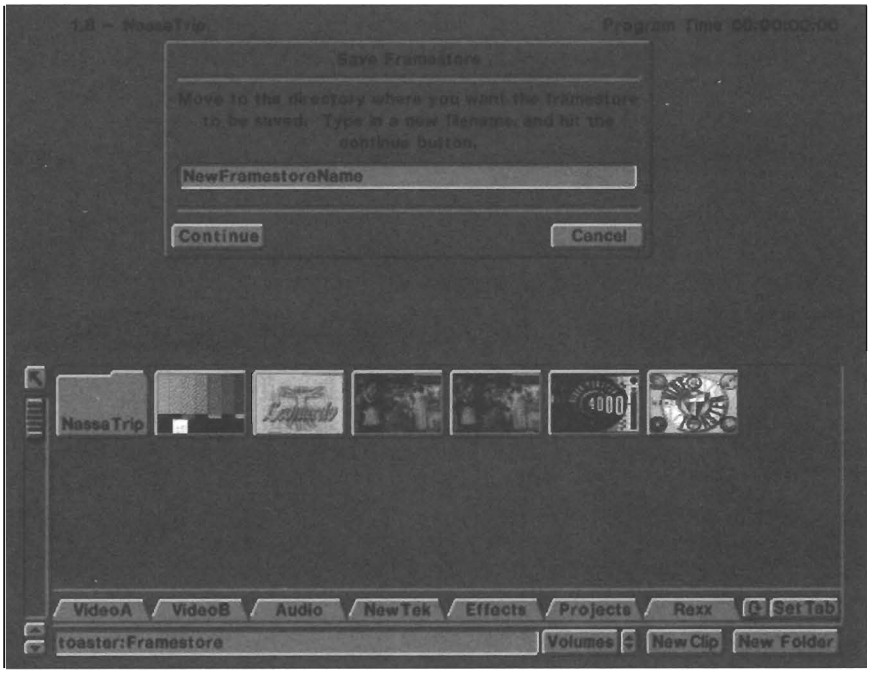
2 Drag the pointer over the Save pop-up and select one option or the other for saving. Your options are 1 Field and 4 Fields, described below.

1 Field
This option is a shortcut that combines two steps into one. It will both process the grabbed image with 1-Field processing, and then save the image to disk. If you are capturing a number of images, all of which need the same kind processing, this is a good choice to use. (For more information on 1-Field motion stabilization, see the tutorial entitled "Image Stabilization: How to Remove Jittery Motion from a Freeze Frame.")

4 Fields
This option saves the grabbed image exactly as you see it displayed from the framebuffer. No image processing/stabilization will occur.

Note:
There is no option that combines 2-Field image processing and image saving in one step.

3 The next screen you see is pictured below. Use the lower window to navigate to the directory of your choice for htis frame. Enter a name for this framestore and click COntinue. The image will be saved.



Important!
Do not save framestore images to a Flyer video drive!

The Flyer drives on each SCSI chain should be of one type, and should contain only one type of file.

Video drives should hold only video clips. Audio drives should hold only audio clips.

All other kinds of files used by the Flyer should be stored on your Amiga's normal system hard drives.

Additional Tutorials

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ToasterPaint Tutorial #1: The Air Brush Tool

ToasterPaint's new airbrush tool brings one more powerful new feature to this already strong broadcast graphics program. The tool works similarly to all the other draw mode, and should be instantly usable for anyone who already uses ToasterPaint.

1 Start on a cleared palette, by pressing shift+k on the keyboard. Select any color, click on the Tools panel, and click on airbrush. Click the Left Mouse button, and start painting.

2 Adjust the brush size using the Brush Size slider. This takes a little getting used to, but pretty soon you'll get a feel for what your result will be, when moving this slider. Experiment with this until you figure it out.

3 Click on the Trans/Warp button, and adjust the transparency to 50%. This is how you adjust the density of the airbrush. Once again, you'll want to experiment with this adjustment until you get a good feel for how this reacts. You'll also want to try using brush size, and transparency together to create the types of results you are after.

4 Set the volume level for this clip. Default is about 70%.

Try airbrushing in different painting modes. You can paint pretty realistic shadows around objects using the airbrush and Darken Mode, and of course And, Or, and Xor modes create unusual results.

5 Jump to the Spare Screen ("j" on the keyboard), turn off the airbrush, and create three, or four filled white boxes, approximately 1/4 to 1/8 the size of the screen. Jump back to the first screen, and press "K" to clear the screen. Turn the Airbrush on again.

6 Click on the Stencil button, and move the pop-up selector to Positive. Spray the Airbrush in the vaccinate of one of the boxes on the spare page. With the Stencil active, and in Positive mode, you can only paint in areas that are white on the spare page.

This feature in particularly useful for creating masks. You can paint over an area to be masked, undo the painting, jump to the spare page, and re-do the painting, and you've created a perfect mask for airbrushing.

7 Click on the Stencil pop-up, and select Negative. Select a different paint color, and paint over the area you just painted. Now you can only paint in the areas not covered by the mask. You can create an interesting look using text as the stencil. Paint over the stencil in one color with the stencil set to positive, and then a different color with the stencil set to negative. This creates an interesting floating painterly effect.

Don't forget that this tool should be used to emulate an actual airbrush. You want to use a pretty light hand when painting with it. If you paint too heavily with it, the effect is lost. If you want to paint a solid color you should just use Normal mode, and not the airbrush. Don't concern yourself with making your airbrushed graphics look too perfect. Once again, you want to use this tool when you want to achieve a hand painted look, which, by it's nature, is imperfect.

As I said in the beginning of this tutorial, all the functions of the airbrush should be pretty obvious to those of you familiar with the other drawing tools in ToasterPaint. It will take some fooling around with the tool to get a handle on it's feel, but you should be able to master this powerful tool in no time.

ToasterPaint Tutorial #2: PostScript Text

In this Tutorial we will cover the new features added into ToasterPaint, concerning text. With the addition of PostScript font support, ToasterPaint becomes a very sexy titling program. Text can be rotated, stretched, sized and sheared within the program. Add these features to ToasterPaint's powerful video image manipulation features, and this becomes the perfect tool for creating title pages and other graphics pages.

The procedure for handling text is pretty much the same as it's ever been within ToasterPaint. But since paint only supported Amiga fonts in the past, most people used ToasterCG for text instead. Therefore this tutorial will start from the very beginning, covering all the steps required to create text brushes in ToasterPaint.

1 Click on the Text button at the bottom of the screen, or press F3 on the keyboard. This brings you to the Text control panel.

2 Click on the Load Font button. This opens a requester to load a font. ToasterPaint will load any Postscript Type 1 font. You've got several in your system, or you might have a font on a floppy disk that you'd like to load. The requester will default into your PSFonts directory, but you can redirect where ToasterPaint will look for the font, by clicking on the drive buttons at the top of the requester. Click on DF0: to view the contents of your floppy, etc.

3 Set the Size requester to the font size you'd like. For this example, set it to 120 points.

4 Click in the text window, and type your first name. Press the arrow button to the left of the text entry window. Your pointer will "go to sleep" for a few seconds, and then return with a Text brush attached to your pointer. Click the Left Mouse button to stamp this brush down on your screen. You can stamp the brush using any of the paint modes, like lighten and darken, or colorize. Experiment using different fonts, and different sizes.

5 Repeat steps one through three. Adjust the slider for Rotate to 45. This rotates the text brush 45 degrees clockwise, or so the first letter is raised, and the last letter is lowered. Press the Arrow Button to create the brush.

6 The Shear and Stretch functions work similarly, and require a little experimentation. Remember that the numeric sliders will go negative. A negative value in the Rotate requester rotates the brush counter-clockwise. In Shear it kicks the letters off to the left, and for Stretch it condenses the lettering.

Cool Tips with Text:
You can create easy drop shadows on text by stamping down your text in Darken mode, and then going to Normal mode and moving the brush slightly up and to the left, and stamp the text . A cool variation on this creates an embossed look. Stamp down in darken mode, as before, but then go to Lighten mode rather than Normal. Stamp the Text down. In the areas where the Lighten, and Darken overlap, they cancel each other out, leaving a highlight on one side, and a shadow on the other. Airbrush a little blur over the area, and the final look appears like embossed text, or transparent beveled glass text. Try it, I think you'll like it.

You can load a busy texture into the spare screen, and use text brushes in Rub-Thru mode to create interestingly textured text. This can look particularly good when used with transparency. You can create a cool look by painting a box with a color gradient running from top to bottom, with similar colors, like light blue at the top , and dark blue at the bottom. After the box is drawn onto the screen, jump to the spare screen, and reverse the gradient, with dark on top, and light on bottom. Use RubThru mode with a text brush to create this interesting look. Don't forget the technique described in tutorial one; using both positive and negative stencils to create an interesting airbrushed text look.

With a little practice, you'll find that the Text functions, combined with ToasterPaint's video image manipulation functions, makes this a powerful, and dynamic graphics authoring program.

ToasterPaint Tutorial #3: Flood Fill and Global Fill

In this tutorial we will learn about the new Flood Fill, and Global Fill functions in ToasterPaint 4.0. The revised and new functionality of these tools makes these extremely powerful.

1. Press Shift+k to clear the screen. Draw several shapes of varying size and shape on the screen, all in one color. Make them separate objects, surrounded on all sides by the black background.

2. Select a different color, and click on Flood fill on the Tools panel.

3. Click inside one of the shapes you drew. The shape will fill in with the new color. Press u to undo the last step, and return all the item to the same color.

4. Click to the Options panel, and click on the Global Fill button.

5. With the second color still selected, once again click inside one of the shapes. This time, all of the shapes will change to the new color. With Global Fill selected, ToasterPaint not only looks for contiguous areas of the same color, but seeks out every pixel of a particular color, and changes them all.

6. Load the Video Toaster logo framestore. Go to the Options panel, and turn off Global Fill. Pick a bright green color. Move the pointer to the yellow ball. Click, and hold the left mouse button on the yellow area, and move the mouse around, staying in the yellow area but dragging over most of the various shades of yellow. The mouse pointer is hard to see in this mode, because it is a single pixel in size. Release the mouse button. ToasterPaint will fill a contiguous area of all the colors you dragged over. It actually keeps a list of all the colors you drag over, and then performs the fill.

7. Press u to undo the last step. Reactivate the Global Fill function on the Options panel. Try dragging over on f the black lines in the logo. With a little practice you can "perform image miracles!"

Many of the functions you can perform using these features were totally unavailable in other 24-bit paint programs. Before the introduction of Global Fill, the flood fill gadget was useful only on images created within the paint program. If you attempted to use this tool on a framestore, you usually ended up with a splotch. With these new features, Flood Fill and Global fill become powerful tools.

Cool Tip:
Global Fill tool can clean up poorly shot "blue screen" footage. The footage was of a person wearing white and standing in front of the blue screen. The subject's clothes were tinted quite blue. As a result of the poor lighting, it was difficult separating the foreground from the background.

In this case, we selected white as the current color. Flood Fill and Global Fill were turned on. Move the mouse pointer exactly to the edge of the subject, and drag a line off to the edge of the screen to select all of the background colors, but not the subject. The Background fills in with white.

To touch up the frame, move to the trouble area and select a few more shades of blue to be masked. Once the mask is complete, click once again on the white area, press j to jump to the spare screen, and then redo the last function. This re-does the fill function, which in this case draws a white matte and leaves a black area where the subject was. This is perfect for use in LightWave as a clip map. You can repeat this procedure for all of the frames in the sequence, which may be easier than trying to get the footage re-shot.

ToasterPaint Tutorial #4: Painting with Flyer Clips

Perhaps the most exciting new feature in ToasterPaint 4.0 is its interconnectivity with the Video Toaster Flyer. Now the tools required for 2D animation, rotoscoping, and hand painting on live video sequences are at your fingertips.

It should be pointed out that the techniques described in this tutorial are all pretty simple, but actually creating a hand drawn effect is a very time consuming process. To produce only a few second of any of these effects can take several hours. This is pretty intense stuff, and if you are in a heavy production schedule, you might want to hang on until you've got a little time available before trying the animation techniques for yourself. The methods described here can be performed on single frames, of on entire video clips.

1 Click on the Process button at the bottom of the screen. This brings you to the Process panel. The screen is divided into two halves, the top looking rather similar to the bottom. The upper portion is used to perform a particular ARexx script on an entire clip of video. The lower half of the screen is used to access (and maybe process) individual frames loaded out of a clip.

2 Click on the Select Clip button, and a requester will open. Locate a video clip on one of your Flyer drives. You can double click on the name, or single click, and then press O.K. This will return you to the Process panel, and you'll see the name in the Select Clip panel. You'll also see that the start and end frame numbers of the clip have been entered into the time code windows. If you were going to run an Arexx script on an image sequence, these windows would indicate the range of frames to be processed.

3 In the lower portion of the screen, enter a time code value about in the middle of the clip. Click on Load Frame, and in a few seconds, you'll see the frame load into the paint screen. At this point you can paint on this screen, and then save it out as a separate framestore by saving the image as you would any image. You'll see that there are also options to load in field one or field two. These load in as full screen images, but have 1/2 the vertical resolution of a frame. If you are going to save the image out as a framestore, you'll be better off loading a frame. The advantage of loading a field is that it doesn't have the frame motion that we associate with frame captured video.

4 If you want to bring in a series of frames, and then save them out as a new Flyer clip, you've got to define both the source, and destination clips. Pick the source clip as described above, then go to the Disk menu. Click on Save Clip, and enter a name for the new clip. Now when you tell ToasterPaint to save an image to a clip, it will save to this clip.

5 We will still be working in the lower half of the Process panel. Pick the frame where you want to start working within the clip. Load field one of the frame.(You will find it easier to paint on fields as opposed to frames because fields don't jitter the way frames do.) Paint whatever you want onto the image. When you have finished, press i. This is the command to write the current image as a field to whatever clip you defined under Save Clip earlier. Load the next field, and repeat the process.

6 After you have created several frames, you can press Shift+i to save the current image as the icon for the clip you are working on.

Important! You must save out a minimum of 10 frames before you can slip out to the Switcher to view your work in motion, as the Flyer doesn't like to play clips shorter than 10 frames. As long as you don't quit ToasterPaint, and don't save any new clips onto the same Flyer drive you are saving this sequence onto, you can work at your leisure.

This is the basic procedure for loading flyer clips into ToasterPaint, and saving out clips. Of course, you can enter a new clip name under save clip, skip the whole clip loading part, and draw a series of pictures, to create traditional 2 D animation.

Rotoscoping tip. Follow the procedure outlined above, for loading images into the program. Paint outlines around the subjects in the video clip. Copy these outline over to the spare page, so you have the outline over a solid color. This creates a cool hand drawn animation effect, and all you have to do in trace the video footage. Press the i key up to 8 times to write 8 fields (or 4 frames) of this image to the clip. Then set the time Frame # time code gadget ahead 4 frames and load another field. This results in a slightly strobed effect, which accentuates the animation effect. You could also save 8 fields, and then load only 2 fields ahead to create a slow motion effect. Rotoscoping is one of those time consuming processes, but the results are stunning.

ToasterPaint Tutorial #5: ToasterPaint, the Flyer, and ARexx

Now that ToasterPaint can load Flyer video clips, we have included many useful ARexx scripts which apply interesting post process filters to your video. Effects as simple as color stripping, negative image, and mirroring, or as complex as texture mapped image montages can be created by simply choosing a script. Effects such as time lapse, slow motion, fast motion, and strobing are also possible. The most mundane procedure in ToasterPaint suddenly becomes pretty exciting when you think of applying it to an entire video segment. Something as simply as flipping video upside down, or creating a mirror image, or mirroring the image down the center... You get the idea.

1 Go to the Process Menu, and select the clip you'd like to process. This will automatically enter the start and stop times in the time code windows. If you don't want to run the filter on the entire clip, you may enter the desired start and stop times in these windows.

2 You can test a script on an individual frame, by working in the lower half of the panel. Set the time code of the frame you'd like to test the script on, in the time code window. On the right side of the menu, you'll see a process window which reads "None." Click on the button and a window will pop up. With the left mouse button held down, move the mouse to the bottom of the pop up requester, and more options will scroll by. Try out some of the scripts on the image, to get a feel for what they do. Try TPLens to see some examples of how you can apply painting techniques over the entire image, with an ARexx macro. Any of the scripts that start with TP are good as examples. Scripts such as slow motion don't look like much on a single frame... We'll have to load an entire sequence before you can see their effect, and they take time to process.

3 Select a clip that would look good in slow motion. Choose start, and stop times for the process. (You might want to jump out to the Switcher, and pop open the control panel for the clip to get good start and stop times.) In the top half of the screen, select the process to perform on the entire clip. Choose the HalfSpeed script, and press the Process button. ToasterPaint will ask you to pick the destination drive. Be sure to select a Flyer drive, and not one of your system drives. Each frame will take about 20 seconds to process, and when the processing is done, you'll find a new icon on the selected destination drive. The icon will not have a picture on it, but you can assign one in the Process panel of the clip's control panel.

For those of you with a little programming experience, or those with and adventurous spirit... Look at some of the included scripts, and modify them to suit your need. The nice thing about ARexx programming is that most of the commands are in English, as opposed to "computerese". With a little patience, most people can figure out how to program their own macros. ToasterPaint has a fairly thorough ARexx interface, and you should be able to create a macro to do most anything.

ToasterCG Tutorial #1: Using the SpellChecker

The purpose of this tutorial is to familiarize you with the new spell checker. In doing this you will also gain a better understanding of CG's new Arexx port, arguably the most powerful addition to Toaster CG 4.0.

1. Enter the Character Generator.

2. Load the font B&P Graphics/**Calgary-DemiBold** at **60** points.

3. Enter the text as you see below. (Make sure you spell the words incorrectly or you'll ruin the whole tutorial!)

Viddeo Toaster
Charakter Jenerator

4. Hold down the Alt key and press F1. This will bring up the Run ARexx Program window.

5. Choose the **SpellCheck.rexx** macro and click OK.

6. You will see a requester that asks you to press **OK** to check the page. Do so now.

7. The correction field will appear. At this point you can correct the misspelled word and press **OK.**

8. The SpellChecker will move to the next misspelled word. Correct it and press OK.

9. You will now see the following message. Click continue to go on.

All done!
3 misspelled words
4 words total

Note 1:
If any of the misspelled words are new to ToasterCG's dictionary, the macro will ask if you wish to add the word to the dictionary as well.

Note 2:
If the CG comes to a word that is spelled correctly but doesn't recognize it , just press continue. SpellChecker will then bring up a requester that allows you to add that word to the word pool. The word pool comes from a file called "woods" located in the Arexx/CG/SpellCheck_Support drawer.

ToasterCG Tutorial #2: Importing Brushes of Any Size

The purpose of this tutorial is to acquaint you with the new image format loaders and image scaling capabilities of the Character Generator. (These capabilities are a direct result of NewTek's licensing Elastic Realities' Host Independent Image Protocol, aka HIIP.)

1. Enter the Character Generator.
2. Select Box from the font pop-up.
3. Drag out the box to any size and aspect.
4. Hold down the Alt key and press F1
5. Choose the Import.rexx macro.
6. Another requester will appear asking for an image. Choose any image within this directory and click OK.
7. The macro will ask if you wish to preserve the aspect ratio. Choose your preference. If you answer yes, the box may be resized slightly in order to maintain the correct aspect ratio of height to width. If you answer no, the image will be squeezed either in height or width in order to make it fit the box exactly.
8. The CG will now load the image, convert the image and scale it to fit the box. Watch the top left of the CG window for updates on the progress of the macro. The image will also be saved to the Brushes directory within the Toaster, so that you can use it elsewhere (and on this page) in the future.
9. When the conversion is finished render the screen to see the final scaled image.

ToasterCG Tutorial #3: Rotating and Shearing Text

The purpose of this tutorial is to teach you how to use the new "stretchy text" feature. You will learn how to rotate and shear text as well as how to create scalable "text brushes."

1. Enter the Character Generator. If you are already in the CG, you may want to save the current book, the clear it for this tutorial.
2. Go to the Ctrls Menu.
3. Load the PostScript font B&PGraphics/Calgary-DemiBold at 80 points.
4. Click +PS Brush button. The Graphic Text Control panel will pop up.
5. In the text field type WOW!!
6. In the rotate field type 45.
7. Click OK.
8. Now go to the pop-up font menu. You will see WOW!! listed at the bottom of the list. Select it. WOW!! will appear on the CG screen with a box around it. This is the scaling box.
9. To scale the new brush, click and drag the bottom right-hand corner of the box. Feel free to drag the brush out to any size or aspect.
10. Click on the +PS Brush again.
11. In the text field type ZOOM.
12. Change rotate to 0. In the shear field enter 50.
13. Click OK.
14. Choose ZOOM in the current font menu. You will see the ZOOM brush on screen with a nice shearing effect on the text. Try scaling the text to your liking as well.

Note:
The Shear and Rotate controls can be combined to create very dynamic looking text. It is important to remember that these are brushes and can not therefore be edited. If you make a mistake in your text, delete the brush and recreate it with the correct spelling or phrasing.

LightWave Tutorial #1: Beginning Keyframing

This tutorial will introduce you to making things move in LightWave. You will learn the basics of keyframe animation, the X Y Z coordinate system for movement, and the Heading Pitch Bank method of object rotation.

Preparing for Take-Off
We'll need something to fly around for our tutorial.

1 Select the Objects menu in Layout.

2 Select Load Object and find either "MyShip3.lwo" if you are using your own creation, or "ShipTex.lwo" if you want to work with our Quick-Start version.

3 Select Continue to return to Layout.

4 In the Layout View sub-menu, select Camera as our view.

The view of our spaceship, from behind, as our virtual camera sees it should look something like Figure A.

Setting out Starting Position

5 In the Layout Edit sub-menu select Object as our current Edit mode.

In the Selected Item pop-up menu at the bottom of the Layout screen, it should read the name of the object you just loaded (since this is the only object currently loaded).

6 In the Layout Mouse sub-menu, select Move as our current Mouse control mode.

7 While clicking and holding down the left mouse button anywhere in the main Layout view screen, drag your spaceship far ahead and to the left of center, X -2.0 Z 10.

8 While clicking and holding down the right mouse button anywhere in the main Layout view screen, drag your spaceship down towards the bottom of the screen, Y - 1.5.

9 In the Layout Mouse sub-menu, select Rotate as our current Mouse control mode.

10 While clicking and holding down the left mouse button anywhere in the main Layout view screen, spin your spaceship around so that it now faces towards us, instead of away from us, H 180.0 P 0.0 B 0.0.

11 Select Create Key at the bottom of the Layout screen to bring up the Create Key requester.

The Frame number should still be at 0 by default and Create Key for Selected Item should be the current keyframe creation selection mode.

12 Select OK to save the current settings for our spaceship at Frame 0.

Your first keyframe position should look something like Figure B.

Setting our Ending Position

Currently, the Current Frame window is set to 0, the beginning of our animation. Let's create a key frame at the end of our animation, say 2 seconds (or 60 frames) later.

13 Click anywhere within the Current Frame text window at the bottom of the Layout screen.

14 Change the number 0 to 60 and press Return.

We are now at frame 60 of our animation, 2 seconds later. Everything looks the same as before because our ship is sitting still until we tell it otherwise.

15 In the Layout Mouse sub-menu, select Move as our current Mouse control mode.

16 While clicking and holding down the left mouse button anywhere in the main Layout view screen, drag your spaceship close to us and to the far right of center, almost completely off the screen, X 0.5 Z - 2.0.

17 While clicking and holding down the right mouse button anywhere in the main Layout view screen, drag your spaceship up towards the top of the screen, Y 0.5.

18 In the Layout Mouse sub-menu, select Rotate as our current Mouse control mode.

19 While clicking and holding down the left mouse button anywhere in the main Layout view screen, spin your spaceship towards the right and tilt it up slightly, roughly in the direction it is travelling, H 150.0 P -20.0.

20 While clicking and holding down the right mouse button anywhere in the main Layout view screen, bank your spaceship clockwise away from us, again roughly in the direction it seems to be travelling, B 40.0.

21 Select Create Key at the bottom of the Layout screen to bring up the Create Key requester.

The Frame number should still be at 60 and Create Key for Selected Item should still be the current keyframe creation selection mode.

22 Select OK to save the current settings for our spaceship at Frame 60.

Your last keyframe position should look something like Figure C.

Putting Everything in Motion

If there isn't a Motion Path (i.e. a line with dots) connecting your previous keyframe with your current keyframe (as shown in Figure C), then you need to turn on the Show Motion Path option in the Options Menu.

23 Select the Options menu.

24 Select Show Motion Path.

25 Select Continue to return to the main Layout screen.

We need to tell LightWave that our animation lasts for 2 seconds, or 60 frames.

26 Select the Scene menu.

27 Click in the Last Frame text window.

28 Change the Last Frame from 30 to 60.

29 Select Continue to return to the main Layout screen.

Let's generate a real-time preview of our animation.

30 Select Make Preview in the Preview pop-up menu in the lower left of the Layout screen.

31 Make sure the first frame is set to 1, the last frame is set to 60, and the frame step is set to 1.

32 Select Wireframe as our Preview Type.

33 Select OK to begin generating a wireframe animation preview.

After watching LightWave generate each frame, you'll see the Preview Playback controls, which look at lot like those on a VCR.

34 Press the Play Forward button, which looks like a single triangle pointing to the right (the second button from the right).

You should have an animation wherein the spaceship starts far away, down and to the left of the camera (you!) and then flies across the screen, up and to the right. Meanwhile, it is slowly pitching up and banking away. That's all there is to it. You're animating with LightWave!

Saving Everything for Later

Let's save our work for later.

35 Select the Scene menu.

36 Select Save Scene.

37 Enter a scene name of "MyFlyby1.lws" and press RETURN to save your scene to your hard disk.

LightWave Tutorial #2: Intermediate Keyframing

This tutorial will go further into LightWave's keyframe-based animation system. You will learn the differences between linear and spline interpolated motion paths and well as how to control such subtleties of motion like velocity, bounce, and anticipation using LightWave's spline settings for Tension, Continuity, and Bias, respectively. Motion short-cuts like Align to Path and Look Ahead Frames will be demonstrated.

Loading a Previous Scene File

This tutorial builds directly on the Beginning Keyframing tutorial, so you can load your own scene.

1. Select the Scene menu.
2. Select Load Scene.
3. Select the scene you saved from the first LightWave tutorial.
4. Select OK to load the scene.
5. Select Continue to return to the main Layout screen.
6. In the Layout View sub-menu, select Camera as our current View mode.
7. In the Layout Edit sub-menu, select Object as our current Edit item mode.
8. In the Layout Mouse sub-menu, select Move as our current Mouse control mode.

Your Layout Screen should look something like Figure A.

Modifying an Existing Motion Path

Your spaceship should be in its starting, or Key Frame 0, position. Notice that the motion path of our ship points straight up towards the right of our screen. Let's add some variety to it.

9. Click and hold down the left mouse on the slider bar to the right of the Current Frame window at the bottom of the Layout screen.
10. While still holding down, slide the slider to the right until the Current Frame window reads frame 30, and release.
11. While clicking and holding down the right mouse button anywhere in the main Layout view screen, drag your spaceship straight down towards the bottom of the screen, Y -1.5.
12. Select Create Key at the bottom of the Layout screen to bring up the Create Key requester.

The Current Frame number should still be at 30 and Create Key for Selected Item should be the current keyframe creation selection mode.

13. Select OK to save the current settings for our spaceship at Frame 30.

Your new spaceship motion path should look something like Figure B.

Adjusting Spline Controls in the Motion Graph

Notice that our once straight line is now curved. LightWave automatically smooths through, or interpolates, keyframed motion paths. Create a wireframe preview of your animation and watch the difference.

14 Select Make Preview in the Preview pop-up menu in the lower left of the Layout screen.

15 Make sure the first frame is set to 1, the last frame is set to 60, and the frame step is set to 1.

16 Select Wireframe as our Preview Type.

17 Select OK to begin generating a wireframe animation preview.

After you are finished watching your new preview and have returned to the main Layout screen, we're ready to finesse our motion.

18 Select the Motion Graph for the currently selected Edit item (i.e. your spaceship), located in the lower left of the Layout Screen.

19 Change the Current Channel pop-up menu from X (the default) to Velocity (one step above).

Notice that our spaceship's velocity is relatively constant. Let's say we'd rather have the spaceship speed up towards the end of the animation, as it flies past the camera.

20 With the left mouse button, select the spline knot that represents Key Frame 60 (furthest to the right).

21 Press and hold down the 't' key.

The words "Tension: 0.00" appear in the upper left of the motion graph, indicating we are in interactive Tension mode. What does that mean? Try the following.

22 While still holding down the 't' key, click the left mouse button down anywhere in the motion graph and drag it to the left and right until the keyframe knot stops at its highest velocity, T -1.0.

As you slide the Tension from 1.0 (right-most) to -1.0 (left-most), the velocity at this keyframe ramps down and up, respectively. Leaving it at -1.0 cause our spaceship to speed up at the end of our animation. Your motion graph should look something like Figure C.

Smoothing Velocity with Tension

The velocity from frame 0 to frame 30 remains constant, then dips sharply and then rises quickly towards frame 60. If we created a wireframe preview of this animation (as we did in steps 13-16), we could probably see some jerkiness to the motion. To smooth this velocity out a bit, we can use Tension (as we did in steps 19-21) to alter the velocity curve through each keyframe until the velocity is one smooth spline.

23 With the left mouse button, select the spline knot that represents key frame 30 (the knot in the middle).

24 While still holding down the 't' key, click the left mouse button down anywhere in the motion graph and drag it to the right until the velocity curve passes smoothly through this key frame, T 0.27.

Now, we've created a hump between frames 0 and 30. Our spaceship shouldn't speed up and then slow down as it is preparing to climb. Let's make the spaceship's initial velocity even, and then it can slow down a little as it prepares to climb.

25 With the left mouse button, select the spline knot that represents key frame 0 (the knot on the left).

26 While still holding down the 't' key, click the left mouse button down anywhere in the motion graph and drag it to the right until the velocity curve passes smoothly through this key frame, T -0.12.

If your velocity graph looks like Figure D, you've just tweaked your first velocity graph.

Exploring Bounce with Continuity

27 Select Use Motion in the Motion Graph to keep the current Spline settings.

28 Generate a wireframe preview by repeating steps 13-16 and watch it a few times.

Our spaceship fly-by is getting much more interesting. While adjusting Tension in the Motion Graph may be the best way to manipulate velocity, the Spline Control settings of Continuity (or bounce) and Bias (or anticipation) are best adjusted interactively in the Layout screen. We should still be on key frame 30.

29 Press and hold down the 'c' key.

The Spline Control settings will appear in the lower right hand corner of the Layout screen. We are now interactively editing the Continuity Spline Control setting.

30 While still holding down the 'c' key, click the left mouse button down anywhere in the Layout view window and drag it to the left and right until the motion path becomes a sharp V-shape, C -1.0.

If you slide the Continuity from 1.0 (right-most) to -1.0 (left-most), the manner in which our spaceship approaches and leaves this keyframe alters, as evidenced by the changing motion path. Leaving it at -1.0 causes our spaceship to bounce hard upon reaching frame 30.

31 Generate a wireframe preview by repeating steps 13-16 and watch it a few times.

Continuity usually ranges from 0 to -1.0. A Continuity of 1.0 creates a hop-skip effect which is rarely useful. Since we do not want our spaceship to bounce at the bottom of it's motion path, we'll change it back to 0.

32 Press and hold down the 'c' key.

33 While still holding down the 'c' key, click the left mouse button down anywhere in the Layout view window and drag it to the right until the motion path returns to normal, C 0.0.

Exploring Anticipation with Bias

The Bias Spline Control can create the sense of anticipation (or delay) in your animations. Let's use it to our advantage in our fly-by. Since Bias controls the behavior of an object around a given keyframe, it is most useful to us on frame 30. We should still be on frame 30 from our last examples.

34 Press and hold down the 'b' key.

The Spline Control settings will again appear in the lower right hand corner of the Layout screen. We are now interactively editing the Bias Spline Control setting.

35 While still holding down the 'b' key, click the left mouse button down anywhere in the Layout view window and drag it to the left until the curve in the motion path shifts before frame 30, B -1.0.

As you slide the Bias from 1.0 (right-most) to -1.0 (left-most), the curve through which our spaceship passes through this keyframe alters, as evidenced by the changing motion path. Leaving it at -1.0 causes our spaceship to bank up a little before frame 30, slightly anticipating the turn. A value of 1.0 would shift the curve after the keyframe, adding a sense of delayed reaction to the motion.

36 Generate a wireframe preview by repeating steps 13-16 and watch it a few times.

Do you like the animation more or less with Bias? We'll keep it for now. While subtle, the Spline Control settings help give your motions a sense of unpredictability and human realism. Your motion path should look like Figure E.

An Animation Short-Cut using Align to Path

You may have noticed by now that the center of our spaceship does not always remain aligned with the path it is following. While it is certainly possible to manually adjust your Heading and Pitch angles after creating your motion, LightWave's Motion Graph editor has a built-in feature for aligning your objects to their motion paths, called Align to Path.

37 Select the Motion Graph.

38 Select Align to Path at the top of the menu. The Frame Offset setting should be at 1 by default.

39 Select Use Motion to keep the current settings and return to Layout.

40 Generate a wireframe preview by repeating steps 13-16 and watch it a few times.

Nice, huh? The only problem you may notice is how predictable and unnatural the motion is, especially around tight turns. This is because the heading and pitch are directly controlled by the spaceship's position in space. Normally, they would be independent of the position. We can offset this predictability and accentuate our sense of anticipation created by using a Bias of -1.0 on frame 30 just by changing the Look Ahead Frames value.

41 Select the Motion Graph.

42 Change the Frame Offset setting from 1 frame to 15 frames.

43 Select Use Motion to keep the current settings and return to Layout.

44 Generate a wireframe preview by repeating steps 13-16 and watch it a few times.

Our default setting for Look Ahead Frames tells Align to Path to look one frame ahead for its position information. By changing Look Ahead Frames to 15 frames, the Heading and Pitch of our spaceship actually changes a half second before it would normally, giving us the more realistic impression that the spaceship is turning first, with the motion following afterwards. An automobile swerving around a sharp corner is another example of an effective use of Align to Path and Look Ahead Frames.

45 Save your scene as "MyFlyBy2.scn" for later use.

Advanced Studies

Try adding additional keyframes in different positions and see if you can smooth out the velocity. Use Tension, Continuity, and Bias to control how your spaceship behaves in flight. Can you give it a sense of being piloted? Try these experiments on an automobile or a bicycle. What problems do you encounter? While the tools of animating in LightWave are simple and straightforward, there is a lot of subtlety to the way things move in the real world, and it is an art form in itself to capture that in the computer.

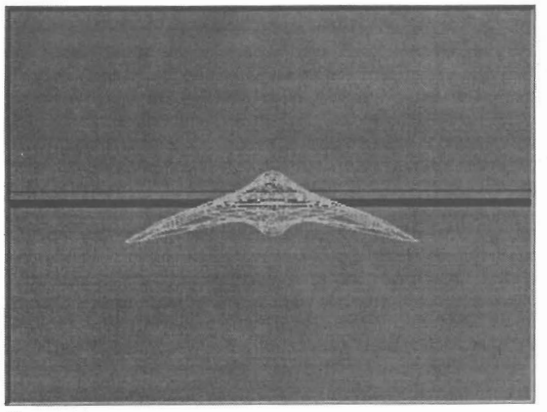


Figure 1A

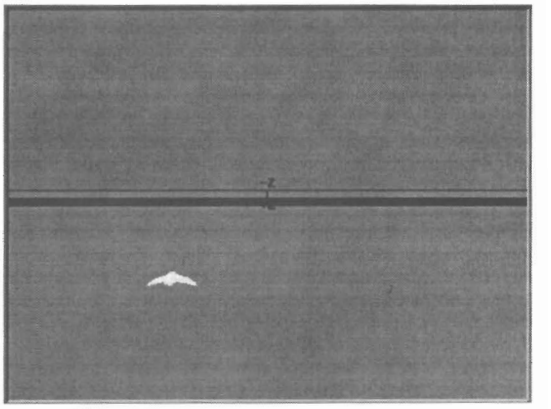


Figure 1B

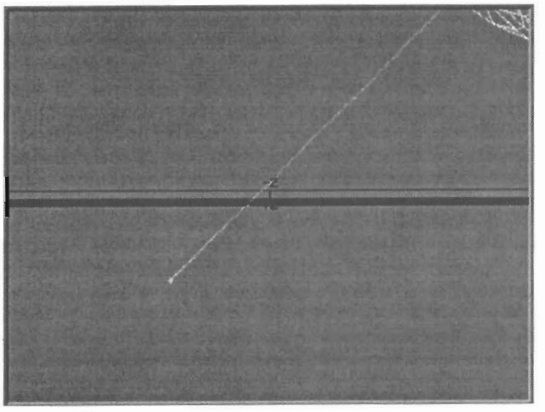


Figure 1C

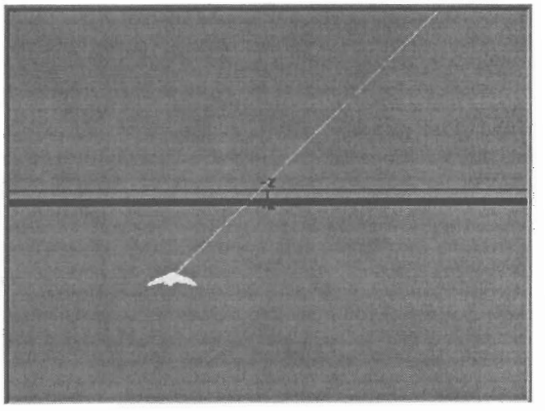


Figure 2A

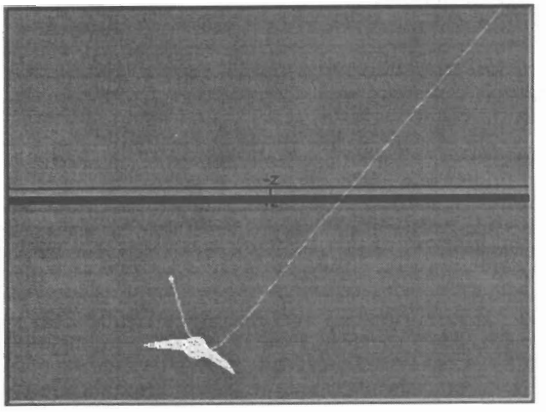


Figure 2B

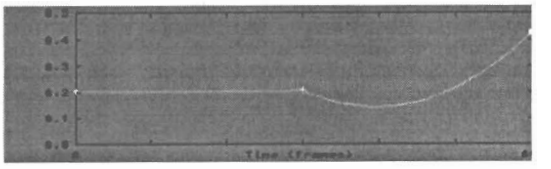


Figure 2C

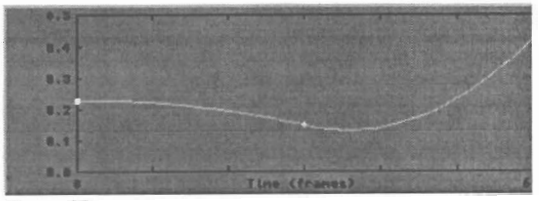


Figure 2D

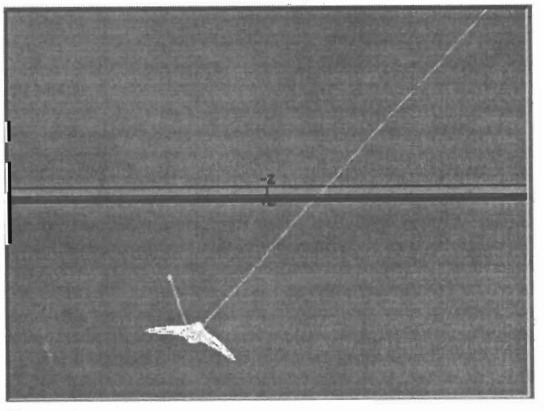


Figure 2E

Modeler Tutorial #1: An Introduction

This tutorial is designed to give you a quick overview of the menus you will be using to create models, for rendering in LightWave 3D. It sure looks like are a lot of buttons here, but before we begin here's a little secret. You are not going to use all of these buttons all of the time. Many buttons you will use seldom. There are even some buttons that you will use once in a blue moon. The fact is that you will end up using 10% of the buttons 90% of the time.

Now that you know this fact, you can probably figure out that if you learn a comparatively small number of these buttons, you will quickly master ninety percent of what you are ever going to have to know to master this program. This is not to say that you won't have to work at figuring out all of the intricacies of LightWave 3D, but anyone can learn to be proficient with the program in a relatively short period of time.

1 Click on the Modeler button. You will find this button in the upper right corner of the LightWave Layout screen. Clicking this button will bring you into the Modeler program.

Modeler is setup so that there are main menus across the top of the screen, and submenus down the left side. The submenus change according to which menu has been selected at the top.

The main area of the screen is divided into four rectangular windows, each of these provides a different view of anything loaded into Modeler. You can see that three of these windows are labeled top, front and side. The window in the upper right corner is not labeled. This window can be used for a moving perspective preview of the object, but we'll get to that later.
One of the more difficult concepts about modeling a 3D object is understanding how the three views work. Since we are working on a 2D computer screen, our objects must be view from various directions, in order to define it's geometry in three dimensions. You can picture the three views as a box that has been unfolded.

Viewing in the front view will show you the front of the object. If you imagine the unfolded box, the top view shows you the object from the top, and if we folded the top view down, you can see how this works. The same holds true for the side view. If we fold this window over, you can see how this view works with the front and top views, to show you your object in three dimensions.

2 Be sure that the Objects button is selected at the top of the screen, and click on the Load button on the left. This opens a requester on top of the Modeler screen, where you can select objects to be loaded into the program. The default path for his requester is Newtek/programs/3D. Select the Tutorials directory, and then click on the XXXXX object. You'll see the object name appear in the File window. Hit O.K. and the object will load into the Modeler screens. (You can also double click on any object file name, and the object will load.)

You should now be able to see how the top view works with the front and side views to provide a 3 dimensional picture of the object.
XXXXXXXX

Notice the rows of small buttons in the upper right portion of the Modeler screen. These are the layer buttons. Each of these buttons is divided into an upper, and lower portion. You'll see a small dot in the first set of these buttons. This indicates that the first layer is occupied.

3 Click on the upper portion of the second row of layer buttons. This activates Layer 2. You'll notice that your object has disappeared. You can also see that the occupied layer indicator is still in Layer 1. There is currently nothing loaded into Layer 2, so no occupied indicator appears in this layer.

4 Using the procedure outlined in step 2, load the XXXXX object from the Tutorials directory. Now you can see the small dot in Layer 2. Both of the layers are occupied, although you can't currently see the object in layer one.

5 Click on the upper portion of the Layer 1 button. Now you can see the original object, and the XXXXX has disappeared. Layer 1 is now said to be in the Foreground, or Active.

6 Click on the bottom portion of the Layer 2 button. Now you will see the XXXXX object in white, and the XXXXX object appears in black. Layer one in said to be in the Foreground, or Active Layer, while Layer 2 is in the Background, or Inactive Layer.

Important Concept:
While working in the Modeler program, you can only move, size, stretch, or otherwise alter objects that are in the Foreground Layer. Objects in the Background can be seen, but can not be modified. This is very useful when fitting pieces of an object together, or modifying one object in reference to another.

7 Click on the upper portion of the Layer 2 button. Doing so will turn the XXXX object white, and bring Layer 2 to the foreground. You'll also notice that Layer 1 is no longer active. Clicking on any layer to the foreground de-activates all other layers, foreground, or background. If you want to see Layer 1 in the background, click on the lower portion of the Layer 1 button.

8 Click on the upper portion of the Layer 4 button. This will de-activate both Layer 1, and 2. You can see that these layers are occupied by the small indicator dots in their layers.

9 Load the XXXXX object from the Tutorials directory. You can see that this object has loaded into the currently selected foreground layer, Layer 4. You can Load any object into any layer by simply selecting that layer as your current foreground layer, and loading.

10 With Layer 4 as our Foreground Layer, select Layer 1 as our Background. Now select Layer 2 as our Background. By clicking on these two buttons, you can alternate between background layers.

11 With Layer 4 as our Foreground Layer, select Layer 1 as our Background. Now hold down your keyboard's Shift key, and select Layer 2 as your Background. You should now see, the XXXXX object in white, in the foreground, and both the XXXXX, and the XXXXX in black, and in the Background. By holding down the Shift key you can select more than one Layer as your Background.

12 Once again holding the Shift key down, click on the upper portion of the Layer 2 button. Now you will see Both the XXXXX and XXXXX objects in white, as your Foreground Layers, and the XXXXX in black as your Background. This allows you to modify more than one layer at a time, while viewing multiple layers in the background.

13 Click on the upper portion of the Layer 1 button, and load the XXXXX object from your Tutorials directory. You now have both the XXXXX and XXXXX objects loaded into the same Layer. You can see that it could potentially be difficult to work on only one of these objects at a time, and this should illustrate the advantages of working in multiply layers.

Take some time to experiment with loading objects into different layers, and using the Foreground and Background buttons to view these objects. You can use the New button at any time to empty all of the layers. A warning message will appear about loosing all of your unsaved work, but this is only important once we start creating, and modifying objects.

Congratulations on the completion of your first Modeler Tutorial. You have taken your first step toward understanding one of the most powerful 3D Modeling programs ever written.

Modeler Tutorial #2: The 3D Universe

Now that you know the lay of the land, let's get to work by creating some simple shapes, and then we'll see how each of the options for simple shape creation work. Before we start modeling, let's talk a little bit about how the 3D universe is defined within Modeler.

Important Concept:
This relates to all that high school geometry you figured you'd never have to use. We can define the geometry of a 3 dimensional object, by plotting it's shape on 3 different axis. These axis are called the X, Y, and Z axis. You can think of these as X going across, or horizontally, Y, going up and down, or vertically, and Z going toward, or away from you. Every point of a 3 dimensional model occupies a particular location within 3D space. If you apply a numeric value to each of these axis, you can define a point's location.

For instance, if we create a point at location 0 (Zero) for X, 0 for Y, and) for Z, we have defined a point at what is called the center of the universe. If we change the X value, our point moves along the X axis or to the right of the center. We have added value away from the center. We can also use negative numbers. a X value of -2 defines the point to the left of the center, twice as far from the center as the original point. Using this same logic, a value of 2 on the Y axis defines a point 2 increments above the center, and a -4 defines one 4 increments below center. The Z axis works the same way. a value of 5 moves the point 5 increments from the center. -

When you are modeling you usually create point in location where each point has different values for X, Y, and Z. For instance, a point with a location of X 3, Y -2, and Z 1, would have a location 3 increments to the right of center, 2 increments below center, and 1 increment away from center. (O.K., by now you are probably wondering what I mean by Increments. Well, in Modeler, by default you work in millimeters, although that can be customized to use inches, or whatever. At this point, it doesn't really matter. We could be defining miles... It's the concept that is important.)

While working with the axis, the only one that people have any trouble with is the Z axis. An easy way to conceptualize this is to picture a line running away from you. In the middle of this line is your imaginary center of the universe. Picture a X axis running through that point horizontally, and a Y axis running through the same point vertically. That point is defined as X 0, Y 0, Z 0. If you move away down the Z axis, away from the center point, and away from your point of view, you are adding distance on the Z axis. You are moving in the positive Z direction. By the same token, if you move from that center point toward your point of view, you are moving in the negative Z direction. Therefore, a point defined with a Z value of -3 would be located 3 increments closer to you, along the Z axis, while a point located at Z 2 would be 2 increments further away from your viewpoint. (Positive Z = away from you, negative Z = toward you.)

If you look closely at each of the views, you'll notice that there are darker lines running horizontally and vertically in each window. This darker line represents the center of the universe.

In the lower left window, or Face view, we are looking along the Z axis at the X (across) and Y (up and down) axis. You can see the these darker lines are labeled. In the upper left window, or Top view, we are looking down the Y axis, and can see the X (across) and Z (toward you, and away from you) axis. In the lower right window, you are looking along the X (across) axis at the Y (up and down) and Z (toward and away from you) axis.

O.K., now let's make something.

1. Select Object at the top of the Modeler screen, and Box on the left. Working in the Front View, (The lower left window) move your mouse pointer above, and to the left of the center of the universe. Press and hold the Left Mouse button. While holding this button, drag the mouse to the right, across the center line, and down below the center. Release the mouse button. You will now see a square in this window. We have defined the width and height of our box, but if you look in the top view, you can see that we haven't yet given our box any depth. While working in only one window, you can only modify objects in 2 dimensions. In order to give this box depth we must work in the top view.

2. Move the mouse into the top view window, and click and hold your Left Mouse button on the edge of your box. Holding the mouse button, drag the mouse toward the top of the screen. While you are doing this you will see your box opening up, and gaining depth. Open the box up about as far as you can. While working with any of the object tools, you can click on an edge of the shape and drag it larger or smaller.

3 your mouse pointer to the lower left corner of the Top View window. Click the left mouse button. The box will pop open to a new shape. While working with the object tools, you can click in any window, and the nearest edge of the object will pop to that location.

4 Using the steps described in the previous two steps, adjust the size of your box so that it is approximately 1/2 the size of the window in each view.

5 Click on the Make Button on the left side of the screen. You'll see that the appearance of our square has changed. Prior to hitting the Make key, we were actually looking at a sort of template. You must define the shape, and then use the Make function to create the actual shape. You can also use the keyboard equivalent <Return> to make your object.

You are actually looking at your shape, as well as the object template on top of each other. At this point, you could switch to another layer and create another copy of this object.

6 Click and drag any edge of your object. You can see that you are modifying the template, but not your object.

7 This is an important procedure that relates to every tool in Modeler. On the left side of the screen, below the Options button, is a large area with no buttons on it. This is called the Blank Area. Click in the blank area with the left mouse button. You'll see that the Box tool template has disappeared. Clicking in this area causes you to drop whatever tool you are currently using. Now you can see your object clearly.

8 Click into Layer 2. Select the Ball tool on the left side of the screen.

9 Using the procedure described in Step 1, click and drag out a template in the Face view window. You'll notice that you are dragging out a box, with a circle inside it. Modeler uses a box shaped template to create all of it's basic shapes.

10 Using the same procedure as with the box, move up to the top view, and give this template some depth. Work in all views and make the template approximately square.

11 Hit the Return key on your keyboard. Now you'll see the spherical shape, defined in all three windows.

12 Go into an empty layer, and select the Disk tool. This tool works similarly to the previous two, with one exception. you must decide on the orientation of the disk, before you create it. If you want the disk to stand on it's end like a soda can, you must start working in the Top view. If you want the disk to be oriented like a pencil rolling around on your desk, you must start in the Face, or Left view window. For this example, let's orient our disk like a soda can.

13 Select Disk from the left side menu. Move your mouse pointer into the Top view and as before, drag out a template. You'll see that this template looks identical to the Ball tool's. Now move into the Face view, and give your shape some height. Notice how, in this view, the template looks like a box. Hit the Return key on your keyboard to make this shape.

From the top, you can see that this object appears round, but from the front, and side it appears square. By now you should be able to understand how you must view your objects from more than one direction to understand it's shape in 3 dimensions.

Experiment with these simple shapes (known as primitives) until you understand how each of them works. In our next tutorial you'll learn how to modify these shapes, and make much more complex objects from these simple shapes.

Modeler Tutorial #3: The Basic Building Blocks

There are two basic building blocks from which most objects are created in Modeler. These are Points and Polygons. Points are infinitely small coordinates within the Modeler universe. Unless you instruct the LightWave renderer otherwise, they are invisible. We usually use points to define the larger Modeler building block, polygons. (Snow, rain, stars, and sparks are examples of points that are visible. These are usually referred to as particles.)

In the example of a flat, two dimensional box, each of the four corners are created by a point. The edges of the box are called vertices. The flat plane which makes up the actual face of the box is a polygon. If that box was three dimensional, in other words if the box had depth, the box would have a total of eight points, four on the front, and four on the back. There would be six polygons; top, bottom, left, right, front, and back. Many of these polygons would share points, and vertices. The top polygon would share two points with the front, and they would have one vertex in common. The relationship between the top and the back would be similar; two points and one vertex in common.

1 Create a three dimensional box, approximately square, and about 1/2 the size of each of the Modeler's views.

2 Locate the buttons at the bottom of the Modeler screen labeled Point, Polygon, and Volume, and select the Point button. We are now ready to select points in our object. In the Face View, move your mouse pointer directly on top of the point in the upper left corner of your box. Click the left mouse button on the point and it will highlight. If you look in the Top or Left views, you'll notice that there are actually two points selected. When you selected the one point in the upper left corner, you actually clicked on the point in the upper left corner of both the front, and back of the box, because they are stacked exactly on top of one another when you view the object in the Face view. There is a numeric indicator at the bottom of the Modeler screen, to the right of the Volume selector. Looking there, you can see that this also indicates that you have indeed selected two points.

3 Move the mouse pointer into the side view, and over the highlighted point on the right side. Click the left mouse button, and the point willdeselect. Check your numeric indicator at the bottom of your screen, and you'll see that you now have only one point selected.

When selecting points or polygons, your mouse will operate in one of four different modes. When there are no points, or polygons selected, you can click on, or drag your pointer over them to select them. Once anything is selected, the mouse automatically changes intodeselect mode. You can select a large group of points by holding down the button, and driving the pointer over all of the points. If you accidentally let go of the mouse button, you can suddenly find yourselfdeselecting items.

You can use the Shift key on your keyboard to select more. Once you have let go of the mouse button, you can hold the shift key down, and continue driving over, and selecting points, or polygons. If you let go of the Shift key, you are back intodeselect mode.

4 The Fourth method for selecting points and polygons is the hardest to master, but once you get the hang of it, you'll use it most of the time. It is called the Lasso. The logic of this mode is the same as with the mouse. If nothing is selected, the Lasso is in select mode. Once any item is selected, it is indeselect mode, and you can hold the shift key on the keyboard to Lasso more. Move your mouse pointer back to the Face view, and hold down the Right Mouse button. Draw a circle around the selected point in the upper left corner of your box. This willdeselect the point, and now your numeric readout will read zero.

5 Still in the Face view, press the Right Mouse button, and draw a line around both sets of point on both the top left, and top right of your box. This line will run over the top of your box, and then through the middle, between the top and bottom points, and across the vertices that define the sides of the box. Look in the Top view, and you'll see that you have selected four points. In the side view it appears as if only two point are selected, because in that view, the point on the left, and right side are stacked on top of each other.

6 Press and hold the Shift key on your keyboard. Press and hold your Right Mouse button, and draw a Lasso in the Face view, around the bottom two sets of points, just like the last Lasso, but on the bottom points. You'll see that the numeric requester now reads 8 points.

7 Click in the Blank Space on the left side of the screen, under the column of buttons. This will drop all of these points.

8 In the Face view, draw a Lasso starting to the left, and above the box. Draw out to the right, still above the box, and past the right points. Still holding the Right Mouse button, draw down to below the lower right corner, and then across to the left, past the lower left point. (This should look like a reversed "C" shape, around the outside of your box. Now let go of the Right Mouse button. The Lasso tool automatically finishes off the shape you drew, by creating a straight line from the start point, to the end point. This is a handy feature, and can really speed up the process of selecting points, or polygons. You now have all of the point selected, and the numeric readout reads eight.

You now have a basic understanding of how to select point in an object. Next we will move on to selecting polygons. The rule here are the same as with points. When nothing is selected, the mouse is in Polygon Select mode. Once a polygon is selected, you are indeselect mode, and holding down the shift key puts you in select more mode. When selecting polygons, there is a problem similar to that of points stacked on top of each other.

9 Click on the Polygon button at the bottom of the Modeler screen. This changes your visibility from seeing selected points, to seeing selected polygons. The eight points you had selected are still selected. Click on the Points button at the bottom of the screen, and you'll see them selected. Switch back into Polygon select mode.

10 You can select polygons by clicking on their vertices, or holding down the Right Mouse button, and dragging over the vertices. In the Face view, move the mouse pointer above the box. Click and hold the Right Mouse button, and drag over the top edge of the box. You'll see a dotted line pop out of the polygon. This line is called a Surface Normal, and is used to show that the polygon is selected, and which direction the polygon is facing. (We'll get into issues about polygon direction later.)

Look in the Left and Top view and you'll see that there are several of these surface normals sticking out of your box. Your numeric readout should indicate that there are three polygons selected. When you clicked on the top edge vertex, you were also clicking on the front polygon, because the share that vertex, and just like those stacked up points, you also ran over the edge of the back polygon, because it also shares a vertex you dragged over. The side of the box weren't selected because you didn't click on a vertex that they share with the top. The top, front and back of the box were selected, because you dragged the mouse over one of their vertices.

11 Working in the side view, click and drag the mouse pointer from left to right, anddeselect the front and back polygons, withoutdeselecting the top. This method of selecting, where you select more than you really want, and thendeselect polygons is very common, especially in very complex objects. Using the point and drag method, there is no way to select only one polygon from this box. You can re select those polygons by moving back to the Face view, holding the Shift key and dragging over the top of the box again. Using the select more mode doesn't turn off selections, while selecting unselected polygons. In other words, even though the top of the box is selected, using select more and dragging over this preselected polygon does notdeselect it, while selecting the front and back.

12 Click in the blank space to drop all selected polygons. Working in the Left view, move your mouse pointer to the left of the box. Starting above and to the left of the box, hold down the Right Mouse button, and draw a Lasso to the right, and then down, all the way through the middle of the box, out the bottom and then to the left, all the way around the polygon. (Remember that this is actually the front of your box, because we are looking at the left view. You are seeing you box from the side.) Release the Right Mouse button, and you'll see that only the front of your box is selected. If you look in the Top of Left view, you'll see the surface normal sticking out, and the numeric readout will indicate one polygon selected.

You may be wondering why the top and bottom of your box weren't selected. You did draw the mouse over vertices of these polygons as well. The Lasso only selects polygons that were surrounded in their entirety. Working in the side view, you surrounded only the front of the box, and therefore it was the only polygon selected. You can use the select more mode here as well. Hold the shift key, while lassoing around any polygon, and it will select as well. You can even circle the entire box.

You now know the ground rule for selecting and deselecting points and polygons. This is an important step toward learning how to modify existing objects, and for creating your own models. Because points and polygons are the building block that all LightWave objects are made from, getting a firm grasp on how to work with them is vital. Practice selecting anddeselecting points and polygons on this box object. Before long you should be able to select any combination of points, or polygons in this object using a combination of clicking, dragging, selecting,deselecting, and lassoing.

Try selecting just the top and bottom of the box. (lasso one, and then hold shift and lasso the other) or just the front and left side. Try everything but the top. (Lasso the whole thing to select all of the polygons, and then lasso just the top todeselect it.) You should get the idea.... Try challenging yourself to select every combination of points and polygons. This is a very important skill, and once you have mastered it, working with any object, no matter how complex, is much easier.

Modeler Tutorial #4: The Art of Selection

There are two basic building blocks from which most objects are created in Modeler. These are Points and Polygons. Points are infinitely small coordinates within the Modeler universe. Unless you instruct the LightWave renderer otherwise, they are invisible. We usually use points to define the larger Modeler building block, polygons. (Snow, rain, stars, and sparks are examples of points that are visible. These are usually referred to as particles.)

In the example of a flat, two dimensional box, each of the four corners are created by a point. The edges of the box are called vertices. The flat plane which makes up the actual face of the box is a polygon. If that box was three dimensional, in other words if the box had depth, the box would have a total of eight points, four on the front, and four on the back. There would be six polygons; top, bottom, left, right, front, and back. Many of these polygons would share points, and vertices. The top polygon would share two points with the front, and they would have one vertex in common. The relationship between the top and the back would be similar; two points and one vertex in common.

1 Create a three dimensional box, approximately square, and about 1/2 the size of each of the Modeler's views.

2 Locate the buttons at the bottom of the Modeler screen labeled Point, Polygon, and Volume, and select the Point button. We are now ready to select points in our object. In the Face View, move your mouse pointer directly on top of the point in the upper left corner of your box. Click the left mouse button on the point and it will highlight. If you look in the Top or Left views, you'll notice that there are actually two points selected. When you selected the one point in the upper left corner, you actually clicked on the point in the upper left corner of both the front, and back of the box, because they are stacked exactly on top of one another when you view the object in the Face view. There is a numeric indicator at the bottom of the Modeler screen, to the right of the Volume selector. Looking there, you can see that this also indicates that you have indeed selected two points.

3 Move the mouse pointer into the side view, and over the highlighted point on the right side. Click the left mouse button, and the point willdeselect. Check your numeric indicator at the bottom of your screen, and you'll see that you now have only one point selected.

When selecting points or polygons, your mouse will operate in one of four different modes. When there are no points, or polygons selected, you can click on, or drag your pointer over them to select them. Once anything is selected, the mouse automatically changes intodeselect mode. You can select a large group of points by holding down the button, and driving the pointer over all of the points. If you accidentally let go of the mouse button, you can suddenly find yourselfdeselecting items.

You can use the Shift key on your keyboard to select more. Once you have let go of the mouse button, you can hold the shift key down, and continue driving over, and selecting points, or polygons. If you let go of the Shift key, you are back intodeselect mode.

4 The Fourth method for selecting points and polygons is the hardest to master, but once you get the hang of it, you'll use it most of the time. It is called the Lasso. The logic of this mode is the same as with the mouse. If nothing is selected, the Lasso is in select mode. Once any item is selected, it is indeselect mode, and you can hold the shift key on the keyboard to Lasso more. Move your mouse pointer back to the Face view, and hold down the Right Mouse button. Draw a circle around the selected point in the upper left corner of your box. This willdeselect the point, and now your numeric readout will read zero.

5 Still in the Face view, press the Right Mouse button, and draw a line around both sets of point on both the top left, and top right of your box. This line will run over the top of your box, and then through the middle, between the top and bottom points, and across the vertices that define the sides of the box. Look in the Top view, and you'll see that you have selected four points. In the side view it appears as if only two point are selected, because in that view, the point on the left, and right side are stacked on top of each other.

6 Press and hold the Shift key on your keyboard. Press and hold your Right Mouse button, and draw a Lasso in the Face view, around the bottom two sets of points, just like the last Lasso, but on the bottom points. You'll see that the numeric requester now reads 8 points.

7 Click in the Blank Space on the left side of the screen, under the column of buttons. This will drop all of these points.

8 In the Face view, draw a Lasso starting to the left, and above the box. Draw out to the right, still above the box, and past the right points. Still holding the Right Mouse button, draw down to below the lower right corner, and then across to the left, past the lower left point. (This should look like a reversed "C" shape, around the outside of your box. Now let go of the Right Mouse button. The Lasso tool automatically finishes off the shape you drew, by creating a straight line from the start point, to the end point. This is a handy feature, and can really speed up the process of selecting points, or polygons. You now have all of the point selected, and the numeric readout reads eight.

You now have a basic understanding of how to select point in an object. Next we will move on to selecting polygons. The rule here are the same as with points. When nothing is selected, the mouse is in Polygon Select mode. Once a polygon is selected, you are indeselect mode, and holding down the shift key puts you in select more mode. When selecting polygons, there is a problem similar to that of points stacked on top of each other.

9 Click on the Polygon button at the bottom of the Modeler screen. This changes your visibility from seeing selected points, to seeing selected polygons. The eight points you had selected are still selected. Click on the Points button at the bottom of the screen, and you'll see them selected. Switch back into Polygon select mode.

10 You can select polygons by clicking on their vertices, or holding down the Right Mouse button, and dragging over the vertices. In the Face view, move the mouse pointer above the box. Click and hold the Right Mouse button, and drag over the top edge of the box. You'll see a dotted line pop out of the polygon. This line is called a Surface Normal, and is used to show that the polygon is selected, and which direction the polygon is facing. (We'll get into issues about polygon direction later.)

Look in the Left and Top view and you'll see that there are several of these surface normals sticking out of your box. Your numeric readout should indicate that there are three polygons selected. When you clicked on the top edge vertex, you were also clicking on the front polygon, because the share that vertex, and just like those stacked up points, you also ran over the edge of the back polygon, because it also shares a vertex you dragged over. The side of the box weren't selected because you didn't click on a vertex that they share with the top. The top, front and back of the box were selected, because you dragged the mouse over one of their vertices.

11 Working in the side view, click and drag the mouse pointer from left to right, anddeselect the front and back polygons, withoutdeselecting the top. This method of selecting, where you select more than you really want, and thendeselect polygons is very common, especially in very complex objects. Using the point and drag method, there is no way to select only one polygon from this box. You can re select those polygons by moving back to the Face view, holding the Shift key and dragging over the top of the box again. Using the select more mode doesn't turn off selections, while selecting unselected polygons. In other words, even though the top of the box is selected, using select more and dragging over this preselected polygon does notdeselect it, while selecting the front and back.

12 Click in the blank space to drop all selected polygons. Working in the Left view, move your mouse pointer to the left of the box. Starting above and to the left of the box, hold down the Right Mouse button, and draw a Lasso to the right, and then down, all the way through the middle of the box, out the bottom and then to the left, all the way around the polygon. (Remember that this is actually the front of your box, because we are looking at the left view. You are seeing you box from the side.) Release the Right Mouse button, and you'll see that only the front of your box is selected. If you look in the Top of Left view, you'll see the surface normal sticking out, and the numeric readout will indicate one polygon selected.

You may be wondering why the top and bottom of your box weren't selected. You did draw the mouse over vertices of these polygons as well. The Lasso only selects polygons that were surrounded in their entirety. Working in the side view, you surrounded only the front of the box, and therefore it was the only polygon selected. You can use the select more mode here as well. Hold the shift key, while lassoing around any polygon, and it will select as well. You can even circle the entire box.

You now know the ground rule for selecting and deselecting points and polygons. This is an important step toward learning how to modify existing objects, and for creating your own models. Because points and polygons are the building block that all LightWave objects are made from, getting a firm grasp on how to work with them is vital. Practice selecting anddeselecting points and polygons on this box object. Before long you should be able to select any combination of points, or polygons in this object using a combination of clicking, dragging, selecting,deselecting, and lassoing.

Try selecting just the top and bottom of the box. (I'd lasso one, and then shift/lasso the other) or just the front and left side. Try everything but the top. (Lasso the whole thing to select all of the polygons, and then lasso just the top todeselect it.) You should get the idea... Try challenging yourself to select every combination of points and polygons. This is a very important skill, and once you have mastered it, working with any object, no matter how complex, is much easier.

Modeler Tutorial #5: The Modify Tools

Now that you have a good understanding of how to select point and polygons, let's see how you can modify object using these elements.

1 Create a box, approximately 1/2 the size of each of the views.

2 Select Modify at the top of the Modeler screen. Select Move under Position on the left side of the screen. Your pointer will change into the Move pointer.(Selecting any of the tools in Modeler changes your pointer. This is a quick way to keep aware of what mode you are currently using.) Working in the Face view, click and hold the Left Mouse button. Move the mouse around, and you will see your object moving as well. Releasing the mouse places your object in it's new location. Hit "u" on your keyboard to undo the last change, and your object will return to it's original position.

The entire box is moving to a new location because there is nothing selected. If you select any point. or polygon, only that item will move. This is an important concept: If nothing is selected, it is the equivalent of everything being selected.

3 Click on the Point select button at the bottom of the screen.

4 Working in the Face view, select the point in the upper left corner of your box. This will highlight the point, as well as the point behind it, as the numeric readout will indicate.

5 Hit the "t" key on your keyboard. This is the keyboard shortcut for Move.

6 Working in the Face view, click and hold the Left Mouse button, and drag the mouse around. You will see only these points moving. Release the mouse button to place the point in their new location. To modify the position of a point, select the point, go to Move, and move the selected point.

While working in the Face window, you can move points along the X (across) and Y (up and down) axis, but not on the Z (toward and away from you) axis. In order to move points on the axis, you'll have to work in the Top, or Left views. While working in to top view, you can move points on the X, and Z axis but not the Y, and while working in the Left view, you can move points on the Y, and Z, but not the X. This is important to understanding how you will work in all three views to modify an object in three dimensions.

7 Hit the "u" key to undo these modifications, and return to your original box.

8 Hit the Polygon button at the bottom of the Modeler screen.

9 Lasso the top polygon of the box.

10 Hit "t" on the keyboard to enter Move mode. Click and hold the Left Mouse button. Move the mouse around and you will see just the top of your box moving. The bottom remains stationary, and the sides of the box flex to accommodate the new position of the top. The sides of the box share vertices with the top, so as you move the top, the sides follow. Because the bottom of the box, and the vertices it shares with the sides are not selected, they remain stationary.

Now you should understand the difference between modifying an object by moving points around, verses moving entire polygons. Each of these methods are important, and you will probably use both in most of your modeling jobs.

11 Once again, hit "u" on the keyboard to undo your last modifications. Enter point select mode at the bottom of the screen, working in the Face view, select the point in the upper left corner of your box. Go to the Left view, anddeselect the selected point at the rear of the box. (the one on the right.) We only want to have one point selected. Select Rotate on the left side of the screen. Your pointer will turn into two little arrows pointing in a circle.

12 Move back to the Face view. Press and hold the Left Mouse button. Move the mouse to the left and right. You will see no result. When you rotate a point in an object, it has no effect, because the points serve as pivot point for the vertices. We saw in step 10 that the points allow the vertices to rotate freely.

13 Hit "u" on the keyboard. Choose Polygon at the bottom of the screen, and select the top polygon of your box.

14 Hit "Y" on your keyboard. This is the key equivalent for Rotate mode. Working in the Face view, move your pointer to about the middle of the top edge of the box. Press and hold the Left Mouse button, and move your mouse to the left and right. Now you will see the top of the box rotating. Hit "u" on the keyboard.

15 Now move the mouse pointer into the Top view. Place the pointer in the center of the box. Press and hold the Left Mouse button, and move the mouse to the left and right. You will see the top of your box rotating on a different axis. The Rotate tool causes objects to rotate around the axis you are looking down. Just like with the Move tool, where you could only move objects on the X, and Y axis, with Rotate, you can only rotate objects around the Z axis from the Front view, around the Y axis from the Top, and around the X while working in the Left view.

16 Hit "u" on the keyboard. The top polygon of the box should still be selected. Working in the Top view, move the mouse pointer over the point in the upper left corner. (The top, left, rear point of the box) Press and hold the Left Mouse button, and move your mouse to the left and right. Now you will see the top of the box rotating but around a different rotational point. The Rotate tool rotates objects around the center point of where you have the mouse pointer placed when you press the Left Mouse button.

This tutorial should give you enough information to get you started with all of the modify tools. Refer to the technical reference section of the manual to learn how each tool works. Experiment with various pointer placements, and see how working in different windows effects how the tools modify your object.

Modeler Tutorial #6: Changing Your View of the 3D Universe

In the tutorial we will discuss how you can modify the way you view objects in the 3D universe. There are a number of way that you can alter your view of an object such as zooming in and out, moving the view, and using the preview window to view the object in 3D.

It is important that you center objects to the X, Y, Z center of the universe. Objects load into LightWave in relation to where they were created in the Modeler. If you save your objects centered in the Modeler universe, your objects will load into the center of the LightWave universe. If your objects are created out in left field, they will load that way, as well. Although there are instances where you will want to create and save an object off-center, in most cases you will want to work right around the center of the universe. Another reason for creating objects around this center point is that, by default, LightWave uses the Modeler's center point as the center point of each object. If you save an object centered perfectly in Modeler, this center point will act as the center point of the object once you've loaded it into Lightwave. When you animate this object, all of it's movements will be calculated from that center point. Where this becomes extremely important is if the object rotates. If you create a box, and it's center is way of to the box's right, the box will rotate around that point, creating an orbit rather than an end over end style rotation. (Once again, this might be what you want.)

1 Select Object at the top of the Modeler screen. Select Text on the left. This opens up a requester to load a font. Select any PostScript Type 1 font. Type your name, first and last, in the box at the top of this requester, and hit O.K. Unless you have a 2 letter name, the text hat was created will run off the visible edge of your screen.

2 There are boarders around the edge of each of the view windows. Click, with the Left Mouse button, on the center of these borders, where they all meet at the center of the screen, and hold down the. If you do this correctly, the borders will highlight. Hold down the mouse button, and move the mouse around. You will see the views changing.

What you are actually doing is changing the size and shape of the opening into the different views. The objects are not moving, but your view is. You can see that the objects are stationary in reference to dark center of the universe lines. Text objects are created starting at the center of the universe, and continue off to the right. Text objects usually run off the screen like this.

3 Press F1 on your keyboard. This key is assigned with the macro called Center. This macro automatically centers objects on all axes within the Modeler universe.

4 Press the comma key on your keyboard. This causes the view to zoom out. Continue hitting the comma key until you see your entire object.

5 Move your mouse pointer into the Face window. Locate the Arrow keys, located between the letter portion of the keyboard, and the numeric keypad. Hit the Left Arrow key. This causes the view to shift to the left, and the object appears to be moving to the right. Remember that it is the view, and not the object that is moving. Now hit the Right Arrow key, and you'll see the view move in the opposite direction. Hit the Up Arrow key to move the view up, (the object appears to move down) and the Down Arrow key to move the view down.

Like many of the Modify tools the location of your pointer effects how the screen is modified. Since we have the pointer in the Face window, pressing the left arrow key moves the view to the left. If the mouse pointer is moved to the Top View, and you press the up arrow the view will move toward the top of the Modeler screen. In the 3D universe, we are actually moving the view away from us, down the Z axis. In the Left view, if we hit the right arrow key the view appears to move to the right, but, since we are actually viewing from the side, this movement is also in the +Z direction, or away from us.

6 Hit the "a" key on the keyboard. This causes the object to be AutoFit into all three of the Modeler's views. You should find the object to be centered in each of the views. The AutoFit command always zooms the view until the object is as big as it can be, in all three windows. This can sometimes yield an unexpected result. If you have reset the center of the windows, so that one view is much larger that the others, the view will only zoom as far in as the smallest window will allow. It is usually a good idea to center the windows, before using the AutoFit function.

7 Press and hold the Right Alt. key on the keyboard. Place the mouse pointer in the Face view. Click and hold the Left Mouse button. Move the mouse around. This mode allows you to interactively adjust the location of your view. This method works similarly to the others, where the axis of movement is relative to the window you are working in.

You should practice modifying the views in Modeler, until it becomes comfortable. Practice loading in different objects and zoom in and out on various parts. You can zoom in until you can only see one point in a super complex object, or zoom out until you can even see the object an longer. You must have a good understanding of the axis, and the views before you can really start creating good looking models in the Modeler.

Modeler Tutorial #7: Creating Polygons using Points

In this tutorial we will cover all the steps required to create polygons by plotting points. You can create most shape by using the primitives under Modeler's Object menu, but this method of creating polygons is important in creating irregular shapes.

1 Select the Polygon menu at the top of the Modeler screen.

2 Select Points under the Create menu on the left side of the screen.

3 Pull the Face window as large as it will go. Click anywhere in this window. You will see a large crosshair appear on the screen. You can drag this crosshair around on the screen, or click elsewhere on the screen and the crosshair will jump to the new position.

4 When you have the point where you want it, click the Make button on the left side of the screen. Now move the pointer to a new position. When the crosshairs are where you want them, hit the Return key on the keyboard. This is the keyboard equivalent for Make.

5 Create one more point, anywhere on the screen. Click on the Polygon select button at the bottom of the Modeler screen. Click on the Make on the Left side of the screen. This "makes" a polygon out of the points you laid out on the screen. You can see the surface normal sticking out of the object.

6 Hit the "u" key on your keyboard, which un-does the last function. You will be back to your three points. Now hit the "p" key on the keyboard. This is the keyboard equivalent for Make Polygon. This is a very useful keyboard shortcut, because it eliminates the need to switch to the Polygon Select mode, and click on the Make button. As soon as you are finished laying out your points, you can simply hit the "p" key to make the polygon.

Move into a new layer, and practice laying out points, and making those into polygons. This is the procedure you will use to create most of the objects you will be working on. Practice creating polygons with 1. 2, 3, or more points. You should note that you want to work around the outside of a polygon shape, laying each point down in order. If you place the points down in a random order, the resulting polygon will have vertices crossing all over the place. Avoid this problem by laying out the points either clockwise, or counter-clockwise, but consistently all the way around the shape of the final polygon.

You may notice that the surface normal of your polygon sometimes points in the +Z direction, and other times in -Z. If you lay the point down in the clockwise order, the normal faces -Z, or toward you, and counter-clockwise layout causes +Z normals. These surface normals are used to indicate several things. You already know that they indicate when a polygon is selected, but the also indicate the direction the polygon faces.

In order for LightWave to render as fast as possible, it only renders polygons that are facing toward the virtual camera. This prevents the program from wasting time rendering the backs of objects, that aren't visible to the camera. Because LightWave is looking to see which polygons are facing the camera it is important that you create objects with their polygons facing outward. The surface normals indicate this direction. Surface normals serve the additional purpose of indicating the relative size of a polygon. The normal of a large polygon is larger than that of a small polygon.

7 Move to an empty layer, and create three points, and hit "p" to make the polygon. Now create another point, near, but not on top of one of the vertices of your polygon. Make sure that this new point is the only highlighted point on the screen. Select Polygon select mode at the bottom of the screen, and highlight the polygon. Click on the Add Point button on the left side of the screen. You pointer will turn into the word "to" with a little arrow. Move your mouse pointer so that the little arrow in pointing on top of the vertices closest to the point that is not a part of the polygon. Click on the vertices. The point will now become part of your polygon. Go back to Point select mode at the bottom of the screen.deselect the point that is currently highlighted, and select any other point in your polygon.

8 Hit the Rem Point button on the left side of the screen. That point is now removed from your polygon. You can now use the Add Point function to re-connect this point to your polygon. Try adding this point back into the polygon, but attached to a different vertices. You can create strange criss-crossed patterns using this function.

The thing to remember when using either the Add Point, or Rem Point functions is that it requires a point., or several points, AND a polygon to be highlighted. If either the point, or polygon isn't highlighted, these functions will not work.

Now you have an understanding of how to create polygons from plotted points. This is important, unless you intend to model everything from the box, ball, disk, and cone shapes available in the Modeler. You should practice these techniques until creating complex polygons is easy. Next we will move from simple flat polygon into the third diminution, and give out objects depth.

Modeler Tutorial #8: Applying Surface Names

One of the modeling steps that people often have trouble with is applying surfaces to objects in the Modeler. People often have difficulty understanding the steps required to apply more than one surface to a single object. In this tutorial we will cover all the steps required to apply one or more surfaces to an object.

It is important tat you understand that naming surfaces in Modeler is different than surfacing an object in LightWave. While working in the Modeler, you create the names of all the surfaces for a particular model, and you apply these names to the individual polygons of the model. You do not actually describe what any surface looks like, from within the Modeler. For instance, you can apply the name Red to one side of a box, name the top Blue and al the other sides Green. When you load this object into LightWave, each of these surface names show up, but you could apply the color Orange to the side, apply a texture map of wood to the top, and stretch a picture of your ace around the rest of the box. What you do in Modeler is simply create the names of the surfaces, and what the surface name of each polygon is.

1. Create a three dimensional box, about 1/2 the size of each of the views.

2. Click on the Surface button on the top of the screen, and select Surface under Transform on the Left side. This opens a requester abled Change Surface.

Up till now, all objects we have worked with in these tutorial have had a surface called default. This is a flat white surface that isn't too exciting.In the requester is the name Default., and you'll notice that the name is highlighted

3. Type in the name Blue, and click the Apply button. This applies the name Blue. Since there were no polygons selected, this name is applied to all the polygons of this object.

4. Go to Polygon Select mode at the bottom of the screen, and select the top polygon of your box.

5. Click on the Surface button on left side of the screen, enter the name Red, and click apply. Since only this one polygon was selected, the surface name Red is applied only to the top polygon.

You can continue selecting polygons, and applying new surface names. This is the basic method for applying surfaces, and multiple surfaces. Remember the nothing selected + everything selected rule, and use it to your advantage. Any time you build an object that is predominantly one color, be sure to apply that surface first. It will make your work much easier, if you don't have to select all but a few polygons to apply the predominant color.

Modeler Tutorial #9: Keyboard SHortcuts

Possibly the most important piece of advice ever given to anyone concerning the Modeler is the importance of learning the keyboard equivalents. Almost every function in Modeler has a keyboard shortcut. As you become more and more familiar with the program, you'll find that you are often hindered by trying to remember where all the buttons are. Using the keyboard shortcuts, you have every function, from every menu, right at your fingertips.

1 Press the Help key on the keyboard. This opens up a list of all of the Modeler keyboard equivalents. (When in LightWave, the Help key brings up different help menus depending on which control panel is currently displayed.)

Even if you pick one shortcut per day, you will find this information unbelievably helpful. You may find yourself no longer having to click your way into some of the menus since you'll use some of the commands on the menu all the time, and the keyboard shortcuts will speed your work incredibly.

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Sequencer/Switcher

Sequencer/Switcher

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The Flyer's unique drag-and-drop design makes the task of editing video fast and easy. All of the confusing aspects of editing (such as match-framing, video timing, auido mixing, submastering, etc.) are handled automatically and invisibly by the Flyer. You simply organize the video clips in the order that you want to see them. The Flyer handles the rest.

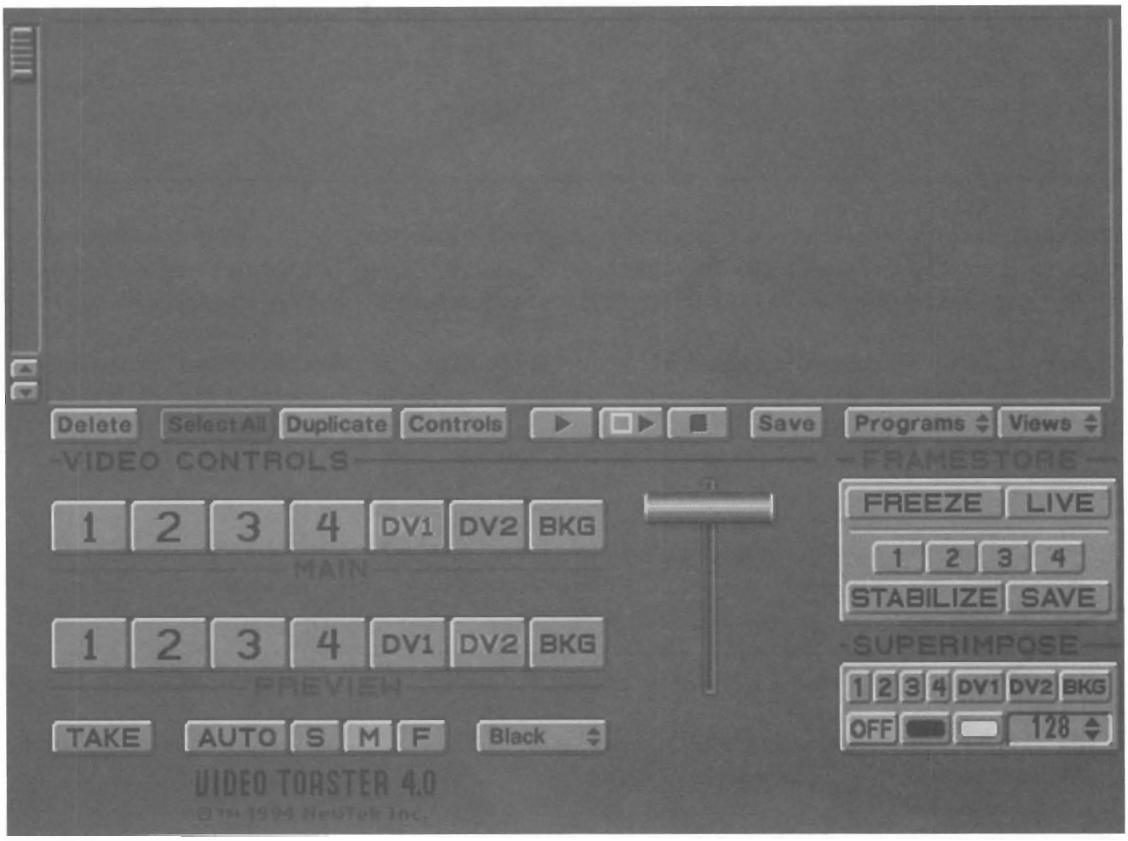
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System 4.0—The Main Screens



Project/Switcher View

This is the normal startup screen. It's primary use is for live video production. The upper window displays the current project, containing effects, graphics, framestores, video clips, and more. The lower window displays the Toaster Switcher, whose controls are explained on page 30.

About the Editor Screens

The Flyer's main screen serves a variety of purposes. To reflect this, it has several different configurations or appearances, each intended to make a particular job easy to perform. One is shown above, and the others are shown on the next few pages.

Why have multiple views? To provide you with greater control over your environment, and to make the task of working with video and graphics tools easier. At any time while you work on a project you have the option changing the screen display to fit your needs.

You might start out using a Project/Files view as you drag items into the current project, then shift to a Project only view as you organize the sequence. You might go back to the Project/Files view to retrieve a file you forgot, or to delete a file you no longer wish to have around.

Although the first screen you see is the Project/Switcher screen (above), it is no more or less important than any of the other screens. It is simply convenient for the Toaster to go directly to this screen first and to allow you to go to the view you wish after the system has started up.

Unless you use the Toaster for much live production, you probably will not use this screen view often.

The main screen always consists of a one or two of the following windows: a Project window (where you build the video program sequence), a Files window (which you use to locate video clips, and a Switcher window. Each window has its own function, which is described below.

The remaining views, shown on the next page, are the Project/Files screen, the Files/Files screen, the Project only screen, and the Project-to-Project editor screen. You can change views by selecting a one from the Views pop-up menu button on the far right end of the main toolbar. Additional views may be added to this pop-up by NewTek, or by third-party add-on software.

Each time you change the view, the windows and their contents that are no longer visible are "remembered" by the Flyer so that, if you should return to them, they will retain the contents that they last displayed. In other words, each window and its contents will remain as you left it.

Project/Files View

Use the Project/Files display any time you need to locate an element to be added to the current project.

For a close-up of this screen with explanations of the various controls, see page 4.

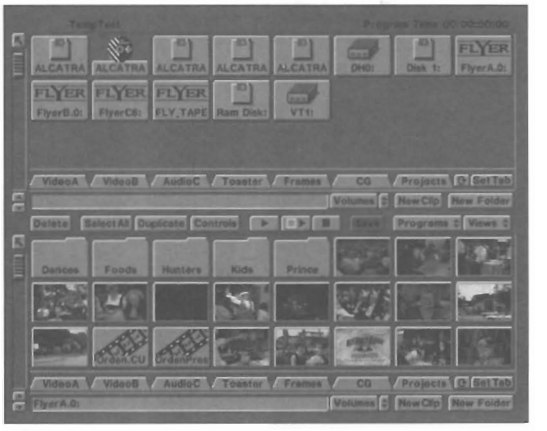


The Project/Files view

Files/Files Views

Use the Files/Files display when you need to perform routine file maintenance (create folders, copy or delete unwanted items, archive projects, etc.).

For a close-up of this screen with explanations of the various controls, see page 5.

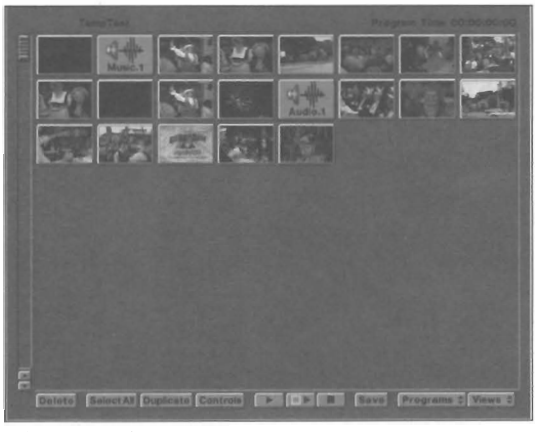


The Files/Files view

Project Only View

Use the Project display when you want to view as much of the project as you can while you edit it.

For a close-up of this screen with explanations of the various controls, see page 6.

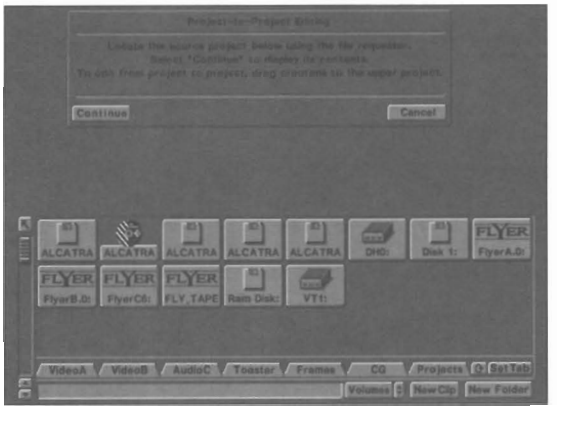


The Project, full view

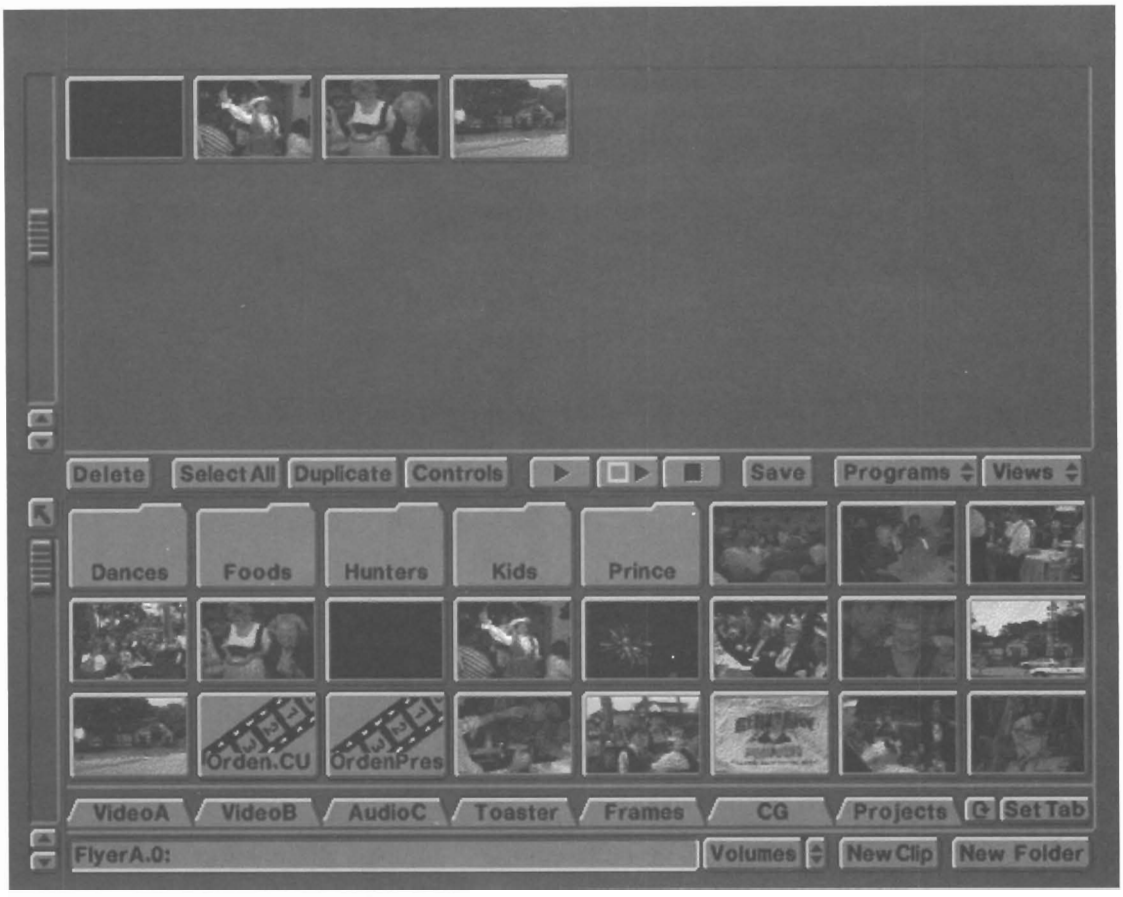
Project/Project View

Use the Project/Project display when you need to copy portions of a previously-created project into the current project. This is more convenient than recreating complex sequences that you have used before.

For a close-up of this screen with explanations of the various controls, see page 7.



The Project to Project edition view



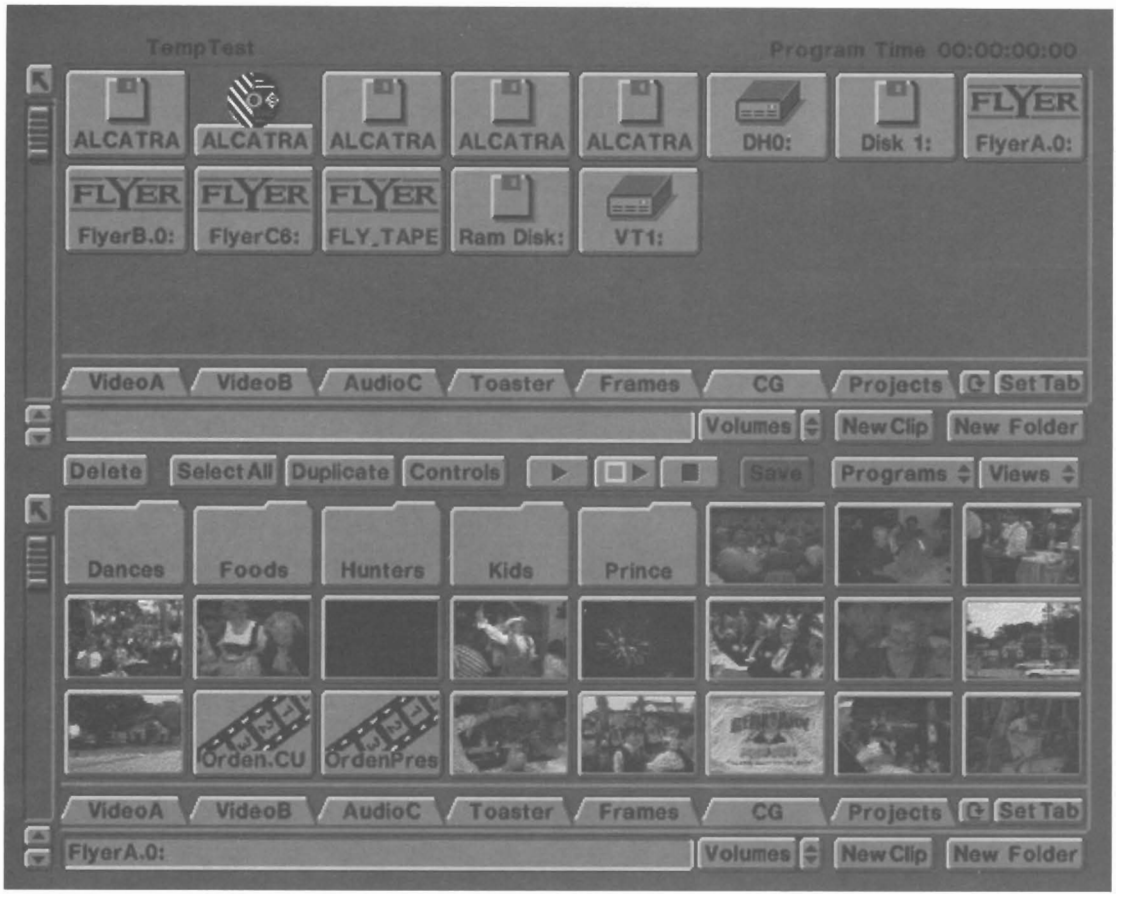
What Does This View Show?

The upper window displays the current project. The lower window displays a file navigator which you can use to locate the items you wish to use in the project.

When to Use This View

This view is useful during the early part of the editing process, when you are just locating and dragging various elements such as video clips, audio clips, graphics, animations and more, into the project window without the intention of editing or sequencing them yet.

Use the Project/Files display any time you need to locate an element to be added to the current project.

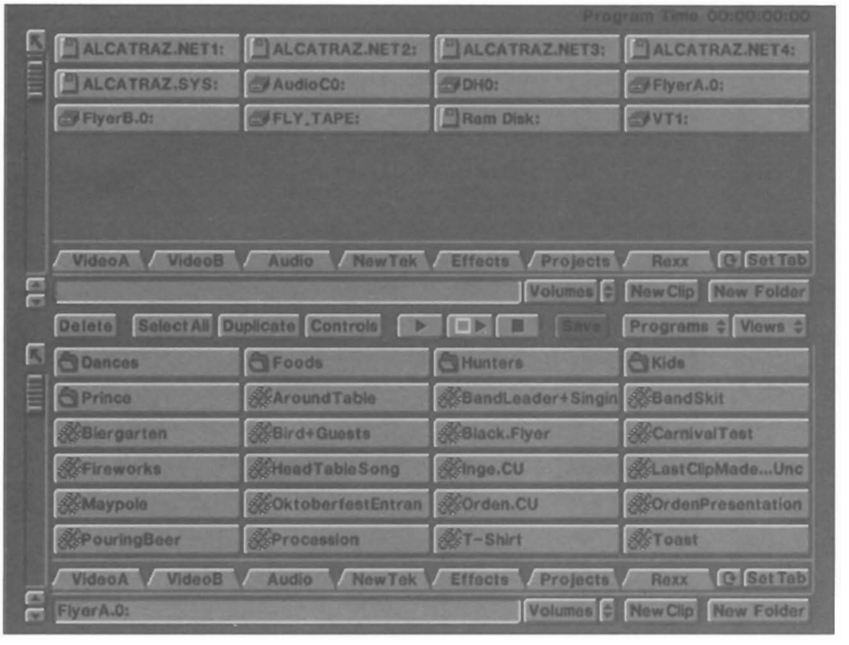


What Does This View Show?

Think of this view as serving the function of a simple directory utility program. Both the upper and lower windows display file navigators. You can drag and drop items between the two windows freely, copying files from one direve (or directory) to another.

When to Use This View

This display is designed for file navigation (so that you can locate clips, graphics, etc.) and file management (allowing you to create folders, copy or delete unwanted items, archive projects, etc.). Use it whenever you need to duplicate files from one location to another.



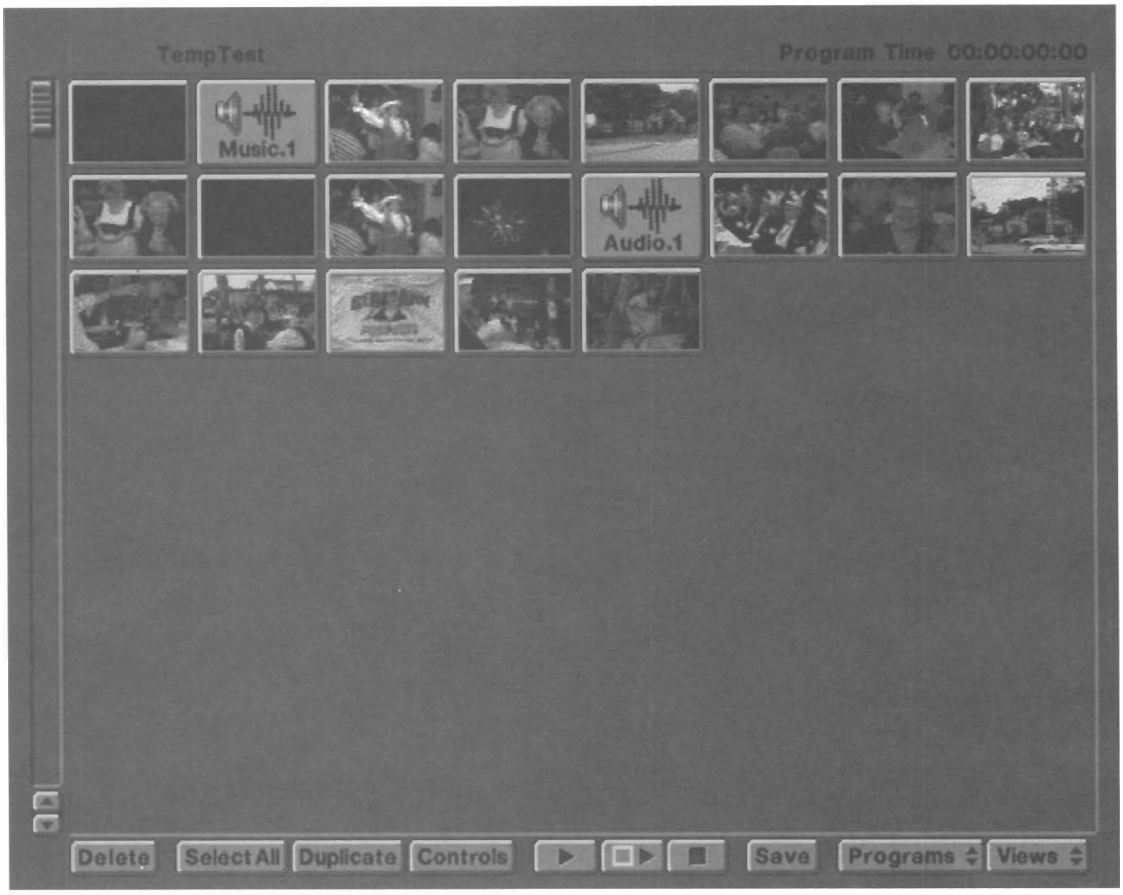
Alternate View for Files Windows

Here's another view of the same files listed in the windows above.

Every files window has an alternate display which you can use to view longer filenames.

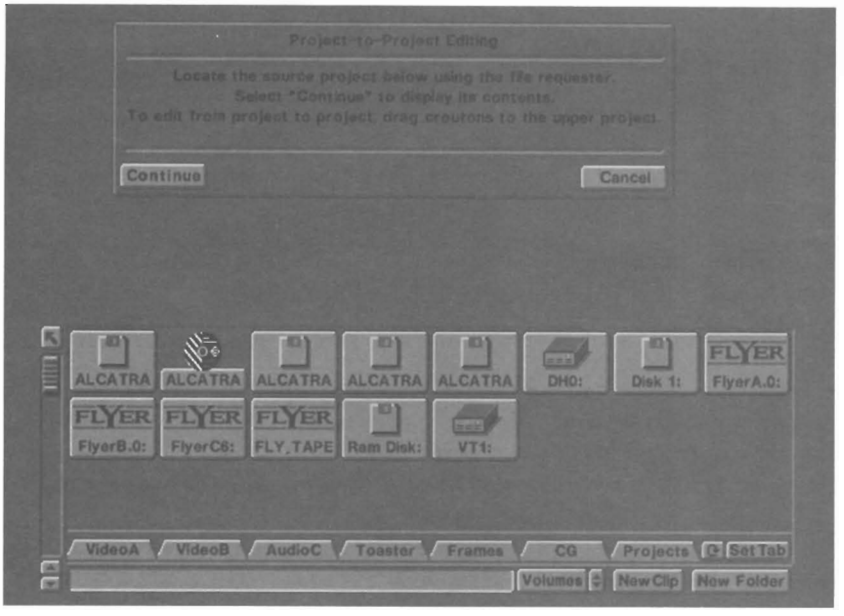
To toggle this display, press the left-*A* key any time when a files window is visible. Press it again to return to the crouton view.

Project Only View

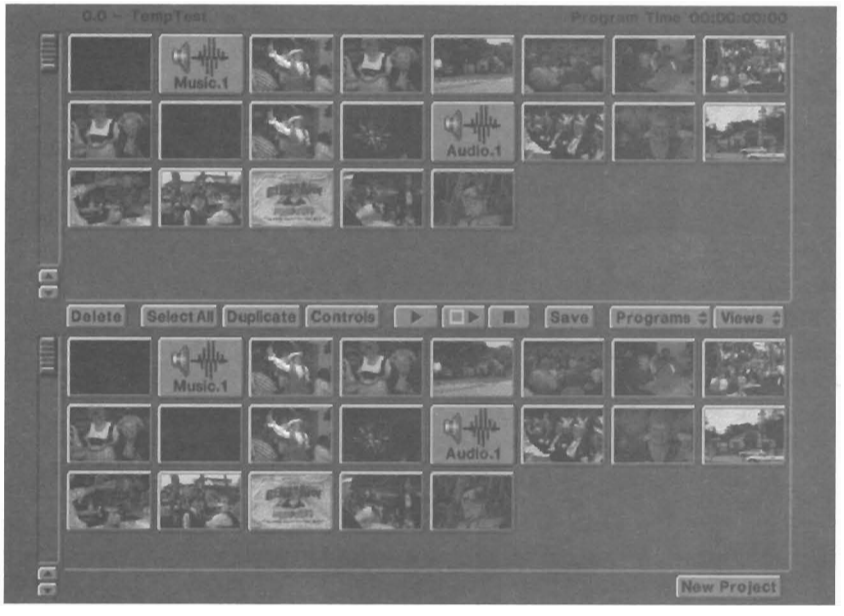


What Does This View Show?
In a single full-screen window, the view displays the current project.

When to Use This View
This view is designed for project editing. Use this view when you want to see as much of the project as possible at one time.



Project/Project View part 1



Project/Project View part 2

When to Use This View

This display is designed for copying sequences from a previously-created project into the current project. This is often more convenient than recreating complex sequences that you have used before.

What Does The First View Show?

To edit a sequence from one project to another, select the Project/Project view. The first screen you see has instructions on the top and a file navigator on the bottom. Use the file navigator to select the source project (this project contains the footage that you will copy into the current project). Once you do so, you will see the second screen.

The second screen shows your current project on top, with the source prect on the bottom. From the source project, you can drag croutons and crouton sequences into the current project. You cannot edit or change the source project in the lower window; you are only copying portions of it into the current project.

Use the New Project button if you wish to select a different source project. Otherwise, use the Views pop-up menu to return to the view of your choice and continue editing.

Elements of the Main Screens

The following pages contain a breakdown of the the buttons, controls, and displays that make up the main screen displays of the Flyer.

Elements of the Button Bar

The button bar contains a selection of the most commonly used functions you will need when working with the Flyer. It appears on every Flyer screen display. Its buttons affect the highlighted item or items in the currently-active window, whether that window is a Project window or a Files window.

The Flyer will carry out button bar commands immediately when the selected item is in a project window. For example, if you select a crouton then select Delete, it will be deleted immediately. Since you are not actually deleting the file represented by that crouton, this is a safe operation. However, the Flyer will ask you to confirm any button bar command that will genuinely affect a crouton. If you select a crouton within a Files window, then select Delete, the Flyer will ask you if you are sure of this step. This is a built in protection to keep you in from unintentionally deleting a file from disk.

If one of these buttons appears dimmed or grayed, it is unavailable.

Delete button
Select Delete to remove the selected crouton from its window.

Delete will instantly remove croutons from Project windows, but it will ask you to confirm before deleting any files from disk.

Duplicate button
Select Duplicate to make a copy of the selected crouton.

Duplicate will make a copy of just the crouton in a Project window. In Files windows, Duplicate will make a copy of both the crouton and the actual file on hard disk.

Play and "Play From..." buttons
Select Play to play the entire project—from the first crouton to the last.

Select Play From to begin playback from the currently selected crouton. This is useful when you want to check a specific sequence without watching the entire program.

Views (pop-up)
This pop-up button displays the list of Flyer Editor display screens.

Save button
Select Save to save the current project and all information relating to it (clips, effects, graphics, timing, etc.).



Select All button
Choose Select All to highlight every crouton in the active window. This is useful for clearing out a project window or removing unwanted files from a hard disk,

Controls button
Choose Controls to display the control panel for the selected crouton in the Project.

The functions on a control panel will differ for each type of crouton. Also, if you select Controls for a crouton that is in a Files window, you'll have access to file-related controls for that item.

Stop button
Select the stop button to halt playback of the currently playing crouton.

Programs (pop-up)
This pop-up button displays a list of third-party programs that are available to you. This allows you to go back and forth between the editor and other programs, such as image processing or audio editing software, easily.

The Project Window

The project window serves as the storyboard where you sequence and edit video programs. In addition, you can create special-purpose projects such as one that contains only special effects for live production. The Project window can share the screen with another window, or it can fill the entire screen.

The Project window can be displayed in one of two sizes: one-half screen size (where it shares the other half with the Files window or the Switcher window), or full-screen size.

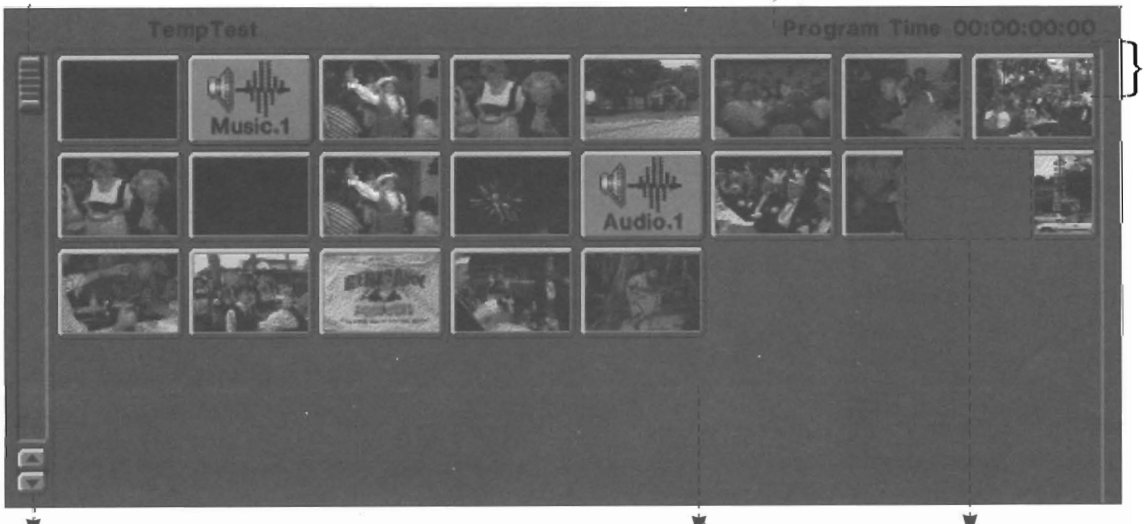
General Usage

A new project window is always empty. You use a Files window to locate the video, audio, and graphics clips that you wish to use to create a complete program. As you find the elements you need, you drag each item from the Files window into the current Project window.

The next step is to arrange and rearrange the croutons into the proper sequence. You play some of them to see if the order is correct or if the pacing is right. You may call up a control panel for any crouton to change these settings, which vary depending on the type of crouton you are working with.

Parent button
Use this button to step back one level from within a nested project (project-within-a-project).

Selected Item/Program Time Display
This area across the top of the screen displays the name of the currently selected item, as well as the length of the current project.



Scroll the Project Window
when you are dragging a crouton by holding it near the top or bottom edge of the window (the top area is indicated here).

If there are additional rows of croutons in the project in this direction, the window will scroll for as long as you hold the crouton near the border.

Slider and Arrows
Use the slider gadget to drag the viewable area of the project up or down so that you can get to other portions of the program sequence quickly.

Use the arrows to scroll the view on row at a time.

Project Window
Drop a crouton here and it will take its place at the end of the current project as you build a video program sequence.

Insert a Crouton Between Two Others
...by holding it in the open space that divides them. When you hold a crouton there, you'll see a "hole" open up between the two croutons (as illustrated above). Let go of the mouse button to drop the crouton and insert it there.

Specific Usage

- Click on a crouton to select it.
- Double-click on a crouton to play (or display) it.
- Drag a crouton to move it to a new position.
- Drop a crouton in the open space at the bottom of the project window to add it to the end of the sequence.
- Drop a crouton directly atop another to replace the one beneath.
- Drop a crouton between two others to insert it between them.
- Select the Controls button to display the control panel for the highlighted crouton. If more than one crouton is selected, then each panel will open after the one before it is closed.

Elements of the Files Window

The Files Window

The files window serves as a navigation tool that allows you to move around among the drives connected to your system. It displays the drives on your system, the folders on each drives, and the contents of each folder. When you locate items that you wish to use in a project (video clips, still frames, whatever), simply drag them from the files window into the Project window.

File windows always share the screen with another window, either a project window or another files window. They can be displayed in one size only: one-half of the screen.

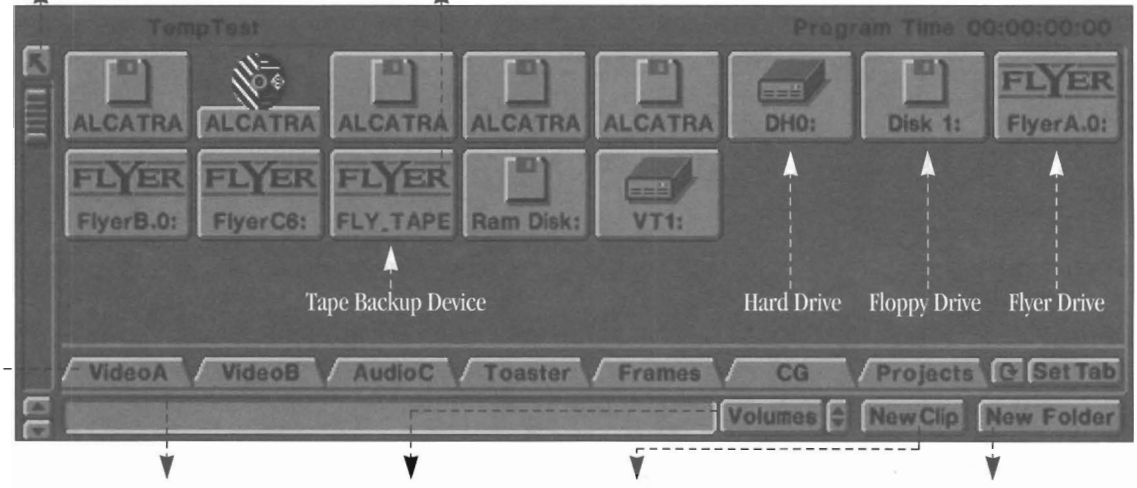
General Usage

When you double-click on any drive or folder, the files display changes to reflect the contents of the double-clicked item. Within it, you may find icons that represent files and even additional folders. For example, you may have a Video folder that contains Sports clips and Wedding clips; probably you would keep these disparate items in separate folders inside the Video folder.

In this way you might have a number of layers to the organization of your hard drive. As you go from one folder to the next, you might think of it as descending a staircase, going down into this folder and that one. Conversely, you climb up and out of each folder by clicking on the arrow in the upper left-hand corner which returns you to the previous folder level with each click. This, along with the directory tabs feature, allows you to move among folders quickly and easily.

Parent button
Steps back up one level on the current path name.

Device display area
Here you can see the devices (drives) connected to the system. There are icons for hard drives, CD-Rom drives, floppy drives, and more.



Directory Tabs
Tabs allow you to jump directly to another folder (the one shown on the tab) and view its contents. A tab acts as a shortcut device, so that you do not have to repeatedly enter and exit folders by clicking through icons.

When a row of tabs is full, click the cycle arrow button to display a new bank of tabs.

Use the Set Tab button to assign your own tabs.

Path Name display
This field displays the path name for the currently selected item.

Devices (pop-up)
This button and its pop-up gadget display Devices, Volumes, or Assigned devices.

New Clip
Click here to go to the Record New Clip panel and record video footage onto the Flyer.

New Folder
Click here to create a new folder on the current drive. You will be asked to name the folder as well.

Specific Usage

- TO view lengthy filenames, press the left-*A* (left Amiga) key. Press it again to toggle back to crouton view.
- Select one of the options from the Devices/Assigns/Volumes popup to display those items in the window.
- Double-click on a hard disk icon (system disk or Flyer disk) to display its contents.
- Double-click on a folder crouton to display its contents.
- Click on the arrow button in the upper left-hand corner of the files window to close the current folder and go back up one level in the display
- Select New Clip to go to the control panel for recording new audio and/or video material onto the Flyer.
- Select New Folder to create a new folder in the current location. The Flyer will ask you to provide a name for the folder.
- Select the Controls button to display file information for the selected crouton. You can also use this panel to rename any crouton.
- If you're familiar with disk path names, you may click in the pathname field at the bottom of the files window and type in the location where you would like to go.

The Switcher Window

The Switcher performs the job of a live video production switcher and framegrabber/framestore. Its window always appears on the bottom half of the screen, below the Project window. Most importantly, when the Switcher window is showing, the functions of the mouse (single- and double-click) are changed, so don't be surprised if things suddenly seem "different." You'll find more details on the Switcher's operation on page 30.

General Usage

The Switcher contains all of the functions needed for live video production. With the Switcher you can switch among four video sources, play Flyer clips (provided you have a Flyer), load and display still images or CG pages, capture images from live sources, use special effects, key graphics and video, and more.

True to this form of video making, you must prepare all of the special effects, graphics, clips, etc., that you may need access to during the production. These items should be arranged in a Project, which will be on the top half of the screen, so that you can get to them quickly and easily. (You might arrange the Project to contain four rows of clips, four rows of framestores, four rows of effects, etc. Since the Project window can display four rows of croutons at a time, this form of organization might be useful for you.)

Elements of the Switcher Window

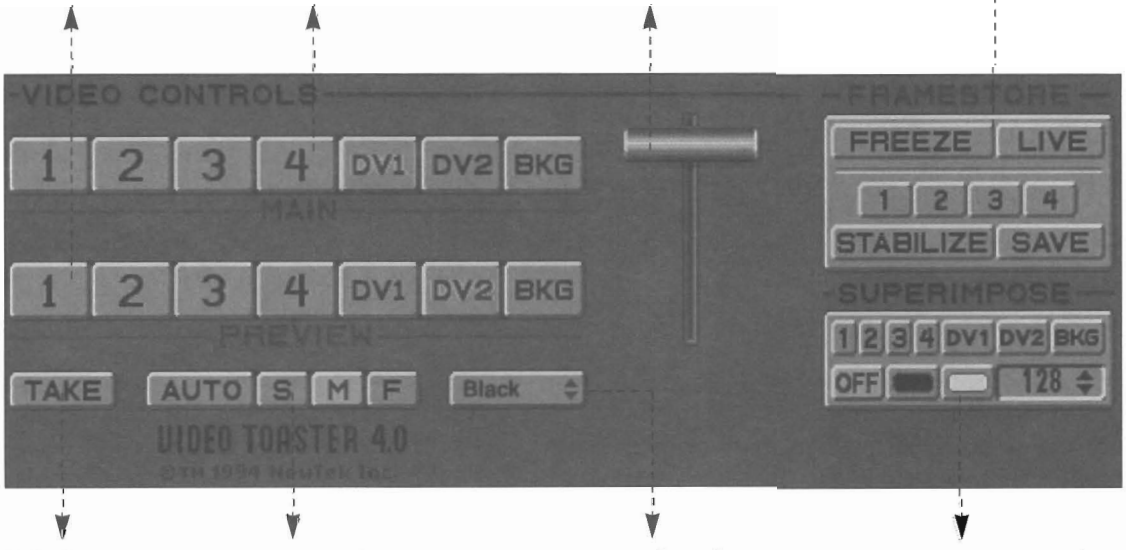
Preview bus
This row of buttons selects the preview source.

Main bus
This row of buttons selects the main video output source.

T-bar
The T-bar allows you to engage transition effects manually.

Framestore Controls
This panel contains controls for grabbing, processing, and saving freeze frames...

- The Freeze/Live buttons indicate the status of the framebuffers. They can also be used to toggle that status.
- The 1, 2, 3, 4 buttons will instantly freeze the video on the selected input on the Main bus.
- The Stabilize pop-up will perform motion removal on jittery freeze frames.
- The Save pop-up allows you to save images frozen on the Main bus.



Take button
This button instantly switches the Main and Preview bus sources.

Auto, S-M-F
The Auto button triggers the current effect to run at a constant speed. S-M-F select the speed.

BKG color selector
Use this pop-up menu to select the color for the BKG/Matte color input.

Superimpose Controls
This panel controls the Toaster's luminanace keyer.

Specific Usage

- Click once on a crouton to make it active. A highlight bracket shows you the next-to-be-loaded crouton.
- Double-click on a crouton to load it to the preview bus and make it ready for display. A highlight box shows that it has been loaded.
- Select a source on the Main bus to take it directly to the main output.
- Select a source on the Preview bus to make it next-in-line to go to the main output.
- Use a special effect crouton to bring the preview source to the main output via a transition.

Notes

Using this display requires some preparation on your part. All of the production elements you intend to use must be inserted into a project for use on-the-air, since the time spent searching for something while on-air is too long. This means that you should place all of the graphics, animations, and Switcher effects into the project ahead of time so that they are ready for use during production.

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Control Panel Reference

On the pages that follow you'll find a variety of control panels displayed and explained. Below is short overview of what a control panel is, and some items you may notice when using them.

Every crouton has its own *control panel*, and each control panel contains a set of gadgets and buttons that allow you to modify the manner in which the crouton is used. Therefore, from one type of crouton to the next, you may see a variety of control panels with different layouts. For example, the control panel for a ToasterCG key page contains controls that govern the fade in and fade out rates of the key, and the number of seconds that you wish the key to be displayed over video; however, the control panel for a video clips contains controls to set the in point and the out point, the volume level of the audio, the audio channels, and more. Each contains only those controls that it needs.

In most cases, the gadgets you find on a panel are self-explanatory. The in point slider and the out point slider clearly refer to the starting and ending moments of the current clip, while the volume control clearly refers to the volume level of the audio playback.

However, on a few control panels some gadgets that have the same name act differently depending on their function for that crouton. For example, consider the Fade In control. For an audio clip, fade in means to bring the volume level up from 0 gradually so that it rises over a period of time. For a graphic overlay such as a ToasterCG key page, fade in means the gradual appearance of the overlay, dissolving in from nothingness, as it were.

As you can see, in practice this should cause no confusion since the type of crouton you are modifying actually determines the operation of the gadget in question. However, if you happen to notice that a specific gadget on *this* panel serves a different purpose than a gadget of the same name does on *that* panel, you're right. It does. Within the contraints of the English language, words sometimes have different meanings depending on their context. This is one such case.

New Clip control panel, Part 1 (Record Raw Footage)

When you want to record footage into the Flyer, select the New Clip button that appears at the bottom of any files window. After a moment the Record Raw Footage panel will appear. Here you can record as much footage as you want (and as a single drive can handle) before cutting it into individual clips.

You can record either video clips or audio clips at one time. Once you begin recording one type of clip, you will need to complete the recording process and re-enter the recording panel in order to begin recording the other type.

After you complete adding footage to a drive, select the Make Clip(s) button at the bottom of the panel. You will be taken to the Mark Clips panel, where you can specify the exact clips you would like to create out of this raw footage. Excess or unused footage will be deleted, and the remaining footage will be converted into clips.

Approx. Time Available
Reorg'd Time Available
Reorganize Drive button
These gadgets show you approximately how much time you have available on the selected drive, and at the selected quality level.

Since drives can become fragmented (where files are not stored as efficiently as possible), and this can affect recording time, you have the option of reorganizing the drive to gain more usable time. Note that this process can take a great deal of time, and is best done during breaks or overnight.

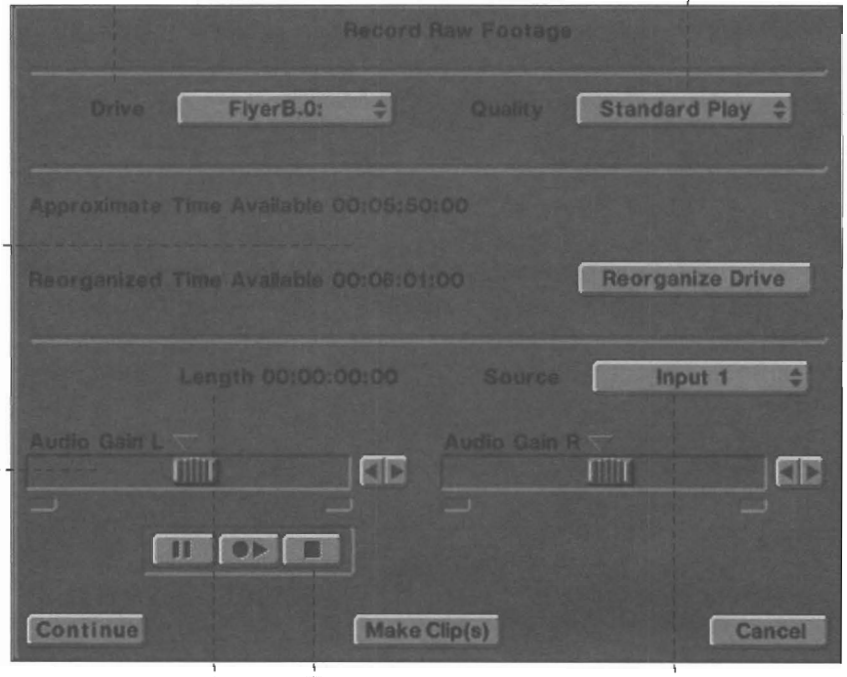
Audio Gain L and R
These two sliders control the audio input levels of the Flyer.

These levels are set by the Flyer for proper recording. The two lamps beneath each slider indicate clipping. The left lamp flashes whenever the volume peaks and clips the meter. The right lamp is a "peak hold" indicator, it remains lit until you adjust the slider lower.

Ideally, you want to see no clipping at all, or (very rarely) see the left lamp highlight.

Drive pop-up
Use this pop-up menu to select which drive will receive the newly recorded footage.

Quality pop-up
Use this pop-up menu to select the recording level:
- Standard (for best video quality)
- Extended (for good video quality)
- Audio only (note that when you select Audio Only, you will see black on the Toaster's main output)



Length
While you are recording, this gadget displays a running total of the amount of time you have put on the drive.

Record Controls
These three controls mimic your VCR. The controls are Pause, Record, and Stop.

Source
This pop-up menu allows you to select the input source from which the Flyer should record video.

Sources include:
Flyer In (Flyer TBC input)
Flyer Y/C (Flyer TBC input)
Input 1 (Toaster input)
Input 2 (Toaster input)
Input 3 (Toaster input)
Input 4 (Toaster input)
Main Out (Toaster Output)

New Clip control panel, Part 2 (Mark Clips)

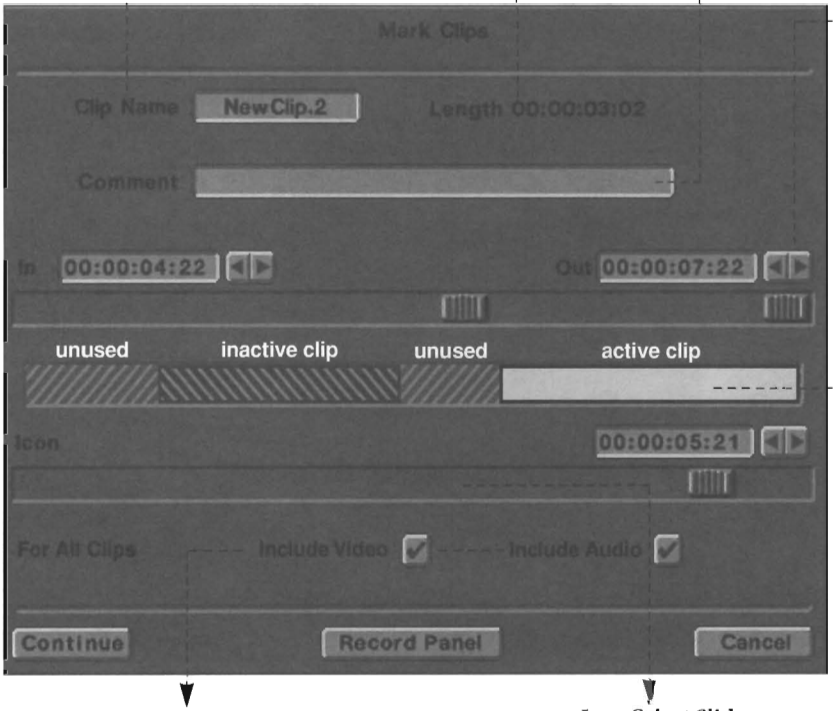
The control panel for a video clip contains several devices for editing its content. Each gadget adjusts the timing of the clip in a slightly different way, providing you with both coarse and fine control. When any one of these is in use, the current video is shown on the Flyer's main output. You can also expand the panel and make changes to the audio portion of the clip.

- Use the pointer to drag the sliders through the video clip, and set up the in and out points visually.
- Click and/or drag the pointer over the double-arrow gadget. Clicking is the equivalent of jogging a frame at a time, while dragging is the equivalent of shuttling. Drag further for faster shuttle speeds.
- Type the time code value you wish to use into the time code gadgets by entering numbers from the numeric keypad.

Clip Name
For every clip you define, enter a name here. The Flyer will name and number each clip generically in case you forget.

Length
For each clip, the length from end to end is shown here.

Comment
If you wish to enter a description for any clip, do so here.



In and Out Sliders
Use these sliders to define the beginning and ending of any clip.

Tip: Leave about 3 seconds of excess at the end of any clip, to allow the Flyer to sequence with effects more easily.

Raw Footage Indicator/ Clip Selector
This gadget represents the entire length of raw footage just recorded to the Flyer. Use the In and Out sliders to define individual clips.

Click anywhere on the bar outside of the highlighted bar to create a new clip. The in and out sliders will jump to new positions, and you can define its start and end.

Clips can be reselected and readjusted just by clicking on one to make it active. In this example, two clips have been defined. Only one is available for editing its in and out points at a time.

Video and Audio Checkboxes
These two boxes determine what kind of clips will be created out of the raw footage just recorded: Video only, Audio only, or Video with Audio. Make sure that the correct boxes are checked before you exit the panel.

Important!
The state of these two boxes affects ***every*** clip that you mark. You cannot mix the three types of clips in a single recording session. When you exit the panel, the clips that are generated will all be of the same type, based on the checkboxes.

Icon Select Slider
Use this slider to select the image that you would like to use for the clip.

Drag the slider through the entire clip from in point to out point until you see an image that helps you recognize the contents of the footage. When you exit the panel and the clip is created, this image will appear in miniature on the crouton.

Video Clip control panel (Quick Tune view)

The control panel for a video clip contains several devices for editing its content. Each gadget adjusts the timing of the clip in a slightly different way, providing you with both coarse and fine control. When any one of these is in use, the current video is shown on the Flyer's main output. You can also expand the panel and make changes to the audio portion of the clip.

- Use the pointer to drag the sliders through the video clip, and set up the in and out points visually.
- Click and/or drag the pointer over the double-arrow gadget. Clicking is the equivalent of jogging a frame at a time, while dragging is the equivalent of shuttling. Drag further for faster shuttle speeds.
- Type the time code value you wish to use into the time code gadgets by entering numbers from the numeric keypad.

What is a video clip?

The word *clip* is used to describe a segment of material that has been recorded to the hard drive.

A video clip may be a single camera shot, or a series of related camera shots that make up a scene.

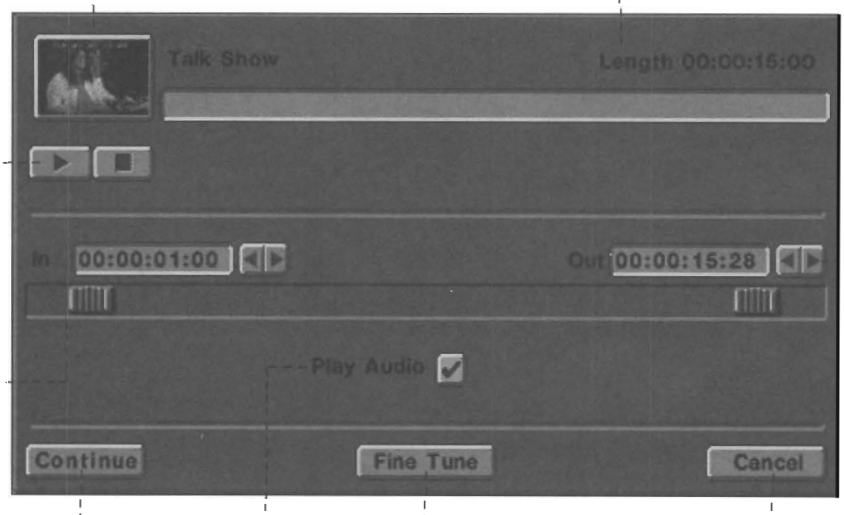
An edited video production is a series of different clips that, when shown in the proper order, tell a story.

Crouton Image/Crouton Type/File Name/Description
These four items show you:
- the crouton whose control panel you have opened,
- the type of crouton it is,
- the name of the file it represents,
- an optional description of the clip.

In this case, this crouton is for a video clip called Carnival.

Length
This readout displays the length of time set up for this crouton (based on the positions of the in and out sliders).

For this particular panel, this video clip is set to play for 1 minute, 1 second, and 10 frames.



Play/Stop buttons
When inside a control panel, use Play to view the clip (or Stop to interrupt playback).

Sliders
The two sliders represent the start and end points of the video clip (*in* and *out*). Drag either one to set the location of an edit point. Their positions determine how much of the clip's full length will be used.

Here's a shortcut when using the slider controls:
- To jump to any point in the clip, click on any part of the empty slider track. The slider (and video) will jump there.

Time Code Readout and Jog/Shuttle Gadget
This is a combination of two devices, a time code readout and jog/shuttle control, which you can use to set the in and out point of a clip.

- Enter time code values directly into the time display in order to set the in and/or out point for the current clip. Press (on the numeric keypad to enter the in point, or) to enter the out point.
- To step through the clip a single frame at a time (jog), click repeatedly on the arrow in the direction you want to go.
- Shuttle through the clip by clicking and dragging to the left or right, off of either arrow. The further you move off the arrow, the faster you'll move through the clip.

Continue
Select Continue to accept the changes you may have made to the panel settings, and to exit the panel.

Fine Tune
Select Fine Tune to expand the panel and gain access to additional editing controls. (See the next page for the expanded view of this panel.)

Cancel
Select Cancel to exit the panel and ignore any changes that you may have made while it was open.

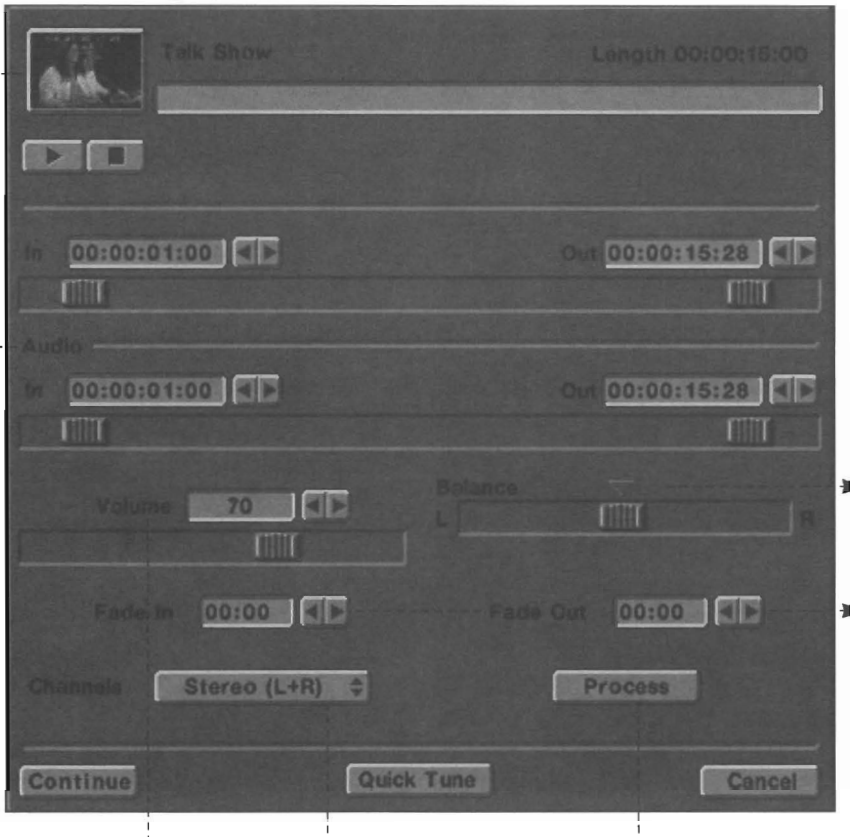
Play Audio
This checkbox allows you to turn on or off the audio playback of the sound that accompanies a video clip.

When the box is checked, this crouton's audio will play when the project is run.

Video Clip control panel (Fine Tune view)

The control panel for a video clip can be expanded so that you can access additional controls for editing the audio portion of the clip (controls that are not usually necessary, but sometimes useful). To expand the panel, click on the Fine Tune button at the bottom of the normal view panel, shown on the facing page.

Why have separate audio editing controls? Primarily for the flexibility of creating *split edits*, a sequence where you may show one video clip with its own audio, then cut to a series of different video clips while continuing to use the audio from the first clip. This technique is commonly used on television news programs.



Crouton Image
The crouton image is just like the Play and Stop buttons: click on it to play the clip; click it again to stop.

Audio control section
The gadgets for controlling audio are the same as those for editing the video: sliders, time code displays, and jog/shuttle arrows. They work exactly as their video counterparts do.

In the expanded view, you can set the audio portion of a video clip to play for a different duration than the video portion.

Balance
Drag the slider to the left or right to shift the balance of the audio playback toward one channel or the other.

To reset the balance to center, click on the center button (the triangle gadget above the slider).

Fade In/Fade Out
These controls allow you to fade the audio up at the beginning of the clip (fade in) and down at the end of the clip (fade out).

Since fades are usually short in duration, these time code displays show time values in seconds and frames.

The value ranges from 0-100%. Note that 100% is equal to the maximum level set by the Volume control (which acts as the master volume control).

Volume
The Volume control allows you to set the *peak volume* level for the audio in this clip.

Peak volume refers to the loudest part of the audio in the clip. Set the Volume level for as high as you wish to hear the loudest sound in the clip, and the rest of the clip will remain at that level or lower.

Channels
This pop-up allows you to select which channels should be used for playback: Left, Right, or Both (stereo).

Process button
If you wish to edit this clip, or make a trimmed copy of it, or copy the audio track to an audio only clip, click this button. See the Process panel for info.

Useful Keyboard Shortcuts

At any time:	
Play clip (from in point to out point)	Tab
Return, Enter	Continue
Esc	Cancel
Expanded view mode on (for all panels)	Caps Lock
Toggle panel Quick Tune/Fine Tune	Help

Numeric Keypad Shortcuts

Activate In point for numeric	(
Activate Out point for numeric entry	)
Activate Length gadget for duration entry	/
Activate Start Time gadget for entry	*
When numeric entry gadgets are active:	
Copy active time code value to memory	c
Paste time code value from memory	v
Jump to next time code pair (HH:MM:SS:FF)	Tab

Audio Clip control panel (Quick Tune view)

The control panel for an audio clip contains a several devices for editing its content. Each gadget adjusts the timing of the clip in a slightly different way, providing you with both coarse and fine control. When any one of these is in use, the audio is played on the Flyer's audio output. You can also expand the panel and make further changes to the audio portion of the clip.

- Use the pointer to drag the sliders through the audio clip, and set up the in and out points aurally.
- Click and/or drag the pointer over the double-arrow gadget. Clicking is the equivalent of jogging a frame at a time, while dragging is the equivalent of shuttling. Drag further for faster shuttle speeds.
- Set the time code value you wish to use in the time code gadgets by entering numbers from the numeric keypad.

What is an audio clip?

The word *clip* is used to describe a segment of material that has been recorded to the hard drive.

An audio clip may be a single sound effect, a lengthy narration, or an entire musical arrangement.

An edited video production is just a series of different clips that, when played in the proper order, tell a story.

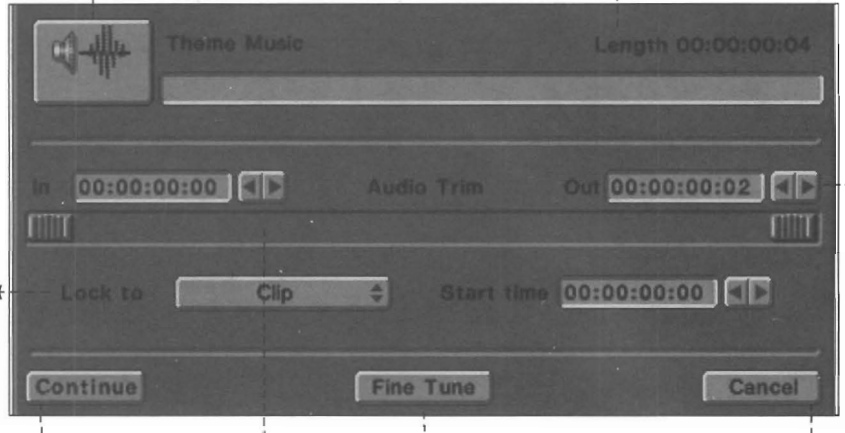
Crouton Image/Crouton Type/File Name/Description
These four items show you:

- the crouton whose control panel you have opened,
- the type of crouton it is,
- the name of the file it represents,
- an optional description of the clip.

In this case, this crouton is for an audio clip called Music.2.

Length
This readout displays the length of time set up for this crouton (based on the positions of the in and out sliders).

For this particular panel, this audio clip is set to play for 33 seconds and 24 frames.



Time Code Readout and Jog/Shuttle Gadget
This is a combination of two devices, a time code readout and jog/shuttle control, which you can use to set the in and out point of a clip.

- Enter time code values directly into the time display in order to set the in and/or out point for the current clip. Press (on the numeric keypad to enter the in point, or) to enter the out point.
- To step through the clip a single frame at a time (jog), click repeatedly on the arrow in the direction you want to go.
- Shuttle through the clip by clicking and dragging to the left or right, off of either arrow. The further you move off the arrow, the faster you'll move through the clip.

Lock To and Start Time
Audio clips, by nature, start at the same moment as the video crouton that preceds them in the storyboard.

Lock To allows you to choose one of two events (the beginning of the prior clip, or the adjusted in point for the prior clip) where the audio clip should begin playing.

Start Time allows you to delay the audio playback for a period of time following the Lock To event.

See the tutorials for tips on how to use these two controls.

Continue
Select Continue to accept the changes you may have made to the panel settings, and to exit the panel.

Fine Tune
Select Fine Tune to expand the panel and gain access to additional editing controls. (See the next page for the expanded view of this panel.)

Cancel
Select Cancel to exit the panel and ignore any changes that you may have made while it was open.

Sliders
The two sliders represent the start and end points of the video clip (*in* and *out*). Drag either one to set the location of an edit point. Their positions determine how much of the clip's full length will be used.

Here's a shortcut when using the slider controls:

- To jump to any point in the clip, click on any part of the empty slider track. The slider (and video) will jump there.

Audio Clip control panel (Fine Tune view)

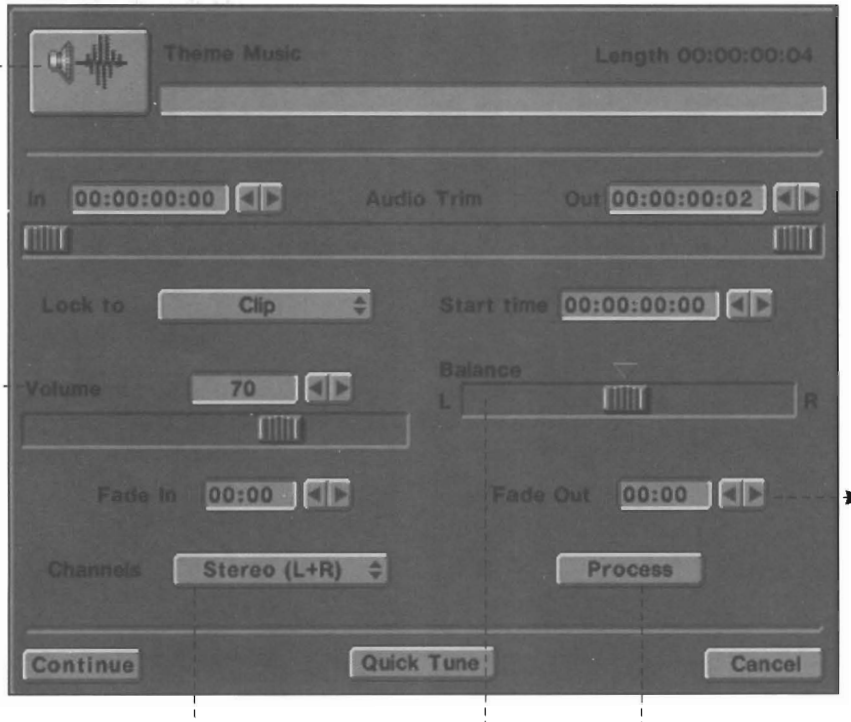
The control panel for a video clip can be expanded so that you can access additional controls for editing the audio portion of the clip (controls that are not usually necessary, but sometimes useful). To expand the panel, click on the Fine Tune button at the bottom of the normal view panel, shown on the facing page.

Why have separate audio editing controls? Primarily for the flexibility of creating a *split edit*, a sequence where you may show one video clip with its own audio, then cut to a series of different video clips while continuing to use the audio from the first clip. This technique is commonly used on television news programs.

Crouton Image
The crouton image is just like the Play and Stop buttons: click on it to play the clip; click it again to stop.

Volume
The Volume control allows you to set the peak volume level for the audio in this clip.

Peak volume refers to the loudest part of the audio in the clip. Set the Volume level for as high as you wish to hear the loudest sound in the clip, and the rest of the clip will remain at that level or lower.



Channels
This pop-up allows you to select which channels should be used for playback: Left, Right, or Both (stereo).

Balance
Drag the slider to the left or right to shift the balance of the audio playback toward one channel or the other.

To reset the balance to center, click on the center button (the triangle gadget above the slider).

Process button
If you wish to edit this clip, or make a trimmed copy of it, or copy the audio track to an audio only clip, click this button. See the Process panel for info.

Fade In/Fade Out
These controls allow you to fade the audio up at the beginning of the clip (fade in) and down at the end of the clip (fade out).

Since fades are usually short in duration, these time code displays show time values in seconds and frames.

The value ranges from 0-100%. Note that 100% is equal to the maximum level set by the Volume control (which acts as the master volume control).

Useful Keyboard Shortcuts

At any time:	
Play clip (from in point to out point)	Tab
Return, Enter	Continue
Esc	Cancel
Expanded view mode on (for all panels)	Caps Lock
Toggle panel Quick Tune/Fine Tune	Help

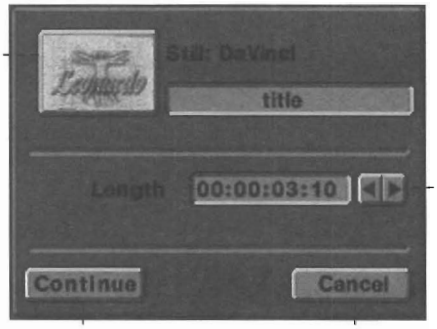
Numeric Keypad Shortcuts

Activate In point for numeric	(
Activate Out point for numeric entry	)
Activate Length gadget for duration entry	/
Activate Start Time gadget for entry	*
When numeric entry gadgets are active:	
Copy active time code value to memory	c
Paste time code value from memory	v
Jump to next time code pair (HH:MM:SS:FF)	Tab

Still Image/Framestore/CG Framestore Page control panel

The term *still image,* or simply *still,* defines a particular type of image. Usually, it's a full screen graphic that remains on screen for a period of time. The defining characteristic of a still image is that it is not an animation or a video clip, rather it is a single static graphic. It may be a freeze frame of video, a ToasterCG framestore page, an RGB image saved from ToasterPaint or LightWave 3D , or a framestore generated by any of the Toaster's video graphics programs.

When you open the control panel for a still image, you'll find gadgets for displaying iy, entering a comment or description about it, and setting the length of time for which it should be displayed in a project sequence.



Crouton Image/Crouton Type/File Name/ Description
These four items show you:

- the crouton whose control panel you have opened,
- the type of crouton it is,
- the name of the file it represents,
- an optional description of the clip.

Length
This is the same as duration, (i.e., for how long would you like this image displayed?). The value shown here determines how long the image is on screen.

You can click inside the box and enter a value (the numeric keypad shortcut for activating numeric entry is the / key), or use the double-arrow gadget to change the value.

Continue
Click Continue to accept the current settings and close this panel.

Cancel
Click Cancel to reset the current settings to their original values (the values they displyed when the panel was first opened) and close the panel.

Useful Keyboard Shortcuts

At any time:	
Return, Enter	Continue
Esc	Cancel
Toggle panel Quick Tune/Fine Tune	Help

Numeric Keypad Shortcuts

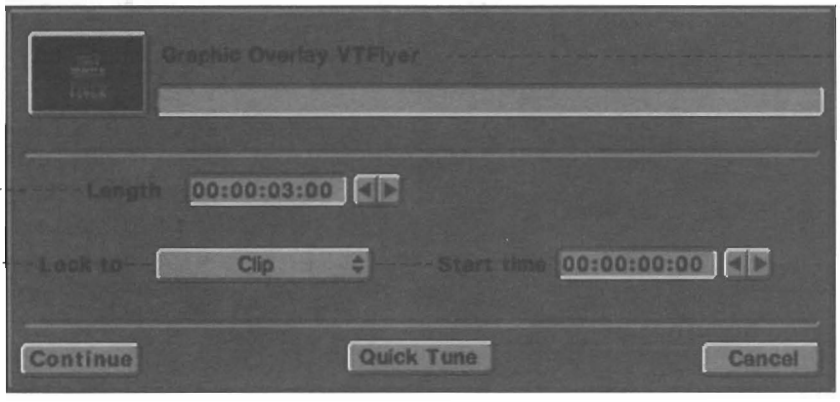
Activate Length gadget for entry	/
When numeric entry gadgets are active:	
Copy active time code value to memory	c
Paste time code value from memory	v
Jump to next time code pair (HH:MM:SS:FF)	Tab

Note:
If you are interested in extracting a still frame (framestore image) from a Flyer clip, you must do that through ToasterPaint (you cannot extract still images from within the Process panel). To do so, see the tutorial on extracting stills.

CG Key Page control panel

ToasterCG generates the four kind of pages that are used in television and video production. The key page is commonly used for talk shows, sports events, and the evening news. Typically, it is used to identify someone or something shown on screen, usually in the form of some text (and maybe a graphic element) in the lower one-third of the picture.

The name key page is a literal description of the process used to display the graphic over the picture. Using the page that contains the text as a reference, the Toaster electronically cuts a hole in the video signal (a "keyhole") that fits the elements on the page, then inserts the graphics themselves. The result is a complete image showing the video along with the text.



Length
The value shown here determines how long the image is on screen.

Lock To and Start Time
Keyed graphics start at the same moment as the video crouton that precedes them in the storyboard.

Lock To allows you to choose one of two events (the beginning of the prior clip, or the adjusted in point for the prior clip) where the audio clip should begin playing.

Start Time allows you to delay the appearance of the key for a period of time following the Lock To event.

See the tutorials for tips on how to use these two controls.

Crouton Image/Crouton Type/File Name/ Description
These four items show you:

- the crouton whose control panel you have opened,
- the type of crouton it is,
- the name of the file it represents,
- an optional description of the clip.

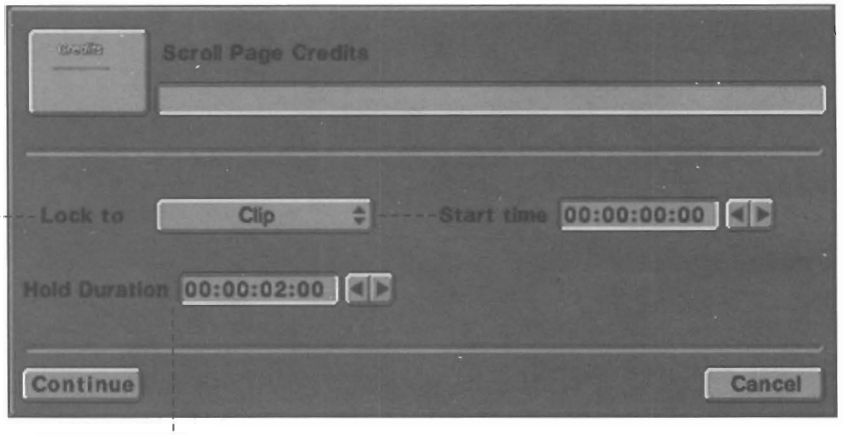
Since the key page is designed to be displayed over some other video (a video clip, a still frame, etc.), it does not add time to the length of a program. Rather, it is inserted over existing video that has its own duration.

While the popular use of the key page is for lower one-third text graphics, you can also use it for over-the-shoulder graphics (as seen in the nightly news), or as anywhere-else-you-can-think-of graphics to fit your production needs. Remember that you can design such pages using a combination of ToasterPaint and ToasterCG for maximum graphic impact.

Note:
The key page control panel shown above is the expanded, or Fine Tune view. The Quick Tune view does not display the Fade In or Fade Out values, which default to 00:00.

CG Scroll Page control panel

A scroll page is typically used at the end of a production when the credits of the personnel who worked on the production slowly slide up through the screen.



Lock To and Start Time
Keyed graphics start at the same moment as the video crouton that precedes them in the storyboard.

Lock To allows you to choose one of two events (the beginning of the prior clip, or the adjusted in point for the prior clip) where the audio clip should begin playing.

Start Time allows you to delay the appearance of the key for a period of time following the Lock To event.

See the tutorials for tips on how to use these two controls.

Hold Duration
Whether you chose to set a repeat option for the scroll page when you created it in ToasterCG, you have the option of pausing the page at the end of its scroll using Hold Duration.

When a Hold Duration above 0 frames exists, the page will pause at its end for that length of time, then dissolve the remaining graphics off screen. There is no option for selecting the speed of the dissolve, or whether the graphics dissolve or cut off screen.

Examples:
A Hold Duration of 00:00:00:00 means "no pause." The page will scroll up the screen and disappear off the top.

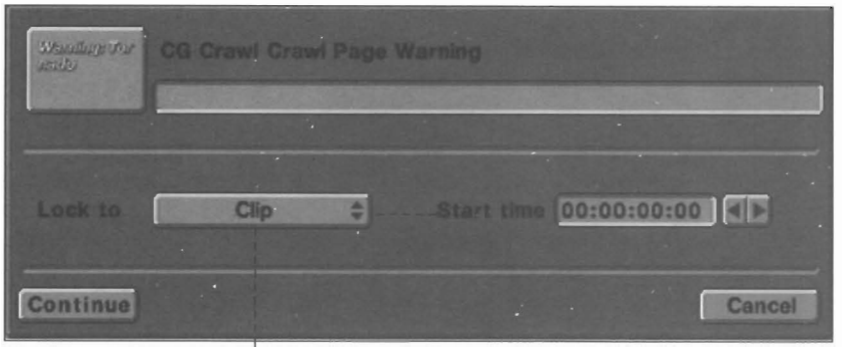
A Hold Duration of 00:00:05:00 means "pause for 5 seconds." The page will scroll through to the bottom, pause for 5 seconds, then dissolve off.

Questions About Scroll Pages

How Do I Set the Speed of the Scroll Page?
From within ToasterCG you can select one of five scroll speeds. This speed setting will be used when sequencing.

CG Crawl Page control panel

A crawl page is typically used as a sort of bulletin or announcement. The idea is that a message slowly crawls across the screen informing the viewer of an event or change in programming without interrupting the program itself.



Lock To and Start Time
Keyed graphics start at the same moment as the video crouton that precedes them in the storyboard.

Lock To allows you to choose one of two events (the beginning of the prior clip, or the adjusted in point for the prior clip) where the audio clip should begin playing.

Start Time allows you to delay the appearance of the key for a period of time following the Lock To event.

See the tutorials for tips on how to use these two controls.

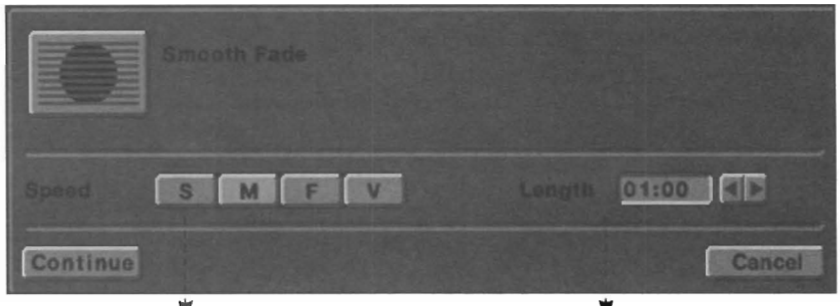
Questions About Crawl Pages

How Do I Set the Speed of the Crawl Page?
From within ToasterCG you can select one of four crawl speeds. This speed setting will be used when sequencing.

Control Panel for the Smooth Fade Crouton

The defining characteristic of a special effect is something that the Switcher performs on the current video source. Examples of special effects include the dissolve (smooth fade), a flying trajectory, a ChromaFX color filter, and the Old Film effect.

Note that not all special effects are transitions—they do not necessarily have to switch video sources when they occur. Sometimes they simply add pizzazz to the video. This is a good reason to view and review segments of your video program as you create it, so that each element is exactly as you want it.



Speed
This gadget lets you select the desired speed of the smooth fade effect.

When you select Variable, you enable the Length gadget to the right, which allows you to set the speed of the dissolve manually.

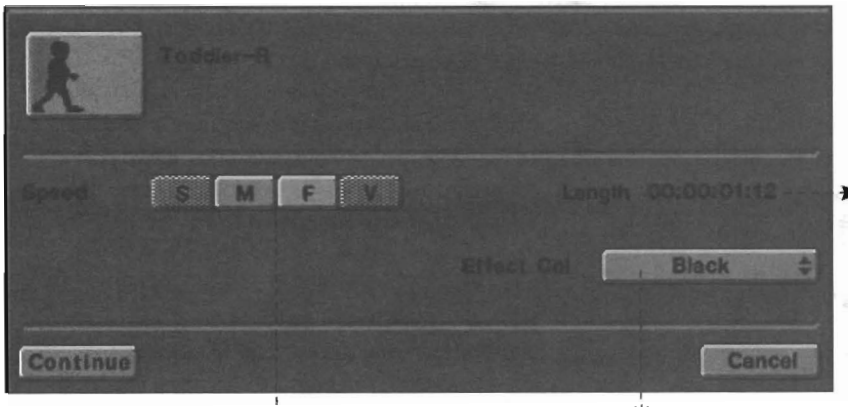
Length
This gadget displays the length of time (in seconds and frames) for the Slow, Medium, and Fast speeds. Also, for these speeds, it cannot be adjusted.

For the Variable speed, this gadget can be adjusted to set the dissolve rate to any length (up to 30 seconds).

Control Panel for Animated and Matte Effects Croutons

Some of the Toaster's animated effects use matte colors created by the Toaster's background color generator.

The effect shown below, for example, shows the black silhouette of a toddler walking across the screen. You can change the color to any of the background colors using the pop-up menu found in the control panel. Matte colors include Black, White, Red, Green, Blue, Yellow, Magenta, Cyan, and Snow.



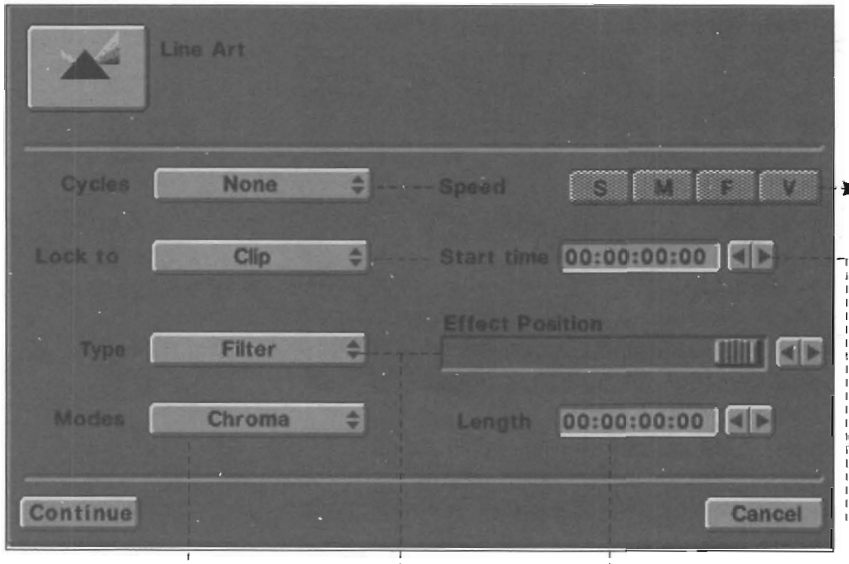
Length
This display shows the length of time (in seconds and frames) for the selected speed setting.

Speed
This gadget lets you select the desired speed of the smooth fade effect. For some effects, as in the one shown, there may be only a few speeds available.

Effect Color
This pop-up lets you select the desired matte color for this effect.

Control Panel for ChromaFX Croutons

ChromaFX are color filters that you can use to enhance video clips in a variety of ways (with effects such as negative video, sepia tone, line art, and more). By placing a ChromaFX crouton immediately after a video clip on the project sequence storyboard, then setting an appropriate Start Time and Length, you can recolor video clips.



Cycles and Speed
If this effect is set to Transition mode, the Cycle Type and Speed gadgets are active.

Cycle dtermines the type of effect movement. Speed selects its speed.

See the ChromaFX manual for details on how these work.

Lock To and Start Time
Keyed graphics start at the same moment as the video crouton that precedes them in the storyboard.

Lock To allows you to choose one of two events (the beginning of the prior clip, or the adjusted in point for the prior clip) where the audio clip should begin playing.

Start Time allows you to delay the appearance of the key for a period of time following the Lock To event.

See the tutorials for tips on how to use these two controls.

Modes
Chroma means that the incoming video will have this color effect added to its original colors.

Chroma Strip means that the incoming video will be treated as a black-and-white signal, to which this color effect will be added.

Filter and Effect Position

The unlabeled pop-up beside Effect Position selects between the two filter modes: Filter (a full screen effect) and Transition (a moving effect).

Effect Position emulates the T-bar found on the ChromaFX panel. It allows you to position a Filter effect.

Length
The value entered here determines how long the effect occurs.

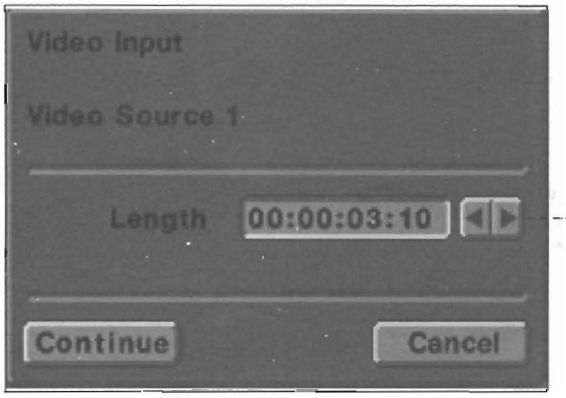
Control Panel for Control Croutons

All of the croutons found in the Control directory (a drawer found inside the Effects directory) are croutons that control the Toaster Switcher in seom form. These include, but may not be limited to:

- The BKG effects, which display a solid color for a period of time
- The Live effects, which display one of the Toaster's input sources for a period of time
- Frame Buffer effects, which display one of the Toaster's framebuffers for a period of time

You can use these effects for special sequences, live productions, or standalone kiosk-type applications where such source selection is convenient.

The control panel for each type of control crouton looks the same, and is pictured below.



Length
This display shows the length of time that this video source will be shown.

For a BKG crouton, it indicates how long you'll view the selected color.

For a Live Video crouton, it indicates how long you'll see this input.

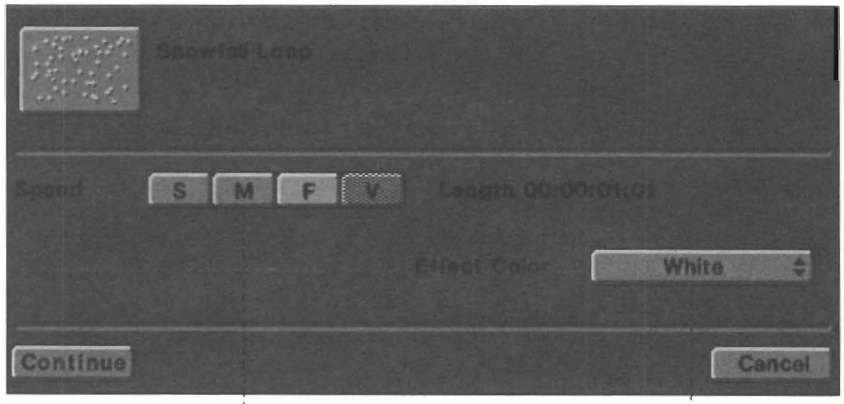
For a Frame Buffer crouton, it indicates how long you'll see the contents of the buffer displayed.

Control Panel for Overlay Effects Croutons

Certain types of Toaster Switcher effects display either a single still frame or a repeating graphic-in-motion that is overlaid atop the current video source. These can be found in the Overlays directory within the Effects drawer. Examples of this kind of effect include falling snow, flashing marquee lights, and the old film effect.

The control panel for each type of overlay crouton looks the same, and is pictured below.

Note:
These effects, in previous Toaster releases, were "manually controlled" in that the operator had to click the right mouse button when he wanted the effect to end. At the time of this manual, this remains the case. There are no controls on the panel of these effects for setting a length of time during which they should run, and then switch themselves off.



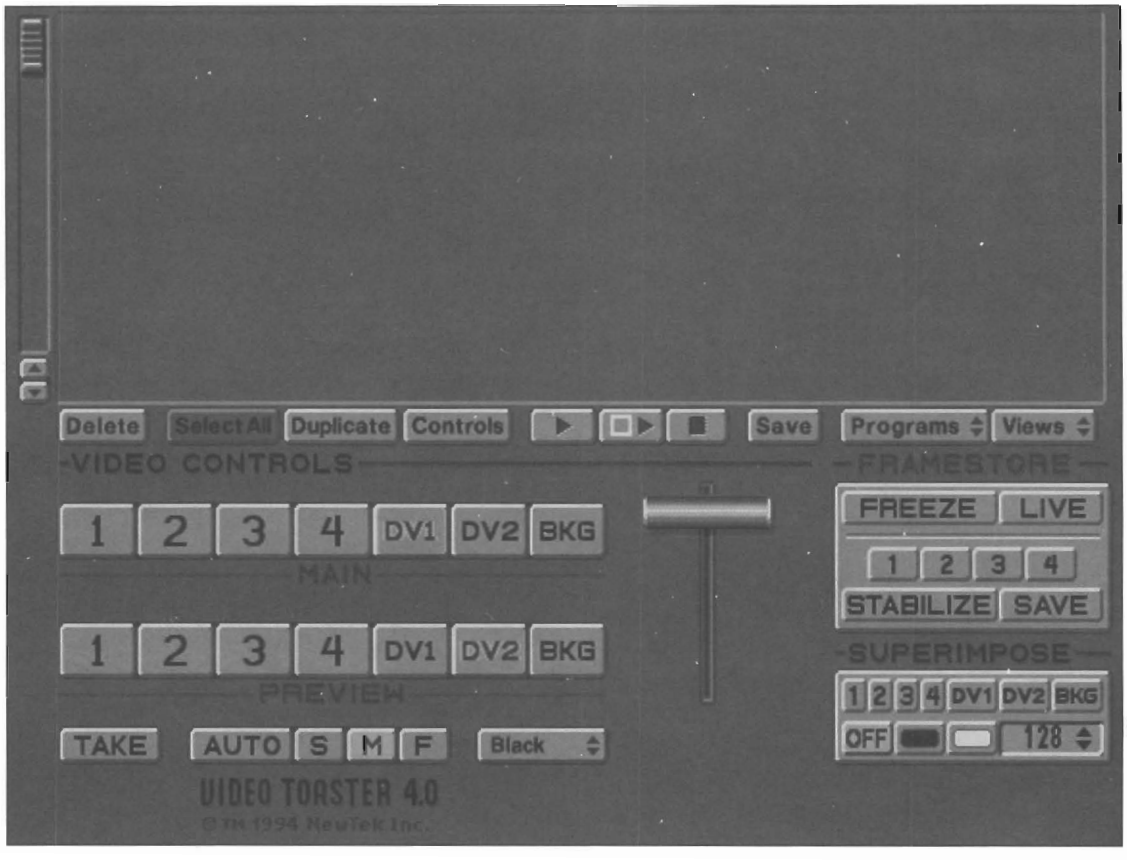
Speed
(Not all effects will have this control).
Use this gadget to select the speed for the overlays with motion.

Effect Color pop-up
This display shows the length of time that this video source will be shown.

This page left blank intentionally.

The Video Toaster Switcher

You can access character generator pages created by ToasterCG, overlaying them on top of the video being processed by the Switcher. You can freeze a frame of the incoming video and save it on the system, allowing you to load it into the graphics applications within the Toaster to use in your own video productions. You can load and display ToasterPaint or LightWave 3D frames, and if you're running on an Amiga 4000, you can even play back 256,000-color LightWave animations in real time.



The Project/Switcher screen. FOr live production, you can "load up" a project containing nothing but effects, framestores, character generator pages, and more, so that everything you need is within reach from this one screen.

How the Project/Switcher Window Works

You may find yourself confused by what seems to be a change in the way things work when the Project/Switcher view is on screen. Suddenly, selecting a crouton from the window causes something to happen.

For example, in any other editor view when you select a framestore crouton, it highlights (and nothing else happens). But when you are at the Project/Switcher view, it highlights and automatically loads into one of the framebuffers on the preview bus.

This change in the way the system responds to your actions may be disoncerting at first. Here's why it happens.

The Toaster Switcher as always been geared toward live video production. A live production situation can best be described as "controlled chaos," where any number of things can always go wrong. The crew works hard to do a perfect job, and strives equally hard to correct any sudden mistake or error that occurs. Being able to act and react quickly is important.

Therefore, to support the ability to work and react quickly, the Switcher now "auto-loads" graphics the moment that you select them on screen. This includes framestores, CG overlays, CG scrolls, and CG crawls. In earlier system software you had to select a graphic, load it, then take it to air. No longer. Now you can select an item and take it to air as soon as it has loads automatically.

Understanding Switcher Terminology

Effect
An effect is a special effect or transition from one video source to another. In the Toaster Switcher, the effects are buttons that display images in the form of the effect they will have on the video image. The effects are laid out in nine grids, called effects banks.

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 (necessary for transitions, which go from one source to the other), and a third chooses a source for inserting text (keying).

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 cutoff by setting the clip level.

T-bar
Another term borrowed from the television industry. The T-bar is a lever, allowing the operator to control the duration of an effect.. With it, you can move effects slowly, stop them at any time, or even reverse them in mid-stream.

How to Select and Display Video Sources

The Main, Preview, and Superimpose Busses
The lower portion of the Switcher screen is dominated by the two main busses and a single effects bus, Main, Preview, and Superimpose, which route the video inputs a variety of routes on the way to the Toaster's output.

- **Main** is used to select the Toaster's current video output. This is the output that you want connected to your recording VCR.
- **Preview** is used to select the video source that is next-in-line, ready to go to the main output.
- **Superimpose** is used for special effects such as keying one source over another, and for displaying ToasterCG pages. It is located on the lower right.

Each bus contains seven buttons: Input 1, Input 2, Input 3, Input 4, DV1, DV2, and BKG. Inputs 1-4 may be video cameras, laser disk players, playback VTRs, or any combination of these as long as these sources are time-base correct and synchronous.

(If you are not familiar with these terms, contact NewTek or your Video Toaster dealer.) DV1 and DV2 are 24-bit framebuffers, each of which can hold a single digital still video image. Together they can capture video freeze frames as well. BKG functions as both a solid color background source (you can select this color from the Setup screen) and the buffer where LightWave 3D, 256,000-color, real-time animations are accessed.

The Main Bus
(keyboard shortcuts: F1, F2, F3, F4, F5, F6, F7)
The Main bus is the heart of the switcher. The source selected here will be the Main output to the recording VCR. The Preview and Overlay work with the Main bus to provide transitions and special effects. To put any source on the Main output, click on that button on the Main bus or press its corresponding key on the keyboard.

The Preview Bus
(keyboard shortcuts: 1, 2, 3, 4, 5, 6, 7)
The Preview bus allows you to look at any of the seven video sources without affecting the program output source. Compose camera shots "offline" without affecting the main output, pre-load Framestore images, and select the next channel to go to program. To view any source on the preview output, click on that button on the Preview bus or press its corresponding key on the keyboard. To send the Preview image to the Program output, you must either by selecting and triggering an effect or by clicking the Take button.

The Superimpose Bus
(keyboard shortcuts: q, w, e, r, t, y, u)
With the Superimpose Bus you can merge two different images (live or frozen) on the Main output through a process called luminance keying. The Toaster creates an electronic hole in the Main signal, then fills the hole with the Superimpose signal. With it, you can superimpose live action over another video signal such as the weatherman over a meteorological map. The Superimpose Bus is automatically used by the Toaster for certain transitions and digital effects. When you use Key, Scroll, or Crawl Page from ToasterCG, they load into the Superimpose bus.

Selecting and Triggering Effects

Where Effects are Located

Dominating the top half of the Project/Switcher screen is the project window. This window is a repository for effects, graphics, animations, even video and audio clips if you have a Flyer.

Each of these kinds of items is represented by a *crouton*, a tiny tile shape that you can drag into the window from a files window (the Project/Files display is discussed on page 4). Croutons arrange themselves in a grid, one beside another, one row above the next, filling the window. The slider on the left side of the window allows you to scroll the view up and down in order to access other croutons.

There are several ways to select items from the Project window. Different croutons perform different actions when selected. You may want to spend some time practicing these steps so that you are familiar with the Switcher's responses are to your actions.

To select an effect

Mouse: Click on it once.

Keyboard: Use the arrow keys to move the selection brackets to the crouton you want. Press Enter on the numeric keypad.

To run a selected effect

Mouse: Double-click on it.

Keyboard: Press the Spacebar.

To run an unselected effect

Mouse: Double-click on it. This runs the effect as quickly as it can be loaded.

The T-bar

The T-bar provides manual control over the effect used to transition between the current video source and the preview video source.

By dragging the T-bar can you pause an effect at any point that you choose or cause the transition to run very slowly or very quickly depending on how long you take to move the T-bar through its range.

Drag the T-bar down to start a transition from the Main source to the Preview source. Before you reach the end of the T-bar's range, drag it back up to reverse the transition. (This may not always work, as some effects do not function in both directions when using the T-bar.)

Release the mouse button while the T-bar is at the very bottom of its track and it will reset itself to the top.You have just brought the previouw source to the main bus using a special effect as the transition. Now you may select another preview source and transition in preparation for your next action.

Stop an effect at any point by releasing the mouse button while partway along the transition. Depending on the selected effect, the resulting image will be some combination of the Main and Preview signals. Note that small flashing triangle to the right of the T-bar, indicating that you are in mid-transition.

To control the T-bar manually

Left Mouse button: Position the pointer anywhere over the T-bar with the mouse. Click and drag downward, pulling the mouse toward you.

Right Mouse button: While the pointer is positioned anywhere on the switcher control panel, click the right mouse button and drag downward. This is a shortcut to the left mouse button method.

Take (keyboard shortcut: Return)

The Take button performs a transition known as the cut. Take instantaneously switches the preview source to the main output. (Another way of performing a take is to select the new source directly from the main bus.)

Auto (keyboard shortcut: Spacebar)

The Auto button provides smooth automatic control over transitions. Click Auto to perform the transition at a steady speed. The T-bar will slide downward in time with the transition. Auto provides for smoother-looking effects than manual operation of the T-bar. To select a different speed for Auto transitions, use the S, M, or F buttons.

Special note about Auto and the effects

Auto is also useful when you have a partially completed transition on screen and wish to complete the effect smoothly. To complete the effect in its "forward" direction, select Auto. To reverse the incomplete effect back off screen in its "backward" direction, hold Shift and press Spacebar.

S, M, F keyboard shortcut: comma [,], period [.], forward slash [/]

The Effects Speed buttons select the Auto speed for transitions: slow, medium, and fast. These buttons do not represent a fixed rate of speed; rather, they are relative to one another for different effects.

Note:

Each effect has its own preset speed. Customize the speed settings to those you want to use by opening the control panel for any effect and setting the speed you prefer.

Incomplete Effect Indicator

This small triangular-shaped indicator appears whenever the T-bar is not at its starting position. This means that the T-bar has been engaged, and an effect is somewhere in mid-transition.

The Freeze/Live button: Capturing Video Still Frames

The Framestore panel contains a set of eight buttons for manipulating still images:

- The Freeze/Live buttons indicate the state of the framebuffers themselves (showing Freeze when they contain a still frame, showing Live when they are employed as the live digital source for special effects).
- The 1, 2, 3, 4 buttons are "instant grab" buttons, grabbing the matching input at the moment you click the button.
- The Stabilize button is actually a pop-up with two options for stabilizing jittery framegrabs.
- The Save button allows you to save the image currently shown on the main bus as a framestore image on your hard disk.

The process of capturing a still frame of video has been greatly simplified in System 4.0. For details, see the tutorial entitled "How to Capture Freeze Frames."

About the Freeze/Live buttons

keyboard shortcuts: f (to freeze the video)
l (to return to live video)
Alt + f (frame image stabilization)
Alt + d (field image stabilization)

The Freeze and Live buttons are essentially one large toggle button indicating the current state of the framebuffers. The framebuffers themselves are always in one state or another (frozen or live), either holding a frozen image or passing live video.

Even if you have a Flyer, you should use the Switcher to capture still frames. (It's much quicker to capture a still frame and save it as a framestore image from the Swithcer than it is to capture it as a video clip, go to ToasterPaint, and then extract the still frame that you want.)

You can use either the Freeze button or the Instant Freeze input buttons (1-4) to freeze frames of incoming video.

The Freeze button functions differently depending on how you set up the Main and Preview busses, so you should experiment with the steps listed below to get a full understanding of its operation.

- When the Freeze button is selected, it indicates that there is a freeze frame in either DV1 or DV2, or both. This frame may be either frozen video or a video graphic image loaded from the Framestore (the directory where the Toaster stores freeze frames).
- When the Freeze button is not selected, the framebuffers are available for use. The framebuffers themselves serve two purposes—to hold still images, or to engage the digital channel. See the "Using the Framebuffers" for further information.

Loading and Displaying CG Pages Manually

If you are using the Toaster as a live Switcher, it's important that you be able to display CG pages manually, since you are not using the sequencer during live work. In order to do this, these pages must have been previously created and placed in a project. With that project loaded, you can go to the Project/Switcher display view and access those pages at will.

Keep in mind that having the Switcher screen visible causes single-clicks to act differently. In the other editor views, a single-click simply selects a crouton. But when the Switcher view is active, a single-click automatically loads the selected item. Double-clicking on a CG page will cause it to load and display (as quickly as it can be loaded). However, single-cliking causes the following reponses:

- A special effect loads into memory on the first click, so that the moment you press the Spacebar (or click Auto) it can occur immediately.

- A framestore (or still image) loads to either DV1 or DV2 on the first click, which then gets selected on the preview row. Since the framestore image is a still frame of video, you can treat it like any video source. Therefore, you may take it, dissolve it, or use any special effect to bring it to the main output.

- CG scroll or crawl pages do not pre-load when selected, since they can be created and displayed immediately. In this case, a single-click simply selects the crouton, nothing more. Only the double-click causes an action; it displays the page. Interrupt the playback of a scroll or crawl with a click of the right mouse button. (**Note:** If you manually play back a Flyer clip during a live production, and you roll a scroll or crawl page over it, you can use the right mouse button to interrupt the graphic without halting the playback of the video clip. You must use the Stop button to halt the video clip.)

- A CG key page loads into either DV1 or DV2 on the superimpose bus on the first click. The buffer on that bus does not get selected, so you will not have any indication that it is ready to display. Use the Spacebar or the Auto button to display it next. Use Return or the Take button to switcher to the selected preview source and place the key over it.

  To remove the Key page from display, you have three choices, depending on how you want the keyed graphic to leave the screen:

  - To take the key off the main output, select any other source on the Superimpose bus except the buffer that is highlighted (it contains the key graphic).
  - To dissolve it off the main source, select Auto.
  - To switch the preview source to main, and remove the key in the process, select Take.

Loading and Displaying LightWave 3D Animations

The ability to record and play back LightWave 3D animations as Amiga-format HAM8 animations began with System 3.0 software. At the time this manual was written, it was not known whether this feature would be implemented, or how the user would operate it. See the addendum for information.

Superimposing Graphics over Video

Luminance keying is a video term that refers to the processing of two video sources so that parts of one will appear on top of the other. Keying refers to the process of cutting out some portion of the foreground video source, while luminance refers to the criterion for determining what gets cut—brightness. What's left is a foreground video image with a hole, and a background video image showing through the hole. Therefore, luminance keying means "cutting a hole in one image (based on how bright parts of it are) and replacing the hole with another video signal." Another word for it is superimposition.

When does the Toaster use superimposition? Internally, where you never see it, the Toaster uses the Superimpose bus when it performs many Switcher effects. On the Switcher, where you will see it, the Toaster uses the Superimpose bus whenever you display CG key, scroll, and crawl pages. In fact, one of the ways you can display these pages is by selecting a source from the Superimpose bus. These pages superimpose their graphics over the underlying video signal.

Generally, superimposing requires that you "try out" the imagery that you wish to superimpose ahead of time, so that you know where the correct brightness cutoff point is when you go to key the image. This cutoff is called the clip level, and you can control 257 levels of clipping with the clip control on the Superimpose bus.

Since luminance keying uses brightness to determine the "hole," changing levels in the brightness of the video source 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.

Adjusting the Clip Level (up and down arrow)
The luminance value (called clip level) determines how much brightness is keyed by the keyer. Adjust this value by dragging the mouse over the numeric clip level readout. The numbers in the box will change as you raise or lower the clip level.

The clip level control works in the following ways:

Keying White [

000:	Nothing but the Overlay image (o turns keying off)
001-256:	A combination of the Overlay and Main images
257:	Nothing but the Main 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]

000:	Nothing but the Overlay image (o turns keying off)
001-256:	A combination of the Overlay and Main images
257:	Nothing but the Main image

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's keyer.

Notes and tips about luminance key effects
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. For example, consider a digital trajectory effect that flies the screen away. With the luminance keyer active and cutting out the black background, this same effect can fly a screen full of text over the main video source.

About Digital Effects, the Digital Channel and Digital Effects Editing

When passing normal video from Inputs 1-4, the Toaster is passing an analog signal, i.e., the signal that you provide to the Toaster comes back out unprocessed and unchanged. At times the Toaster needs to convert that singal to a digital one in order to carry out special effects. You can tell when a signal has been converted to its digital counterpart—you will see an analog input highlighted on one of the busses, plus both DV1 and DV2 highlighted on the same bus (so that it appears there are three buttons pressed on the same row).

Typically, you'll notice this when you look at the Switcher screen after engaging a digital effect. The Toaster will have automatically engaged the digital channel to carry out the effect.

However, depending on the sources you have selected for Main and Preview, there may be times when the Toaster cannot use the framebuffers to perform out a digital effect. In these instances, the Toaster will perform a wipe that most closely resembles the selected digital effect.

It's important that you understand these two things about the digital channel: that you can activate and deactivate it manually (which is desirable for setting up certain effects to avoid jump edits), and that you only need to do so for a few effects in particular.

The Toaster cannot know what you intend when you are editing, therefore when you wish to engage a digital effect, you should set up the busses properly beforehand. When it comes to digital effects, (those which manipulate the position or size of the screen,) there are really only two kinds—those which bring the preview source over the main source (a digital-on effect), and those which remove the main source to reveal the preview source (a digital-off effect). We refer to them this way because it explains which source, main or preview, needs to be digital before the effect is triggered to avoid a stutter edit. By activating the digital source on the appropriate bus first, the correct source is already digital, therefore there will be no jump in the video.

This is only important in two situations—when the Main source is digital and you wish to use a digital-on effect, and when the Main source is not digital and you wish to use a digital-off effect. In both instances, the main video will undergo a 1/15th of a second switch (either going digital or going analog) just at the moment you trigger the effect. This can be noticeable. By setting up the bus to be digital or not before triggering the effect, you'll avoid the jump and perform a perfect transition. When the jump is visible, it seems that sometimes the video appears to "stutter" at the moment the effect is activated. A normal digital delay (1/15 of a second) is what causes the appearance of the forward or backward time jump.

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 highlighted. 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 Main bus.
3. Select one of the Cube or Sphere warp effects.
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 Main bus.
2. Select Input 1 on the Preview bus.
3. Select one of the Cube or Sphere warp effects.
4. If the Freeze button is highlighted, click it to free it.
5. On the Main bus, click on DV1 or DV2.

You have just routed the Main source through the Toaster's digital channel. The Main 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 buses at any one time - If digital 4 is selected on Preview, for example, then Main or Overlay cannot contain another digital source.

On the next page, along with the keyboard shortcuts for the Switcher, you'll find some general guidelines about the framebuffers and their operation with regard to digital-on and digitial-off effects.

Digital-On Effects

(Preview source replaces Main source)

Analog over analog	OK.
Analog over live digital video	Jump cut results.
Analog over frozen digital video	Altered effect results in wipe.
Live digital video over analog	OK.
Frozen digital video over analog	OK.
Frozen digital video over frozen digital video	OK.

Digital-Off Effects

(Main source replaces Preview source)

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.
Frozen digital video over frozen digital video	OK.

Keyboard Commands

F1	Input 1 on the Main Bus.
F2	Input 2 on the Main Bus.
F3	Input 3 on the Main Bus.
F4	Input 4 on the Main Bus.
F5	DV1 on the Main Bus.
F6	DV2 on the Main Bus.
F7	BKG on the Main 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 Superimpose bus.
w	Input 2 on the Superimpose bus.
e	Input 3 on the Superimpose bus.
r	Input 4 on the Superimpose bus.
t	DV1 on the Superimpose bus.
y	DV2 on the Superimpose bus.
u	BKG on the Superimpose bus.
Esc	Jump back to previous view
Tab	Play project sequence from beginning
Del	Stop project sequence playback
`	(left single quote) Open New Clip panel
F8	Cycle Views: Project Project/Files Files/Files Project/Switcher
F9	Controls (project window) Info (files window)
F10	Setup Panel

Arrow keys	Navigate among croutons
Enter	Select current crouton
Return	Take
Spacebar	Auto
(comma)	S (Slow)
(period)	M (Medium)
(fwd slash)	F (Fast)
o	Luminance keyer off
[	Key on black
]	Key on white
f	Freeze (turn on frozen video)
l	Live (turn on live video)
Alt+d	Field Motion Removal
Alt+f	Frame Motion Removal
Help	Display help & toggle 2/3 monitor setup
Left-*A* + m	Jump to Amiga operating system (Workbench); the same key combination will return to the Toaster Switcher.
Ctrl+L Alt+F10	Exit Video Toaster (immediately)

Numeric Keypad Commands

The numeric keypad allows you to select croutons in the current project window by row and column numbers. As you press the number keys, you'll see the current crouton number (shown in the upper left hand corner of the screen) change to reflect this.

For example, to select the 5th crouton on row 235, press the following numeric keys: 2, 3, 5, the numeric period key, then 5. The period key acts as a separator betwen the rwo and column numbers, since you will have any number of rows, while there are always just 8 columns across. (The period is optional, but a useful way to separate the two.

Notes

Notes

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CromaFX™

ChromaFX

ChromaFX Color Video Processor

A sophisticated color processor, ChromaFX empowers you with complete control over video images. Change brightness, contrast, saturation, and more. Alter live video with sepia tone, line art, solarization, and negative video effects. Use any number of color effects in a video project for flying color effects, organic cycling transitions, and dissolve effects.

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How ChromaFX Works - Luminance Mapping

All ChromaFX 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 ChromaFX 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. ChromaFX 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 ChromaFX, 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 ChromaFX 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.

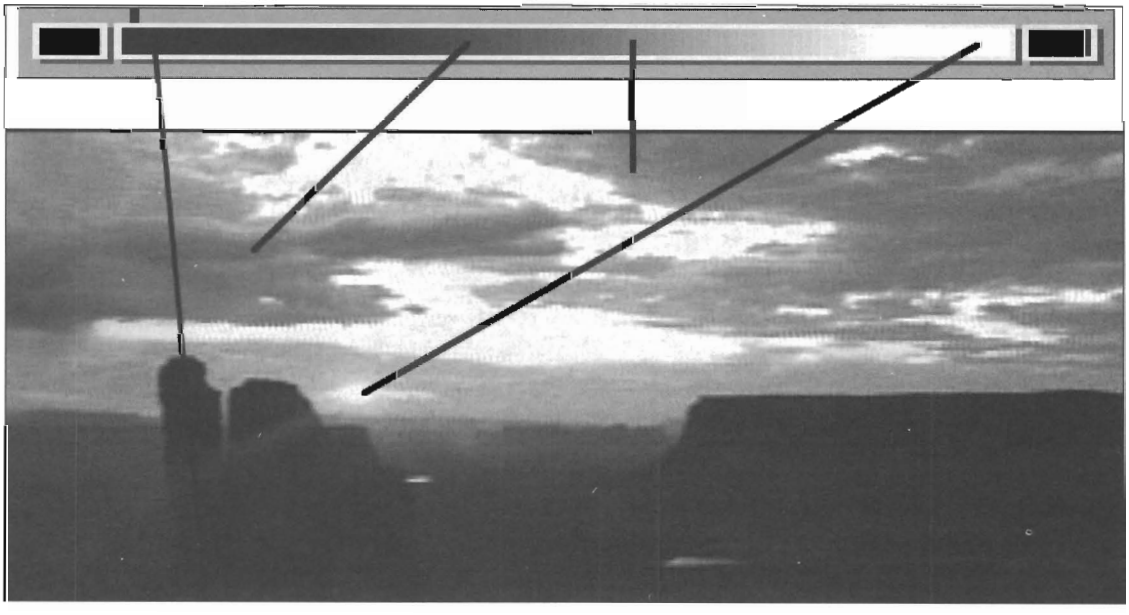
- The brightest parts of this image are the sun and certain portions of the sunset. Therefore, the portion of the Color Strip that will affect these bright areas is the far right end (that represents the brightest parts of the scene). Colors mapped into this portion of the strip would affect the sun and sunset regions of the picture.

- The darkest parts of the image are the shadow areas. Therefore, the portion of the Color Strip that will affect shadow areas is the far left end (that represents the darkest parts of the scene). Colors mapped into this portion of the strip would affect the dark and shadowy parts of the picture.

- All other brightness values fall between the brightest and the darkest values. Depending where you insert color(s), they will be mapped into their corresponding zones of brightness.

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.

The darker portions of any image are color mapped with the colors that you insert into the left side of the Color Strip. The lighter portions are mapped using colors from the right end of the Color Strip.



ChromaFX 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 save effects croutons.

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 palettes, 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.

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 e 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

ChromaFX

The ChromaFX screen consists of three main control panels and several smaller multi-button panels.

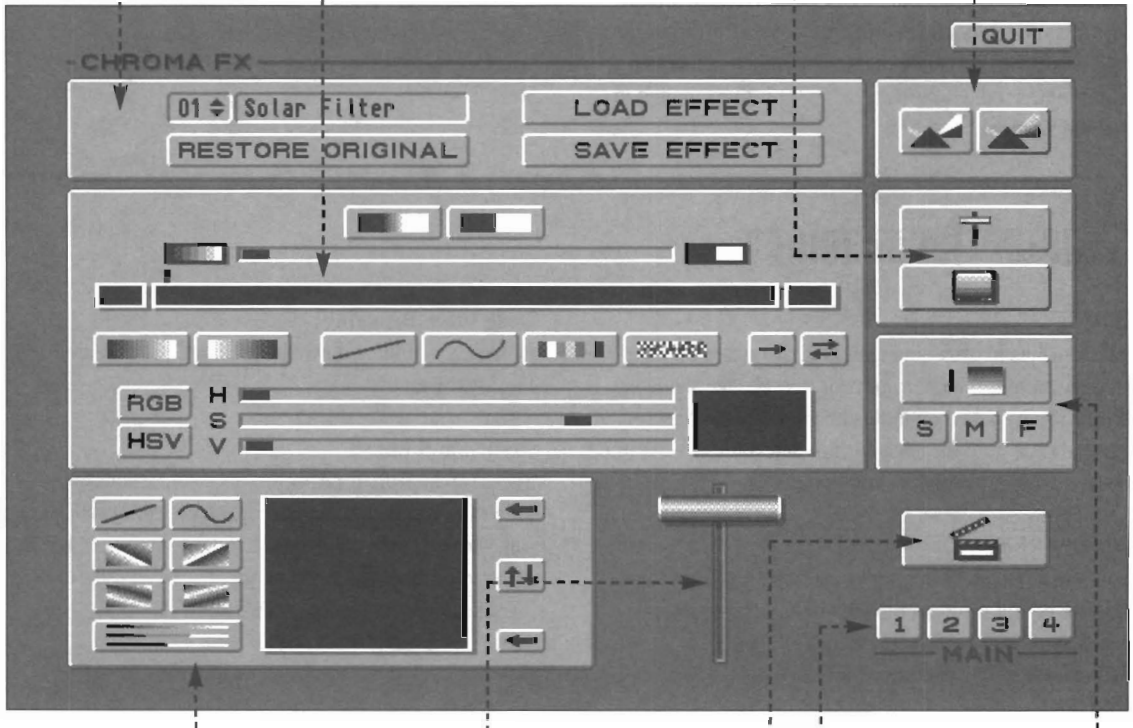
Effects Selection
Use this panel to load, name, rename, and save effects (as part of the built-in 100 effects, or as standalone croutons).

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 ChromaFX 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.

Video Source Buttons
Use these buttons to see how the rendered effect looks on any of the four video sources.

The Color Cycling Control Panel
Use these buttons to select the type of color cycling to apply to the video signal.

Reference Section

Entering and Exiting ChromaFX

To enter ChromaFX: Use the Programs pop-up menu from an editor screen and select ChromaFX.

To exit ChromaFX: select the Exit button in the upper right hand corner.

To quit ChromaFX: go to the editor screen, hold the Shift key, and select ChromaFX from the Programs pop-up menu.



Selecting, Loading and Saving Effects

This portion of the ChromaFX screen allows you to select ChromaFX filters for loading, editing, and saving. To maintain compatibility with earlier versions of ChromaFX, ChromaFX has two ways of loading and saving effects. To load and edit one of the 100 built-in effects, use the numeric selector (below, left). The current effect's settings will appear on screen. To save any changes made to that effect, simply exit ChromaFX and the current numbered filter will be updated with your modifications (if any). These procedures are consistent with the methods used in earlier versions of the software.

With System 4.0, you can now save any effect by itself as a drag-and-drop crouton (you are no longer limited to the four preset effects). This means that you can save any number of ChromaFX for use in editing. Also, you can load and modify these croutons any time you wish, since each crouton contains all the information it needs to be edited.

For clarity and organization, we recommend that you load and save croutons individually for all your color processing effects.

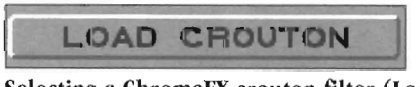


Selecting a built-in ChromaFX Filter
This display shows you the number and name of one of the built-in 100 filter effects. To select a filter, either click and drag the pointer over the numeric portion of the window, or enter the two-digit number of the effect you want from the numeric keypad. The effect is automatically loaded into ChromaFX for editing.

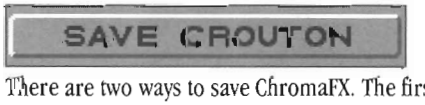
Renaming a ChromaFX Filter
To change name of an effect, click inside the text portion of this window, then use the Delete or Backspace keys to erase the old name. Type in the new name and press return. Names are limited to 12 characters.



Restore Original
This button will restore the original ChromaFX effect settings to the current effect whose name is shown above. This is a fail-safe option that allows you to restore the original ChromaFX effect in case you have modified it unexpectedly and you wish to return to its original state.

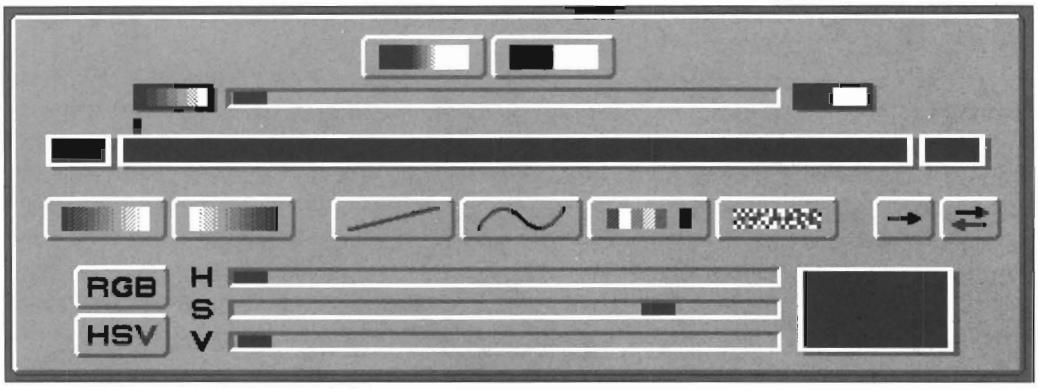


Selecting a ChromaFX crouton filter (Load Effect)
To load an effect that you have made (and saved as a crouton, separate from the built-in file of 100 premade effects), use Load Effect. ChromaFX will present you with a file requester so that you may locate and load the crouton effect.



There are two ways to save ChromaFX. The first method occurs automatically. Whenever you exit ChromaFX, any changes that you made to any of the 100 built-in effects will be saved upon exiting ChromaFX.

The second method allows you to save a filter as a crouton (just like any effect crouton). To do so, select Save Crouton. ChromaFX will present you with a file requester so that you may choose the location and name for this crouton. (Note: these crouton images can be loaded into ToasterPaint. While you cannot modify them in Toasterpaint and still use them as ChromaFX filters, it does allow you to make exciting gradient blends in ChromaFX for use as textures or background images.)



Editing the Color Strip

This portion of the ChromaFX screen contains controls for editing either the top or bottom line of the full screen palette that is used to create a color filter. The controls on this panel make changes to the Color Strip (the horizontal line).



Soft Transitions button
This button causes the transitions between one luminance band and the next to be blended smoothly.

> **Important:** This button has no effect when the Posterization slider is in its left-most position.



Sharp Transitions button
This button makes the transitions between one luminance band and the next to be sharp. Each luminance band is distinct.

> **Important:** This button has no effect when the Posterization slider is in its left-most position.



Posterization Slider
This slider controls the amount of posterization (quantizing) that appears in the Color Strip. From left to right, luminance resolution ranges from 96 divisions to just two. As the slider reaches maximum, colors in the picture break up into bands as they are reduced. The image takes on a more blocky, pixelized appearance.



Color Strip
The Color Strip is the central workplace of ChromaFX. It displays the luminance map of the current line (either the top or bottom) from the Color Table, which represents the full screen filter.

The Color Strip's display is shown on the Toaster's Preview output only. On the Interface monitor the display is black-and-white.

At either end of the Color Strip is a box representing the brightest or darkest part of the map. Above the Color Strip is an indicator that marks the location of the color 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.

In a map of normal, unaffected video this box will contain black. Click the pointer inside this box to move the current color indicator to the left end of the Color Strip. (The Darkest Box acts as a shortcut button to get to the end of the Color Strip).

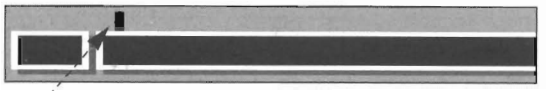
> **Note:** The name of the Darkest Box has nothing to do with any color it might contain. It refers to the darkest parts of the video image to which color is applied.



Lightest 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.

In a map of normal, unaffected video this box will contain white. Click the pointer inside this box to move the current color indicator to the right end of the Color Strip. (The Lightest Box acts as a shortcut button to get to the end of the Color Strip).

> **Note:** The name of the Lightest Box has nothing to do with any color it might contain. It refers to the lightest parts of the video image to which color is applied.

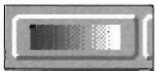


Current Color Indicator
The Current Color indicator serves two purposes:

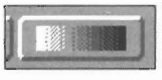
- It indicates the position of the current color being edited.
- It marks one end of the range that will be affected when you use the Horizontal Spread, Horizontal Spectrum, Random Color or Snow button. The other end is set by the next point you click on in the Color Strip.

To select a color or a location on the Color Strip, click anywhere on it (or drag the mouse along it). The indicator will jump to the point where you stop, and the Current Color window will change to display the color at that position.

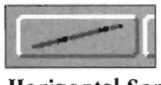
To move the current color indicator to either end of the map, click in the Lightest or Darkest Box. The marker will jump to that end of the Color Strip, and the Current Color box will be updated.



Normal Video
Click this button to replace the contents of the Color Strip with a normal video luminance map—a smooth spread from black to white. A Color Strip containing this luminance map will leave the image unaffected.

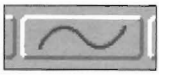


Negative Video
Click this button to replace the contents of the Color Strip with a negative video luminance map—a smooth spread from white to black. A Color Strip containing this luminance map will produce a negative image (normal black and white will be inverted).



Horizontal Spread
Use Horizontal Spread to create a smooth color spread between any two points on the Color Strip.

To create a horizontal spread, click on a color or position in the Color Strip. Select the Horizontal Spread button. Now click (or drag) the pointer elsewhere on the Color Strip. A smooth spread of color will be created.



Horizontal Spectrum
Use Horizontal Spectrum to make smooth, shifting color spreads on the Color Strip.

The Horizontal Spectrum tool cycles through all of the available hue 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.

To create a horizontal spectrum spread, click on a color or position in the Color Strip. Select Horizontal Spectrum. Then click (or drag) the pointer elsewhere on the Color Strip. A spread of shifting colors that cycles through the spectrum will be created.

As an 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
Random Color inserts random bars of color into the range you indicate. Random Color is not affected by the colors at either end of the range (like the Horizontal Spread and Spectrum tools), it will insert random colors into both the endpoint locations and the range in between.

To create a Random Color range, click on a color or position in the Color Strip. Select Random Color. Then click (or drag) the pointer elsewhere on the Color Strip. A range of colors will be created.



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 (or drag the pointer along the Color Strip until you locate it). Click on the Copy button. Now click anywhere else on the Color Strip to place a copy of the color at that location. This ends the copy operation.



The Swap Button
Use the Swap button to cause two colors to change places on the Color Strip.

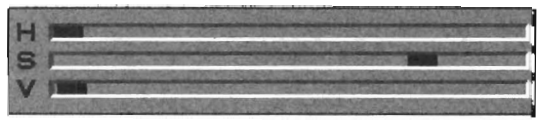
In the Color Strip click on one of the colors you want to swap (or drag the cursor along the Color Strip until you locate it). Click on the Swap button. Now click on the other color, the one you want to change places with. This ends the swap operation.



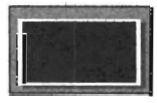
RGB Button
Click the RGB button to use Red, Green, and Blue color values to create color. Each value may range from 0-255. As you slide a color slider for one of these colors to the right, you are adding more of that color.



HSI Button
Click the HSI button to use Hue, Saturation, and Intensity to create color. Hue steps through the colors of a color wheel in a 360° circle, returning to the same point at the end of the slider's range. Saturation controls the amount of color present. Saturation ranges from no color to full color. Intensity is the lightness of a color. Intensity ranges from none (black) to full (white).



Color Sliders
Use the three color sliders to adjust the color value displayed in the Current Color box (to the right of the sliders). Each slider represents the full range of color values. Click on a slider and drag it to the left or right to set the amount, or click beside the slider, in its track, to move it in 16-level increments in that direction.



Current Color Box
The Current Color box displays the color you are currently modifying, whose position is indicated by the Edit Marker just above the Color Strip. The Current Color box's color display is only shown on the Toaster's Preview output.

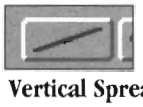


Editing the Color Table

The Color Table is like a collection of Color Strip lines stacked one atop another. It displays a thumbnail image of the full screen filter that will be applied to the video image. In the Color Strip editor at the top of the screen, you edited horizontal lines representing luminance. The edited line was either the top or the bottom line from this display.

The controls here allow you to select either the top or the bottom line for Color Strip editing, change the vertical transition between the two lines, or swap the two lines. The buttons to the left of the Color Table display allow you to change way that color is mapped between the top and bottom lines. The buttons to the right select the Color Strip line for editing, and switch the position of the two lines.

Its color display is only shown on the Toaster's Preview output. On the Interface monitor the display is black-and-white.



Vertical Spread
Select Vertical Spread to create a smooth spread of color directly from the top line of the Color Table to the bottom line.



Vertical Spectrum
Select Vertical Spectrum to create a shifting 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 lines to create this spectrum.

> **Note:** ChromaFX must consider all possible variations necessary in order to cycle colors and make the top and bottom lines match. You may not get exactly the spread you are looking for, and may have to experiment to achieve the results you want.



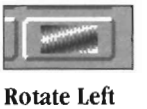
Shift Left
Shift Left takes the entire top line and duplicates it down the screen, at the same time shifting its position to the left with each step. This is useful for creating transition effects where you want the colors in the image to cycle.

> **Note:** When this button is depressed, the bottom line of the Color Table is not used in the resulting filter, only the top line. Also, the Exchange Lines button and Bottom Line button are unavailable.



Shift Right
Shift Right takes the entire top line and duplicates it down the screen, at the same time shifting its position to the left with each step. This is useful for creating transition effects where you want the colors in the image to cycle.

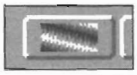
> **Note:** When this button is depressed, the bottom line of the Color Table is not used in the resulting filter, only the top line. Also, the Exchange Lines button and Bottom Line button are unavailable.



Rotate Left
This tool takes the entire top line and replicates it downward while rotating its position to the left. At the same time it inverts the colors.

The Rotate tools create a much more radical shifting of the colors than the Shift tools. These 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, only the top line. Also, the Exchange Lines button and Bottom Line button are unavailable.



Rotate Right
Rotate Right takes the entire top line and replicates it downward while rotating its position to the right. At the same time it inverts the colors.

> **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 creates a much more radical shift of the colors than Shift. They are useful for creating Transition effects where you want the entire image to appear to have undergone a nuclear explosion (like the Nuke effect).



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, only the top line. Also, the Exchange Lines button and Bottom Line button are unavailable.



The Top Line button

The Swap Lines button

The Bottom Line button

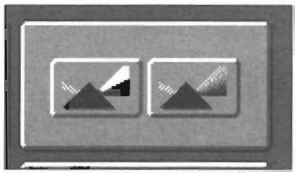
Top Line button
To edit the top line of the Color Table inside the Color Strip, select the Top Line button.

Swap Lines button
To edit the bottom line of the Color Table inside the Color Strip, click on the Bottom Line button.

> **Note:** When the vertical control buttons (Shift or Rotate) are used, the Swap Lines button is not available, since only the top line of the Color Table is in use.

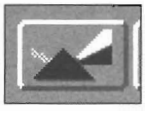
Bottom Line button
To switch the positions of the top and bottom lines, select the Swap Lines button. The two lines will change positions on the Color Table display.

> **Note:** When the vertical control buttons (Shift or Rotate) are used, the Bottom Line button is not available, since only the top line of the Color Table is in use.

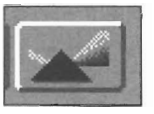


Chroma Control - Color or Black-and-White?

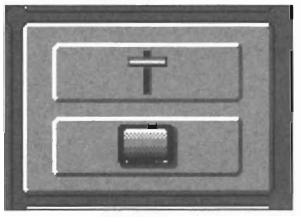
The Chroma Control Panel governs whether the incoming video signal is processed as a signal that originated as a black-and-white image or a color image. When you select black-and-white, the ChromaFX color filter replaces the original colors. When you select color, the ChromaFX color filter is added to the existing colors.



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.

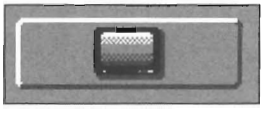


Filter Positioning Controls

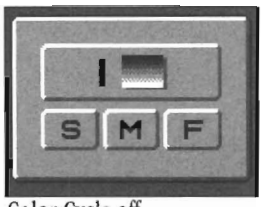
Use the Filter control panel to determine the manner in which the Color Table is applied to the video signal, either gradually (line-by-line, based on the position of the T-Bar) or as a full screen filter.



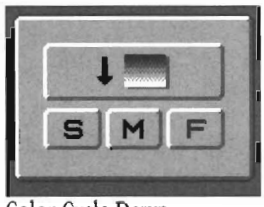
Transition
The Transition mode allows you to a exercise manual positioning control over the full screen filter effect by dragging the pointer over the T-Bar. As you drag the T-bar down, successively lower lines of the Color Table are applied to the image until the T-bar reaches the bottom.



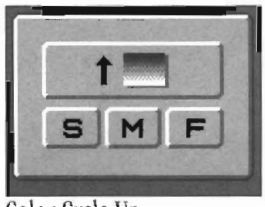
Filter
Filter mode applies the entire color palette to the incoming video signal in a direct 1:1 relationship. Think of the entire Color Table as a filter that you hold in place over the screen. To achieve the best filter effects, the Chroma Control panel should be set to Color.



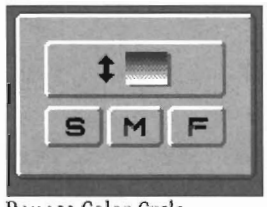
Color Cycle off



Color Cycle Down



Color Cycle Up



Bounce Color Cycle

Color Cycling Control

Click the Color Cycle control to apply successive lines of the Color Table to the video signal automatically. Once activated, the color filter cycles at the selected speed (slow, medium, fast) in the direction chosen (top to bottom repeat, bottom to top repeat, or rebounding between top and bottom).

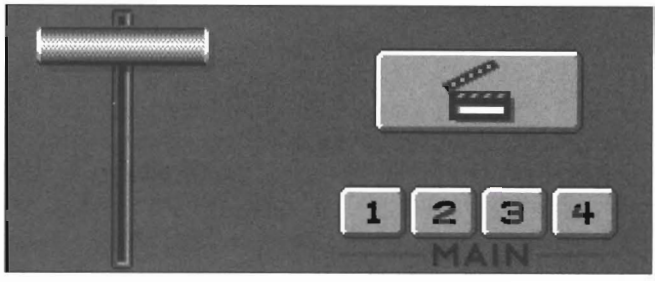
Cycle Direction
To select the cycle direction, click on this button until it shows the cycle mode you desire. There are four settings: No cycling, Down, Up, and Bounce.

Downward 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.

Upward Cycling
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.

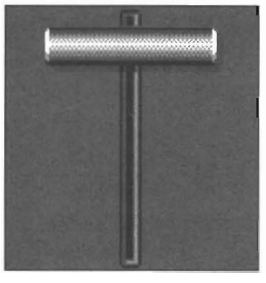
Bounce
Bounce Cycling applies the top palette line of the Color Table to the incoming video image and continues with successive palette lines. When it reaches the bottom palette line, it reverses the process, and so on.

S, M, and F
Use the Slow, Medium, and Fast buttons to control the speed of Color Cycling.



Rendering and Positioning 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 framebuffers and apply it to the video image. Depending on the kind of filter showing in the Color Table, the Color Table may not display an accurate representation of the effect itself. Use the T-bar or Clapboard controls to render effects from filters so that you can preview their appearance.

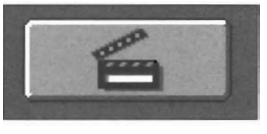


T–bar

The T-bar on the ChromaFX editing menu performs two functions:

- If the effect has not been rendered: Click on it to render the effect to a framebuffer.
- If the effect has been rendered: Drag it downward to manually apply the effect to video.

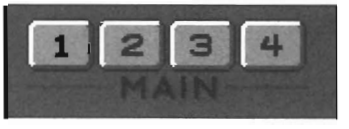
The T-bar operates in exactly the same manner from the Switcher window.



Clapboard

The Clapboard button performs two functions:

- If the effect has not been rendered: Click on it to render the effect to a framebuffer.
- 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 a source.
- Click on any of the four program source buttons with the mouse.

Keyboard Shortcuts

F1	Select Main Input 1		
F2	Select Main Input 2		
F3	Select Main Input 3	ESC	Return to editor
F4	Select Main Input 4	F10	Return to editor

Effects List

00	(blank)	25	Crazy Nuke	50	Color Bands	75	FleshSpread1
01	Solar Filter	26	Fade to Neg	51	ColorShade	76	Warm
02	Sunset Filter	27	Fade->PostNeg	52	RainboStripe	77	Cool
03	Ocean Filter	28	Chrome	53	RainboBands	78	Brown
04	Hue Filter	29	Gold	54	Soft Rainbow	79	CoolDark
05	Hue Bands	30	Red Chrome	55	Fog	80	WarmDark
06	Mars Filter	31	Yellow Light	56	OldMovie	81	BrnCyan-3col
07	SepiaTone	32	RedMids	57	B&WPoster	82	DarkWood
08	Contrast	33	BlueDarks	58	BlueMetal	83	BlueVelSpred
09	Brightness	34	MidRangeTint	59	Daylight	84	OrangeWhite
10	Gamma	35	MidRangeFilt	60	Tungsten	85	WarmSunset
11	Line Art	36	Red-Grn-Blu	61	Flourescent	86	MagentaBands
12	Charcoal	37	Poster-Solar	62	Red	87	Maroon-3col
13	Pastel	38	Poster Cycle	63	RedCyanField	88	MaroonLavSpd
14	Light Poster	39	Snow Mids	64	Purple	89	Tobacco
15	Posterize	40	Snow Lights	65	PurpleWhtPoster	90	BlueRedSpred
16	Heavy Poster	41	Snow Darks	66	Yellow	91	BluePrint
17	PosterBrite	42	Snow Cycle	67	Moonlight	92	USA-3color
18	B&W Poster	43	Snow Bands	68	WarmGraySprd	93	Bronze
19	Red Poster	44	Green Neon	69	Chartreuse	94	PearlyGates
20	Fire	45	Neon Cycle	70	CoolGraySprd	95	BluePoster
21	Solarize	46	Stripe Cycle	71	CoolSpread	96	PastelSpread
22	Cycle Solar	47	Stripe Filter	72	BlueGreen	97	BritePoster3
23	Nuke	48	Band Filter	73	Flesh-3col-1	98	RedDraw
24	Nuke Solar	49	Zebra Stripe	74	FleshPoster1	99	Pinky

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Rotate Right button 10
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ToasterPaint™

ToasterPaint

ToasterPaint
24-bit Paint Program

Table of Contents

Welcome to ToasterPaint.

ToasterPaint is a full-fledged 24-bit NTSC paint program for creating television graphics. ToasterPaint is completely mouse-driven, with special keyboard shortcuts built-in to make maneuvering faster.

With ToasterPaint you can load graphics in the Amiga IFF format (from 2 bits to 24 bits deep), the Toaster's Framestore format, plus the Flyer still frame and clip formats. You can capture and import freeze frames of video, even rotoscope across the frames of a Flyer clip. Use PostScript fonts the same way as ToasterCG and LightWave Modeler do.

A variety of drawing modes, an air brush, redefinable Undo/Redo, variable transparency, and antialiased texture mapping tools place ToasterPaint in the front line of flexible, powerful video graphics software.

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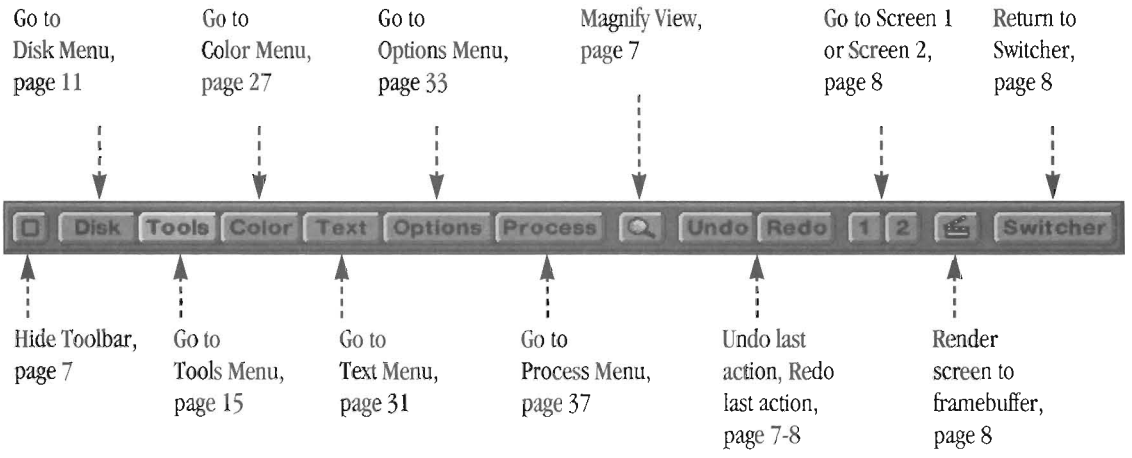
ToasterPaint Screen Controls

An important element in ToasterPaint's main screen is the toolbar. The toolbar is present on every control panel, and it provides you with access to all of ToasterPaint's control panels.

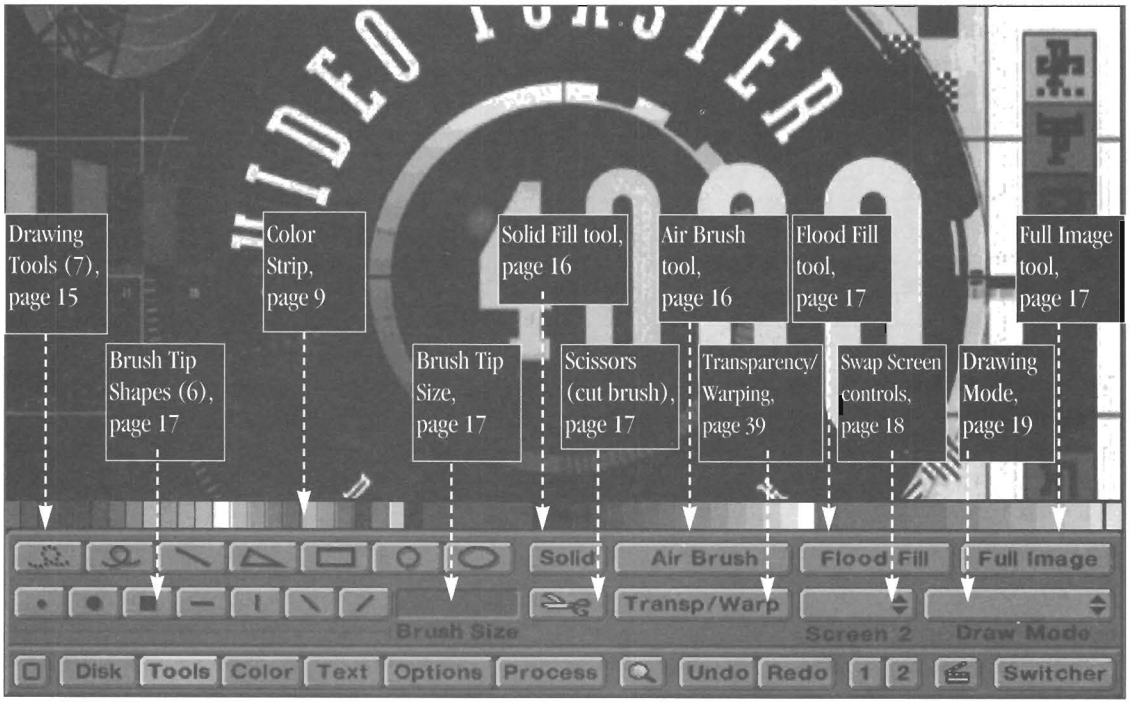
There are a number of control panels in ToasterPaint. The most commonly used are listed on the toolbar (Disk, Tools, Color, Text, Options, and Process). A seventh, Transparency/Warping, is available via the Tools menu, since you will likely use its effects with the various drawing modes and tools found on the Tools menu.

The remaining control panels are support panels that appear when necessary, such as the file requester, a navigation tool which ToasterPaint displays when you need to load or save files.

The Toolbar



The Main Screen (Tools Menu)



The Tools menu. Notice that the toolbar (shown at top of page) appears at the bottom of the screen, right below the current control panel. It appears here for every control panel.

ToasterPaint Basics

Entering, Exiting, Mouse Operations, and Screen Flashes

Following are some basic concepts you should know when using ToasterPaint.

Entering and Exiting ToasterPaint

To enter ToasterPaint
Use the Program pop-up menu from any Editor screen and select ToasterPaint.

To exit ToasterPaint
Select the Switcher button at the right end of the toolbar.

To quit ToasterPaint
Go to any editor screen and select the Quit ToasterPaint option from the pop-up Programs menu.

Mouse Functions

Left Mouse Button
In ToasterPaint, the left mouse button has two functions:

- To select buttons or commands.
- To draw or paint on screen.
- (If you use an Amiga 2000/3000, you have a third function: to move the screen view when you hold the Shift key down. See Auto-Scroll, below.)

Right Mouse Button
In ToasterPaint, the right mouse button has two primary functions:

- To cancel the operation in progress. (Note: If the pointer is a "wait" cloud without Zzz's, the operation cannot be cancelled with the right mouse button.)
- To redisplay the tool panel.

Program Response

Screen Flash (Amiga 2000/3000)
If, when you attempt a drawing or painting operation in ToasterPaint, the screen flashes once in response, ToasterPaint does not have enough RAM available at this time to carry out the operation. Check to see if other applications are active (such as ToasterCG or LightWave 3D), and quit them to free up more memory. Then try again.

If you have a spare screen or an alpha channel screen that is active (i.e., if you have used either the spare screen or alpha screen at any time during this session, then they are active), you should go to the Options panel and delete them. (Save any artwork on those screens first, if you want it for later.) Deleting them will free up more memory.

Alternately, you may need to try out the operation on smaller areas of the screen at a time.

If you own an Amiga 2000, have one megabyte of chip ram (the 1MB Agnus chip), and you use ToasterPaint a great deal, we recommend that you consider adding the third-party product called the MegaChip to your system. See the Appendix for how to contact DKB, makers of this product.

ToasterPaint Basics

Terminology and Screen Display

ToasterPaint Terminology

Brush, Custom Brush
Any time you use the scissors tool and cut out a copy of a portion of the screen image, you have cut out a custom brush (usually referred to as just a brush).

Undo, Redo
After you draw an element on a ToasterPaint image, you can undo it to return to the look of the screen prior to the last action. This is a common software feature.

An uncommon feature is ToasterPaint's Redo, which allows you to then select a new color, or a new drawing mode, followed by Redo. ToasterPaint will then redraw that portion of the screen using the new color or style. It's a powerful feature you'll find yourself using a lot as you massage graphics into shape.

Transparency
ToasterPaint allows you to draw elements with variable levels of transparency. When you draw a rectangle over someone's face, for example, the rectangle completely covers the face beneath. With 50% transparency, the rectangle appears blended with the face so that you can see through it. You can control various aspects of the blend as well. (See the Transparency and Warping panel for details.)

Texture Mapping
ToasterPaint can draw and redraw new elements in any size, maintaining the sharp, clean look of the original element. You can even draw with different tools to create perspective looks. Texture Mapping requires that you cut out a brush before you can map. (See the Transparency and Warping panel for details.)

RubThru
RubThru enables you to composite graphics from any two images to create a seamless blend of the two. You can even blend another and another to create many-layered graphic images. (See the Toolbox for details on drawing modes.)

Screen Display

RGB Display
ToasterPaint's screen display varies depending on the Amiga in which the Toaster is installed.

Amiga 4000
ToasterPaint works in a 256,000-color full-screen display (commonly called HAM 8). The display quality is so good, in fact, that you may find yourself using the render command very little.

Amiga 2000/3000
ToasterPaint works in a 4096-color quarter-screen display (commonly called HAM or HAM 6). This is due to the amount of display memory that is available to these machines, and to the nature of their design. It is not something that you can alter by adding more memory or more storage. (Note: Although some noticeable gain in speed is apparent by the addition of the MegaChip to an Amiga 2000, it does not change the fundamental nature of the Amiga's 4096-color display.)

Why is it that ToasterPaint can handle 24-bit images but cannot display them as 24-bit images? Primarily because the Amiga computer was not designed for this kind of display. However, since it is a computer, it can certainly work with 24-bit information. Therefore, when you paint, you'll see the best possible display that the Amiga can show you. When you render the image, you'll see the best possible image that the Toaster can show you. Once you've tried it, you'll find it easy to get reliable results.

ToasterPaint Basics

Screen Display and AutoScroll

Screen Display on Different Amigas

Amiga 4000
The ToasterPaint screen displays the entire video image. However, due to a limitation of the Amiga's native display, a 16-pixel strip of pixels down the side of the image is not accessible. You can shift the screen to get access to this area (using the left and right arrow keys). Also, all drawing operations that overlap this strip (even when it is not visible) will work on it.

Amiga 2000/3000
The ToasterPaint screen can show one of two displays: the 1/1 screen or 1/4 screen display (these are approximate).

The 1/1 (or nearly full-screen) display shows you most of the full screen image. In the this display, certain tools are not available due to the amount of memory available (it is not possible to maintain the display and allow certain tools to function at the same time). These tools will either dim, or disappear from the toolbar when in the 1/1 display.

The 1/4 screen display shows about 25% of the screen. It's like looking out a small window while someone holds a large painting in front of it. You cannot see the entire painting in the window at once, but the other person can shift the painting up and down and left and right so that you can see any one part of it. ToasterPaint acts as the other person, and it can move the painting around so that you can view any portion of it on screen. We call this ability to shift the view *auto-scroll.*

Auto-Scroll (Amiga 2000/3000)

Auto-scroll is automatic. As you move the pointer near one edge of the screen, the image will shift to move with the pointer. 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.

You can also use the four arrow keys to shift the screen image. The arrow keys cause the canvas to move slowly in the selected direction. Hold the Shift key when you press the arrow keys to move the screen in steps of 32 pixels (instead of 1 pixel). If you need to move the canvas while you are drawing, however, it is generally better to use Shift+left mouse button (discussed below, in Moving the Screen).

ToasterPaint's blank screen color is black, and so it the outer border surrounding any image. Therefore, you may not be able to see the screen 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 (press the G key). The pop-up menu that normally displays the current drawing mode will then display the X and Y coordinates of the pointer.

ToasterPaint tries to anticipate your drawing far enough in advance so that you can continue to draw in the direction of the edge of the screen, and have enough image there to see far enough ahead. Sometimes this is not enough, so ToasterPaint allows you to shift the display in the middle of a drawing operation and allow you to continue where you left off. Read about this next, in "Moving the Screen."

Disabling Auto-Scrolling (Amiga 2000/3000)

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 move the pointer to one of the edges of the screen, the canvas remains locked in place. Press h to lock the canvas down. Press the Help key again to enable auto-scrolling.

Note:
Scrolling the screen with the arrow keys is not affected by Help.

ToasterPaint Basics

Moving the Screen View

Moving the Screen (Amiga 2000/3000)

Sometimes it is convenient to shift the 1/4 screen display so that you can work on a different portion of the image.

To move the screen view
Hold the Shift key and drag the mouse with the left mouse button pressed. Now move the mouse to drag the screen around, as if it were attached to the pointer. Let go of either the Shift key or the mouse button when you have positioned the screen to your liking.

To move the screen view during a drawing operation
Let's assume you are cutting out a large brush, so large that it extends off ToasterPaint's displayable screen area. As you drag the scissors around the screen, you reach the point where you need to move the screen view. Continue holding the left mouse button and press the Shift key. Now drag the mouse to shift the screen view. When the view is to your liking, left go of the Shift key, and continue cutting from the point where you stopped.

Note:
If you shift the screen view too far, the pointer may stray from the last spot where you stopped drawing (in this example, cutting). You can tell because you'll see the tiny pointer move away from the point where you stopped moving originally, even while the Shift key was still held down. If so, just make sure to move the pointer back to the point where it should have been before you let go of the Shift key. Then you'll be able to continue as normal.

Moving the Screen (Amiga 4000)

Due to the nature of the Amiga's operating system, a native Amiga display as wide as 752 pixels goes beyond the "active" area of the screen. For this reason, there is a 16-pixel-wide strip along the side of the screen that you cannot see. To view it, you'll need to shift the screen display occasionally.

To shift the Amiga 4000's HAM 8 display
Use the left or right arrow key. This will shift the screen image so that you can see and work on the far edge of the picture.

Press the arrow keys at any time, even in the middle of a drawing or brush-cutting operation, so that your actions will affect the entire image area.

You should also know that this portion of the screen is always consider active. That is, if you perform a "whole screen" operation, the unseen portion will also be painted. If you stamp down a brush whose edges go off screen into this area, the portion of the brush that lies on the unseen strip will be stamped down correctly.

In other words, it remains active and "paintable" for all drawing operations.

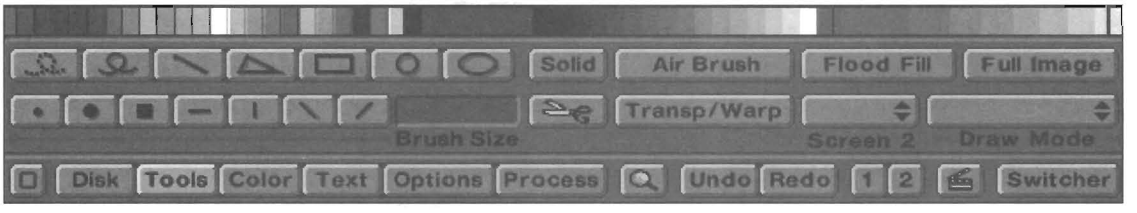
ToasterPaint Reference

The Control Panel and its Components

ToasterPaint's control panel consists of three sections: the toolbar, the color strip, and the current control panel. The term "current control panel" may seem somewhat vague, but there is good reason for it.

The control panel that you see on screen always consists of three elements: the toolbar, the color strip, and the current tool panel. Rather than constantly refer to one or another of these, we refer to this displayed group as "the control panel." Or, more simply, we use the name of tool panel, as in "go to the Tools panel," or "go to the Options panel." Since the Tools panel and the Options panel each contain a toolbar and a color strip, we need not mention that these are present. They always are. It's pretty straightforward.

Following is a description of the elements of the toolbar.



A sample control panel, showing the three elements that make it up: the top row of color shades is the color strip; the Tools panel is the main section in the middle; the toolbar is the row of buttons across the bottom.



Hide Panel
To hide the current control panel, click on this box. This leaves more screen image visible for drawing. To redisplay the menu, click the right mouse button.



Disk, Tools, Color, Text, Options, Process
Select any of these buttons to go to that control panel.



Magnify
Select this button to activate the magnify mode.

A new window will open on screen. The pointer will turn into a magnifying glass. The area in the window displays a close-up of that portion of the screen image beneath the pointer.

Move the magnifying glass over the image until you locate the portion of the screen you wish to work on close-up. Click the left mouse button to fix that location. ToasterPaint will zoom in to that spot and return you to painting mode.

> **Note:** All tools work the same whether the view is magnified or not. While in magnify mode, you can scroll around the image by using the arrow keys on the keyboard.

To return to normal view
Click on the Magnify button again, or click the close box in the upper left corner of the magnify window.



Undo
Click Undo to take back the last drawing operation. If you draw a rectangle on screen, then decide that it was the wrong color, select Undo to remove it and return to the screen as it was before.

> **Note:** You can undo only one operation, the one where you last clicked the mouse on screen.

> **Tip:** You can Undo the last Undo operation by selecting Undo again. This allows you to draw something, remove it, then replace it, remove it again, and so forth, giving you the chance to see the image with and without the change.

> **Important:** There are three exceptions to Undo. You cannot Undo after a load or save operation, after changing screens, or after creating a PostScript text brush.



Redo

Redo is a powerful command that repeats the last drawing operation. The power of the Redo command is that if you change various aspects of the drawing settings, then select Redo, the new drawings settings will be used.

> **Note:** This allows you great versatility. If you paint too much color somewhere, click Undo, change the transparency settings to a lighter value, then select Redo, and the original area will be repainted with a fainter, more transparent amount of color.

> **Tip:** If you accidentally fill an area with solid color when you meant to cut out a brush in that shape, click Undo, select the brush (scissors) tool, then select Redo. ToasterPaint will cut out a brush in the exact shape of the area you filled.



Screen Controls (1, 2)

The three screen control buttons allow you to select the current drawing screen, screen 1 or screen 2. Click on one or the other to jump to that screen.

ToasterPaint allows you to work with two drawing screens. This allows you to use one as a compositing tool, alpha channel, stencil, or scratch pad.

Screen 1 is the default starting screen for ToasterPaint, a solid black screen that is 752 pixels wide by 480 pixels high (the dimensions of video imagery that the Toaster manipulates). Its button will be highlighted when you first enter ToasterPaint.

Screen 2 is the spare, or swap screen. Normally, screen 2 acts as simply another drawing screen, the swap screen, with all of functions of screen 1. In addition to this, ToasterPaint allows you to select any of three other uses for screen 2: as an alpha screen, as or as two forms of stencil screen (positive or negative). These settings are useful for operations that require two screens.

For more information on using these special screens, see the Screen 2 pop-up menu on the Tools menu.

> **Note:** When different images have been loaded into each screen, they are perfectly registered, or aligned. When you draw in the upper left hand corner of Screen 1 using the RubThru mode, then the upper left hand corner of Screen 2 will show through.

> **Tip:** Using the Coordinates display from the Options menu, you can locate exact screen positions from one screen to the other, since all coordinates match on both screens.



Render to Frame Buffer

When you wish to see the current image displayed on the current Toaster frame buffer, select the Render button. This renders the current screen to the Main output of the Toaster. You can select which frame buffer to display (either DV1 or DV2) from the Options menu.

As a shortcut, you can have ToasterPaint update the framebuffer constantly, after every drawing operation, by pressing Help. This activates the continuous update feature. Press Help again to turn this off.



Switcher

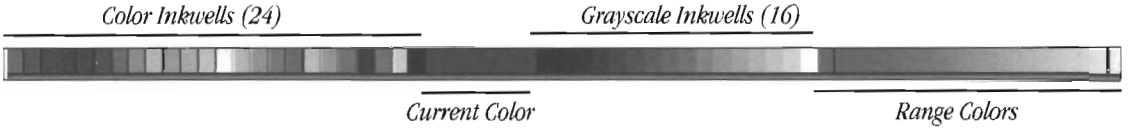
To return to the Project/Switcher screen, select the Switcher button. This does not quit or shut down ToasterPaint. Rather, it simply delivers you to the Project/Switcher display.

> **Important:** If you have an image in either the spare or the alpha screen, returning to the Switcher will clear this image from the screen. Also, any brushes (current or alternate) will also be cleared. Only the contents of screen 1 remain unchanged. Make sure you save an image or brush that you wish to use again before going to the Switcher.

The Color Strip

The color strip is a convenient color selection tool that is always visible along the top of the current menu. From left to right, here are its primary components. Each of these is discussed in detail below.

- The color palette, displaying 24 ready-to-use colors, each in its own inkwell.
- The current color box, showing the current drawing color.
- The gray scale palette, displaying 16 shades of gray, primarily for use on an alpha channel screen, but also handy for choosing grays in normal painting.
- The color range tool, with a color box at each end and the color spread between them.





The Color Inkwells
This portion of the color strip contains 24 inkwells that act as a pre-mixed, ready-to-use colors for drawing and painting. To draw with any of these colors, simply select it with the pointer, then begin drawing.

You can customize the color palette to contain the colors that you prefer to have available every time you start ToasterPaint.

To add or change a color in the color palette
Go to the Color menu, select (or mix) the color you wish to add, then click on the Add Color button. The pointer will turn into an arrow with a question mark. Click the pointer on the color well that you want changed. It will change to that color. From now on, whenever you start ToasterPaint, this color will appear here in the color palette.



Current Color
This large box in the middle of the color strip shows the current color selected for drawing.



Grayscale Inkwells (Alpha Channel Colors)
This portion of the color strip contains 16 inkwells with fixed shades of gray from solid black to pure white. Unlike the color inkwells, these cannot be changed. You can use these grays on any screen, but they are designed for use on the swap screen (when the swap screen is used as an alpha channel or as a stencil image).

Both the alpha channel screen and the stencil screen use luminance values to create their effects. Therefore, they do not use any color information at all. They only use the varying brightness levels of the different shades of gray to determine their appearance.

(The Color Strip is continues on the next page)



Range Color Display

ToasterPaint can create color ranges between any two selected colors. These two colors are shown at opposite ends of the color range, which resides on the color strip shown above.

There are three elements to the Range Color display: the Center color (the color well on the left), the Edge color (the color well on the right), and the color ramp (in the center). The color ramp shows the approximate range of color that you will draw on screen.

The color well on the left displays the center color. This is the center color when you draw a closed shape using the Range mode.

To insert a color into the Center box

Go to the Color menu, mix the desired color using the color mixing controls, then select select the Center button.

The color well on the right displays the edge color. This is the edge color when you draw a closed shape using the Range mode.

To insert a color into the Edge box

Go to the Color menu, mix the desired color using the color mixing controls, then select select the Edge button.

Note: You can adjust the location of the center and edge colors from within the Transparency/Warping menu. The type of transparency mapping chosen (spherical, horizontal, or vertical) and the location of the hotspot indicator can be used to position where these colors will appear and how the color range will be used.

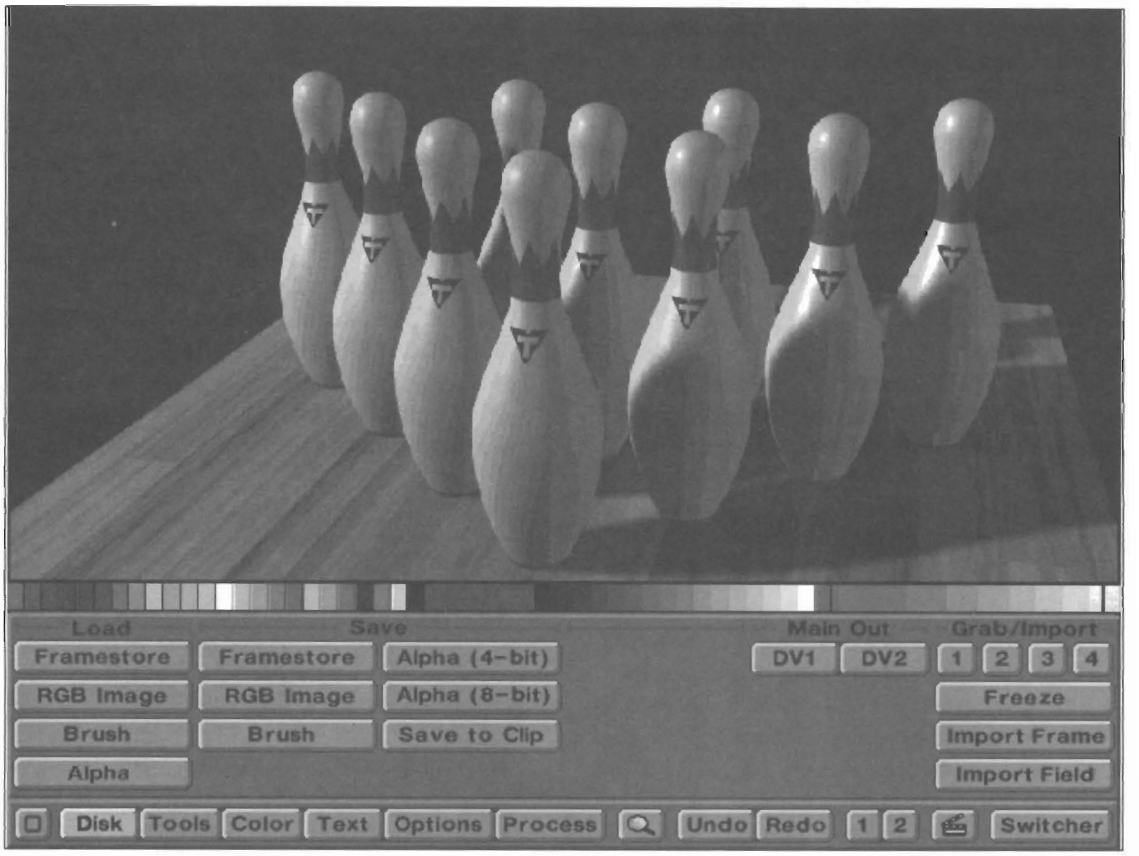
Tip: On the Transparency/Warp menu, the center color is always drawn toward the hotspot indicator on the transparency map.

Important: The transparency controls themselves (the numeric sliders labeled Center and Edge) can also be used in conjunction with Range mode. This allows you to draw with both color blends and transparency at the same time. If you do not want transparency at the same time, make sure to set the numeric sliders to 0.

Loading, Saving, and Freezing Images—the Disk Panel

All input and output operations are controlled from the buttons found on this menu, whether you are loading an Toaster Framestore, saving a 24-bit RGB image, selecting a Flyer clip, or importing a frozen image into ToasterPaint.

Note that **Load Clip** is not included here. Since most of your work with Flyer clips will take place via image processing routines, you will find the commands for loading and saving clips on the **Process** panel.



Load Commands

Framestore

Load Framestore
This command allows you to load images that have been saved in the Toaster's Framestore format.

RGB Image

Load RGB Image
This command allows you to load picture files that have been created with any Amiga graphics program.

ToasterPaint can load any Amiga IFF image (as well as PICT images, using the ReadPICT and WritePICT commands in the utilities drawer of the Toaster— see the documentation in that drawer for details) except for the newer AGA format images.

Specifically, ToasterPaint does not support the HAM8 format when loading or saving. We recommend that you convert HAM8 imagery to 24-bit in order to load to ToasterPaint.

Brush

Load Brush
This command allows you to load custom brushes that you have created with any Amiga graphics program. Brushes appear momentarily in the upper left-hand corner, then become attached to your pointer. The brush can then be used just as any other custom brush.

Alpha

Load Alpha
This command loads an alpha image into the spare screen, screen 2. (If screen 2 is not currently set to be an alpha channel, ToasterPaint will do so, and then it will load the image.)

(continued from Load Alpha)

Note: ToasterPaint supports alpha channels of 2, 4, and 8 bits. The image saved is always an 8-bit alpha channel. However, depending which Toaster application you use the image within, you may not use all 8-bits of data. For example: **The 2-bit alpha channel** is used by the Switcher/Editor when running on an Amiga 2000/3000. **The 4-bit alpha channel** is used by the the Switcher/Editor when running on an Amiga 4000. **The 8-bit alpha channel** is used by LightWave 3D on any system. ToasterPaint loads any of these kinds of alpha channels through the Load Alpha button.

Save Commands



Save Framestore
This option brings up the Save Frame requester. Here you you can save the current ToasterPaint image in the format known as the Framestore format which is supported by the Toaster Switcher.



Save RGB Image
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 r 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 as a Framestore and have the Switcher display it, use the Save Frame option .



Save Brush
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 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.



Save Alpha (4-bit)
Select this command when you wish to save the alpha screen (screen 2) as a 4-bit alpha channel image for use by the Editor/Switcher.

On the Amiga 4000, the 4-bit alpha channel screen can be used by the Toaster to set 16 transparency levels for keyed graphics.

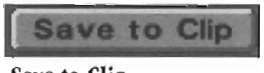
On the Amiga 2000/3000, 2 bits of the 4-bit alpha channel screen can be used by the Toaster to set 4 transparency levels for keyed graphics. The file is still saved as a 4-bit alpha channel, but only 2 bits are used.

Note: ToasterPaint supports alpha channels of 2, 4, and 8 bits. The 2-bit alpha channel is used by the Switcher/Editor when running on an Amiga 2000/3000. The 4-bit alpha channel is used by the the Switcher/Editor when running on an Amiga 4000. The 8-bit alpha channel is used by LightWave 3D on any system. ToasterPaint loads any of these kinds of alpha channels through the Load Alpha button.



Save Alpha (8-bit)
Select this command when you wish to save the alpha screen (screen 2) as an 8-bit alpha channel image (an image with 256 shades of gray) for use by LightWave 3D.

Note: Whether you are using an Amiga 2000, 3000, or 4000, ToasterPaint maintains the integrity of the 8-bit image internally. This means that no matter what model Amiga you use, you can work on 8-bit alpha channel images that can be used by LightWave 3D.



Save to Clip
Save to Clip will either (a) save the current image as a Flyer clip, or (b) append the current image to an existing Flyer clip. If you enter a new name for the clip, a new clip will be started using this image. If you select an existing clip, the image will be added to the end of it.

Important: The Flyer can only display clips in increments of four full fields of data. This command tacks only the current image (one field) onto the file you specify. Therefore, if you wish to create a still image clip, you must use this command four times in succession (specify a new file name the first time, then reselect it the next three times).

This also applies to any clips to which you append in image If you are appending a series of images, remember to add them in multiples of four.

Frame Grabbing Controls



1, 2, 3, 4
These four button correspond to the four video inputs of the Toaster. Select the input that is connected to the video source you want to grab an image from. The moment you click on a source, it will be grabbed. Clicked repeatedly to grab again and again.



Import Frame
Select Import Frame to load the current image from either DV1 or DV2 (whichever is currently selected for display) into the current screen. The 4-field image is processed, converted to a 2-field image, and loaded to the current screen. (Be certain that the current screen has either been saved or that you wish to over write it.)

> **Tip:** Import Frame is useful when the image you are grabbing has little or no motion jitter in it. An image with a lot of motion jitter in it may not import into ToasterPaint very well. Portions of the image may have alternating lines of data. If such is the case, try Import Field instead.



Import Field
Select Import Field to load the current image from either DV1 or DV2 (whichever is currently selected for display). The 4-field image is processed into a 1-field image and loaded to the ToasterPaint screen. (Be certain that the current screen has either been saved or that you wish to over write it.)

This option is extremely useful for grabbing a motion-free still out of a jittery framebuffer image.

> **Important:** A single-field image has less resolution than a full frame image, so it will appear more jaggy (especially on diagonal lines or edges). This is the nature of the NTSC video signal.

Main Display controls



DV1, DV2
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.

Using the File Requester in ToasterPaint

A *file requester* is a tool used by the computer to enable you to "rummage through its contents."

The file requester presents you with a number of tools that represent real-world functions. For example, selecting a hard drive whose contents you wish to view is just like walking over to a row of file cabinets and choosing one over another. Selecting a directory on that drive is similar to opening a drawer on a real file cabinet. Finally, opening a file (like a paint graphic) is a lot like pulling a file out of the drawer to look at it and work with it.

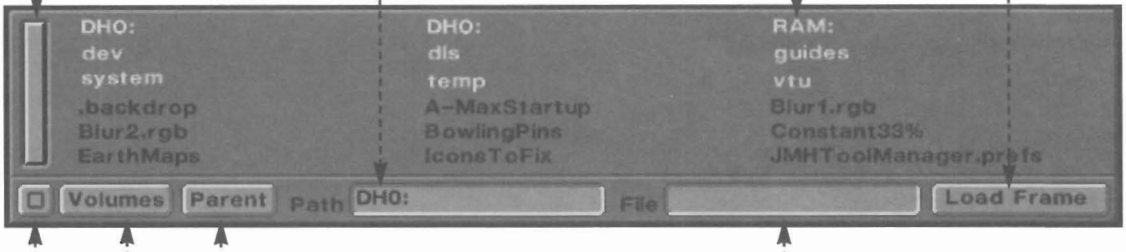
Shown below is the Load Frame version of file requester, along with callouts that point out various tools and their functions. .

Scroll Bar
Drag here to slide the list view up or down to view all names on the list.

Path
This field shows the current drive and directories you have "opened."

Hard Disks and Directories (Drawers)
Their names appear in white. Double-click on them to "open" them and display the list of their contents.

Load Frame
This button always shows the function of the current requester. After locating the file you want, click here to perform the desired action.



Close Box
Click here to close the file requester and return to the last panel.

Volumes
Click here display the list of disks currently available on the system.

Parent
Click here to go back one level to the previous directory/drawer.

File
When you click on a file name, it will appear here. If this is the correct file, you can double-click to perform the action or use the action button beside it.

ToasterPaint presents you with the file requester whenever it needs information from you about the action you just selected. Actions where ToasterPaint requires more information from you include:

- Loading an image (Framestore, RGB, Brush, etc.)
- Saving an image (Framestore, RGB, Brush, etc.)
- Choosing a Flyer Clip, and Processing a Flyer Clip
- Loading a PostScript font

The File Requester works identically in all of these instances. In the lower left corner of the file requester is the close box. Click it to close the file requester and return to the last control panel.

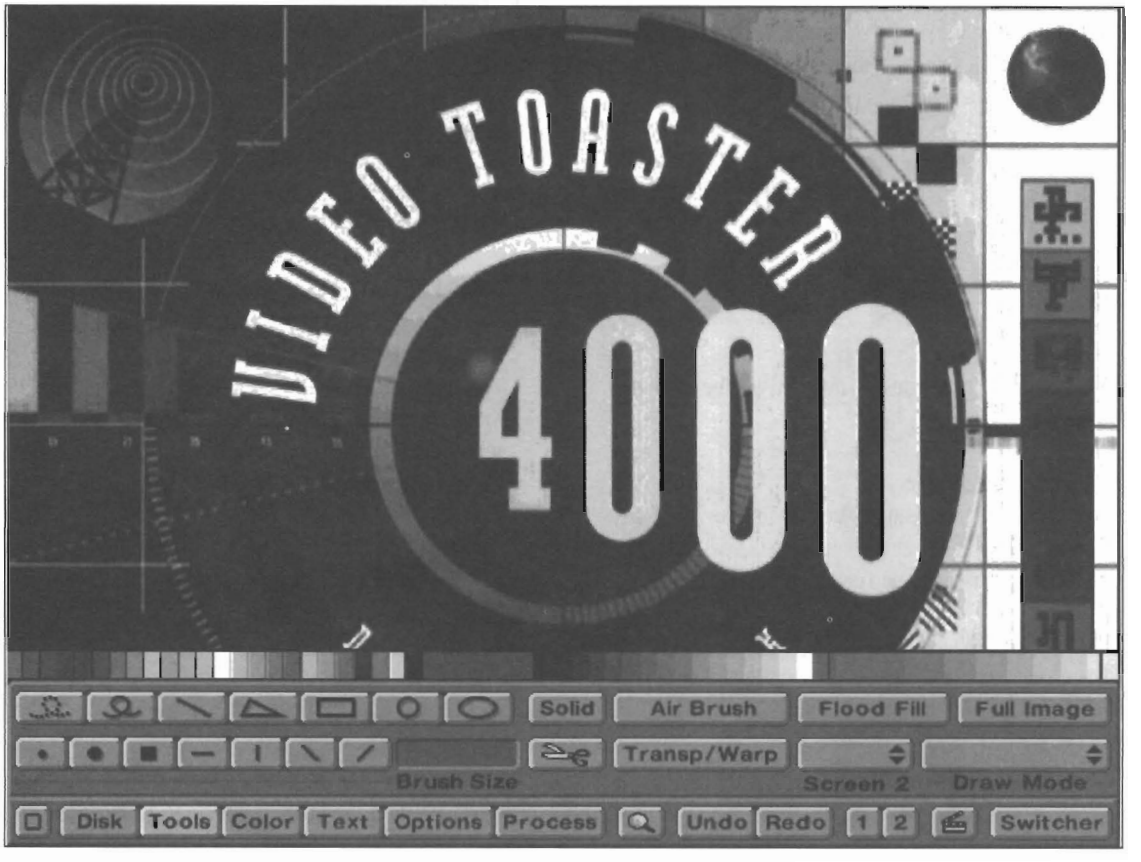
Above the Close Box is a scroll box. When the directory listing is too long to show all of it in the main window, this slider will shorten to indicate there are more names available. Drag it to view those additional files.

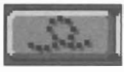
The Volumes button displays the names of all the volumes currently running on your system. This is a handy way to get to the "top level" of all drives and begin to locate files.
In the large display area you will see the names of all drives, directories, and files. Drives and directories appear in white. Click on one to open it and display its contents. File names appear in black. Double-click a file name to perform the file requester's function on it (i.e., in the Load File requester it will load the double-clicked file) automatically.

The Parent button takes you back to the previous level. If you have entered a drive and gone into several directories, each click will take you back one directory level until you reach the top.

Painting and Drawing Tools—the Tools Panel

The Tools panel is considered the main panel in ToasterPaint. Most of the drawing tools and drawing styles found in ToasterPaint are here, as well as direct access to effects such as range painting, transparency, and warping (also known as texture mapping).





Freehand
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 Solid button is activated. If you move the mouse very fast, the line won't be continuous.



Freehand Continuous
This tool creates a line using the current brush, the current color, and whichever Drawing mode is in effect.

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. If you do not match up the start and end points of your drawing, ToasterPaint will connect them with a straight line.

When the Solid button is activated this button appears filled, indicating that it will draw irregular shapes that are filled with the current color.



Straight Line
This tool creates straight lines.

To draw straight lines
Click anywhere in the canvas to establish one end point. As you move the pointer, a straight line is drawn. Move the pointer until the line is the distance and direction you want, then click the right mouse button to draw the line.

The Solid button has no effect on the straight line tool.



Polygon/Vector Line
This tool can create lines or polygons (many -sided shapes).

To create a polygon
Click anywhere on the screen to place 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. (continued)

At the last corner of the polygon shape, click the right mouse button. The polygon will be completed with straight lines connecting all corners. (If you do not match up the start and end points of your drawing, ToasterPaint will connect them with a straight line.)

With complex polygons, you may wish to complete the shape before clicking the right button to make sure that the polygon is drawn as you want.

When the Solid button is activated this button appears filled, indicating that it will draw polygons that are filled with the current color.



Rectangle
This tool draws rectangles of any size using the current brush and color.

To create a rectangle
Click anywhere on screen to place the first corner of the rectangle. Drag the rectangle outline to the desired size and release the mouse button to complete the rectangle.

When the Solid button is activated, the rectangle is filled with the current color according to the Drawing Mode in effect.

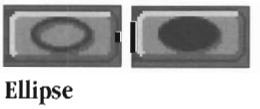


Circle
This tool draws filled and unfilled circles of any size.

To create a circle
Click anywhere on the screen and drag the circle outward to the desired size. Release the mouse button to complete the circle. The point where you click first is the center of the circle.

When the Solid button is activated, the circle is filled with the current color according to the Drawing Mode in effect.

> **Note:** This tool makes somewhat "tall" circles when viewed on the video output. To make more perfectly rounded circles, use the ellipse tool and hold down the Alt key when dragging out the circle.



Ellipse
This tool draws an ellipse of any size.

To create an ellipse
Click anywhere on screen and drag the ellipse to the desired size. The point where you click first is the center of the ellipse. 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. When the Solid button is activated, the ellipse is filled with the current color according to the Drawing mode.



Solid
Select the Solid button to make the drawing tools solid-filled drawing tools. This button is a toggle; it can be turned on and off. The drawing tools will appear filled on the menu when you activate Solid, except for Straight Line and Freehand (which do not use Solid).

> **Note:** the Freehand Curve tool disappears when solid is selected, since only *solid* outlines can be filled.

> **Tip:** If you accidentally draw a shape on screen that you wanted filled, but you forgot to turn Solid on, simply select Undo, turn the Solid button on, then select Redo. The drawing operation will be redone the way you wanted.



Air Brush
The Air Brush is a powerful tool for drawing soft-edged freehand forms and shapes. It is the electronic equivalent of an artist's air brush.

The diameter of the air brush is controlled by the Brush Size selector. You can control the flow of the air brush with the Center button of the transparency mapping controls on the Transp/Warp menu.

To use the air brush
Select Air Brush. Although the drawing tools appear active, they are not. Air Brush is a freehand drawing tool only. Use the brush tip size gadget to set the size of the air brush tip. Move onto the screen, and hold down the left mouse button. The air brush will begin painting.

Practice movement with the airbrush tool. Moving too quickly can cause the air brush to stutter. Move slowly for smoother, more gradual airbrushing.

> **Important:** The air brush tool is a freehand drawing tool. Therefore, none of the normal drawing tools is available when you select it. You cannot draw a rectangle with the airbrush, for example.

> **Note:** Depending on the amount of memory your system has, and the speed of its processor, the air brush may occasionally slow down (especially if you attempt to air brush quickly across the screen). You may need to use a smaller brush size.



Flood Fill
This button fills contiguous pixels of the same color (or within a specified color range) with the current drawing color. Flood Fill is an extremely powerful tool because it works with whatever paint mode is selected and the current level of transparency.

There are two ways to use the Flood Fill tool

- **Single Color Fill.** Select Flood Fill, then click on the portion of the screen you want filled with color. This works well for large areas of solid color where you are certain that all pixels within the region are of one RGB value.
- **Multi-Color Fill.** Select Flood Fill, then drag the pointer over the general vicinity that you want filled. ToasterPaint will take note of all of the pixels that the pointer crosses over, and it will fill an instances of contiguous pixels that it finds of those RGB values.

Example. Let's use an example to show you the two ways to use Flood Fill. Suppose you had a photograph of a sports car racing toward you in a dark tunnel. Its headlights glow bright white.

The first use of Flood Fill might be to recolor the two headlights so that they appeared more yellow, rather than white. Select a shade of yellow, activate Flood Fill, then click inside one headlight. Instantly, all the connected pixels inside the headlight that had the exact same shade of white will fill with the shade of yellow you chose.

This is the nature of Flood Fill. It fills all of the contiguous (or, side-by-side) pixels with the current drawing color.

The second use of Flood Fill will be more complete. With the same shade of yellow selected, and Flood Fill still turned on, now click and drag the pointer throughout the headlight, crossing over all of the connected pixels of different shades of white. When you let go of the button, ToasterPaint will fill the entire headlight with yellow. If you missed a few pixels, just drag over them again.



Full Image
Select Full Image when you want to apply the current drawing mode to the entire screen. The keyboard shortcut for this is the w key.

> **Tip:** This is useful when you want to blur an entire image. Select Blur or Blur 2, then click Full Image. ToasterPaint will blur the entire image. You can even control how the current color or drawing mode is applied with the transparency map controls on the Transp/Warp menu.

> **Tip:** Another use of Full image is with the scissors tool. When you want to resize the full screen image down to something smaller, you need to cut it out as a brush and then texture map it. Select the scissors tool, then click on Full image to cut out the entire screen as a brush. Now you can go to TXMap mode and resize it. (See TxMap for details.)



Brush Shapes
There are seven built-in brush tips available in ToasterPaint. Select any one of the tips by clicking on it.

The first is the one-pixel brush. Note that this brush tip is not affected by the Brush Size selector. It is always one pixel high and one pixel wide.

Beside the single-pixel brush are the round-tip brush, the square-tip brush, the horizontal-tip brush, the vertical-tip brush, and the two slant-tip brushes. The slant-tip brushes are particularly useful for calligraphy-type effects.



Brush Size Selector
The brush tips can be set to a variety of sizes convenient for painting and drawing (except, of course, for the single-pixel brush).

There are seven sizes available. Drag the slider slowly left or right and you'll see the size gadget jump from slot to slot, indicating that you have changed to the next size. To go directly to a new size, click in that location within the slider and the size gadget will jump to your pointer. Smaller sizes are to the left, while larger sizes are to the right.

> **Tip:** Notice that ToasterPaint gives you a preview of the size of the selected brush when the pointer is over this slider gadget.



Scissors
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 drawing tool. Click on the tool you want to use, then click the scissors to activate the brush cutting mode. Draw around the area you want as a custom brush and release the mouse button. A copy of the area you've defined becomes a custom brush attached to the pointer.

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The shape tools cannot be used directly with this custom brush (i.e., you could not cut out someone's eye, and then draw a circle of eyes using the circle tool). To return to drawing with a regular brush tip, or to remove the brush from the pointer, simply select a brush tip from the Tools menu.

Note: When you cut out a brush, you can cut out both the brush itself and its background, or cut out the brush without its background. See the NoBackground brush option on the Options menu for details.

Important: When cutting brushes for use with LightWave 3D: Use the single dot brush and the rectangle tool, with Coordinates turned on. Make sure that the brush image is an even multiple of 32 pixels wide. If you do not follow these steps, LightWave 3D texture maps that use brushes may have visible seams.

Important: When cutting brushes for use with ToasterCG: Brushes must be no more than 736 pixels wide by 400 pixels tall. (752 is ToasterCG's maximum brush width. ToasterPaint "rounds off" saved brush widths that are not an exact multiple of 32 to the next higher multiple of 32. Therefore, a brush with a proper width (such as 32, 64, 128, 256, 512, etc.) will work fine, while a brush with a width that is not will be saved at the next higher value that is a multiple of 32. (so a brush that is 272 pixels wide will be saved as one that is 288 pixels wide). Any brush wider than 736 will be saved as 768 and be too wide for CG.



Transparency/Warp button
Select the Transp/Warp button to go to the Transparency and Warp menu, which contains all controls for setting transparency levels, range color painting, texture mapping, and tiling effects.

See the Transparency/Warp panel for details on how to use these controls.



Screen 2
This pop-up menu allows you to decide how the spare drawing screen will be used: as a standard swap screen, as an alpha channel for the screen 1 image, or as a positive or negative stencil for drawing on screen 1. In all cases, screen 2 has the exact same dimensions as screen 1, 752 pixels wide by 480 pixels high, with exact registration.

Screen 2/Swap (Normal)
This tells ToasterPaint that the spare screen is a standard screen, just like Screen 1. You can jump back and forth freely between screen 1 and 2, using all drawing modes.

To use screen 2 as a standard spare drawing screen (like screen 1)
Click and drag the pointer over this pop-up menu. Select the Swap option. This makes the spare screen into a standard, 24-bit color drawing screen. (This is the standard setting that ToasterPaint uses for the spare screen unless you set it differently.)

Important: When you change the function of screen 2, its contents will be erased in order to reset it. Therefore, before you change the function of screen 2, make sure to save your work. Otherwise, it will be lost.

Screen 2/Alpha
This setting tells ToasterPaint to use screen 2 as an alpha channel screen. This screen, which is used to generate transparency maps for other uses, utilizes the gray scale palette near the middle of the color strip rather than the palette filled with color hues.

Alpha channels are used to generate transparency maps. Different shades of gray in the alpha channel image represent different brightness levels within the image. These brightness levels are used to determine the amount of transparency or blending between two images. Depending on an application's use of the alpha channel, brighter values may mean more transparency and darker values less transparency, or vice versa.

The alpha screen has the exact same dimensions as screen 1, that is, 752 pixels wide by 480 pixels high, with exact registration. It's important to know what the alpha channel is used for, since you may wish to create overlay graphics for LightWave or the Switcher.

To use screen 2 as an alpha channel screen
Go to the Tools menu and drag the pointer over the Screen 2 pop-up menu. Select the Alpha option.

Screen 2/Stencil Positive
This setting tells ToasterPaint that screen 2 is to be used as a stencil for any drawing operations that you plan to perform on screen 1. The image, text, or graphics that you have on screen 2 will be used as a mask, protecting those parts of screen 1 from being changed. The determining factor is the brightness of the imagery on screen 2. Any portion of screen 2 with a luminance value over 128, 128, 128 (RGB) or just 128 (gray scale) is considered part of the mask.

For example, screen 2 is set to Stencil Positive. On screen 2 you create a text brush that says "ToasterPaint" and stamp it down using the color white (255, 255, 255). Back on screen 1, you select the air brush and scribble across the screen (making sure to go over the area where the word "ToasterPaint" appears on screen 2). The air brush will draw on screen 1 outside of the areas of the word "ToasterPaint."

The positive stencil setting tells ToasterPaint to look at the image drawn on screen 2, and protect any portions that are brighter than 128, 128, 128 from being changed. Since the entire word "ToasterPaint" was drawn in 255, 255, 255 white, it became the mask. The remainder of the image at 0, 0, 0 black, was not used.

To use screen 2 as a positive stencil screen
Go to the Tools menu and drag the pointer over the Screen 2 pop-up menu. Select the Stencil Pos option.

Screen 2/Stencil Negative
This setting tells ToasterPaint that screen 2 is to be used as a stencil for any drawing operations that you plan to perform on screen 1. Any portion of screen 2 with a luminance value below 128, 128, 128 will act as a mask that will protect corresponding portions of screen 1 from being changed. Anything above this value will not be masked. The determining factor (what part is masked and what part is not) is the brightness of the imagery on screen 2.

As an example, let's use same screen 2 design that we used for the positive stencil setting (above). Screen 1 is blank (or any image, it doesn't matter), and screen 2 contains the word ToasterPaint stamped in white on the black background. In this case, with stencil set to negative, select the air brush and scribble across screen 1 (making sure to go over the area where the word "ToasterPaint" appears on screen 2). The air brush will draw on screen 1 inside of the areas of the word ToasterPaint, leaving the outside areas untouched.

The negative stencil setting tells ToasterPaint to look at the image drawn on screen 2, and to protect any portions that are darker than 128, 128, 128 from being changed.

To use screen 2 as a negative stencil screen
Go to the Tools menu and drag the pointer over the Screen 2 pop-up menu. Select the Stencil Neg option.



The Draw Mode pop-up menu
The drawing mode is the current effect or style in which paint will be applied.

For example, suppose the current color is bright red and the draw mode is Normal. When you draw on screen, you will lay down red paint over the background or image. If you change the draw mode to lighten, drawing on screen will lighten those portions of the screen where you draw.

The Draw Mode button is actually a pop-up menu; drag the pointer over it to select a different style of drawing from the menu that appears. When you select a new drawing style, its name will then appear on the pop-up button as a reminder of the mode you have chosen.

Note: If you turn on the Coordinates toggle at the Options menu, then the current draw mode name will be replaced with the X and Y coordinates of the pointer. This is useful for lining up graphics at exact locations.

Note: If you activate the Use Grid toggle on the Options menu, then a # symbol will appear beside either the draw mode name or the coordinates display, whichever is activated, on the Draw Mode pop-up menu. This acts as an indicator that the grid is active.

ToasterPaint Drawing Modes

ToasterPaint offers a variety of drawing modes. Each of these painting modes offers very powerful ways to create and alter images. The effect of the drawing mode extends to all of ToasterPaint's tools. In other words, the in the Normal drawing mode, all tools will draw normally. In Darken, all tools will function to darken the background or image underneath.

Important: Keep track of the mode and the sub-menu functions you have turned on! It's fairly easy to set a certain level of transparency for a certain draw mode, then change drawing modes and forget that you have transparency turned on when you go to draw. (The Golden Rule: If you don't get the results you expect, make sure that all settings are the way they should be.)

Following is a description of each of ToasterPaint's drawing modes.

Tip: All of ToasterPaint's drawing modes can be adjusted using the transparency mapping controls on the Transp/Warp menu. For example, to Lighten an area on screen a small amount, select Lighten mode, and set the transparency controls to 50%. This lessens the effect of Lighten when you draw, giving you more control over how much of an effect is applied.



Normal Drawing Mode

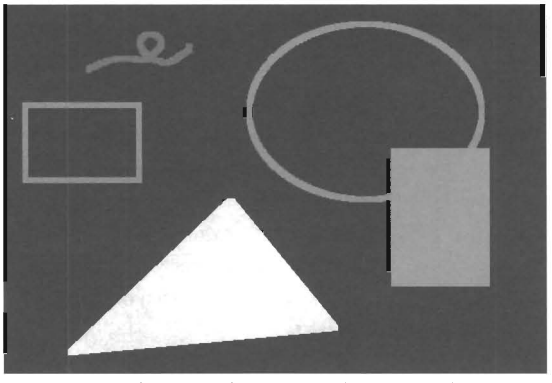
This is the default painting mode.

When you draw in the Normal mode

The paint you apply to the screen is that of the current color.

When you stamp down a copy of a custom brush in Normal mode

The brush is applied to the screen using in its normal colors.



An example of Normal drawing mode on a black background. Nothing fancy here, simply a few drawing tools used with and without the Solid button turned on. Normal drawing mode draws shapes and outlines in solid color.

Range Drawing Mode

The Range drawing mode applies paint to the screen using the color range displayed on the color strip.

When you draw in the Range mode

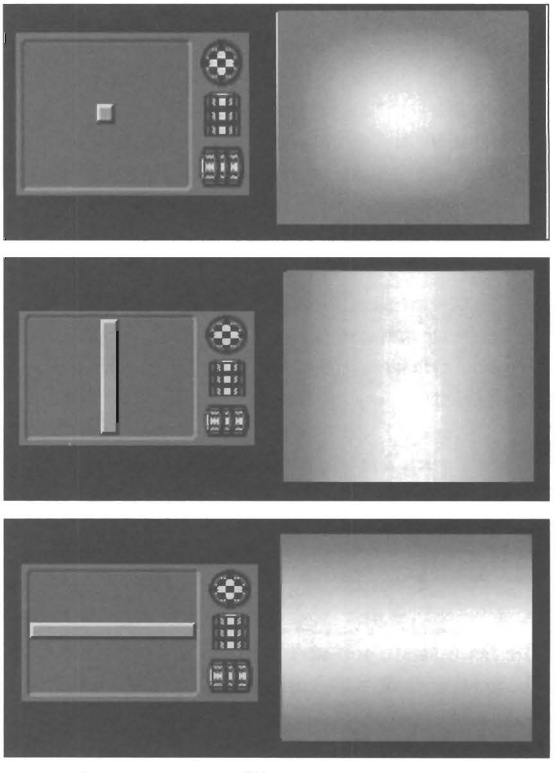
The current color is ignored. Paint is applied using the ramp of colors in the color range only.

When you stamp down a copy of a custom brush in Range mode

The area underneath the brush will be colored according to the current range settings. The colors of the brush are not used by Range drawing, only the shape of the brush.

> **Note:** When you first select Range drawing, the transparency map (on the Transparency/Warp menu) is automatically switched on in Spherical mode. The three mapping modes allow you to determine how and where the center color appears when you draw on screen. (See the Transparency and Warping panel for details.)

> **Tip:** This drawing mode can be used to create highlighting effects, backgrounds with graduated shades of multiple colors, or other lighting effects.



Three simple examples of Range drawing using a filled square. Each example shows the setting for the mapping control on the Transparency/ Warping panel beside the resulting graphic. The mapping control can be used to affect how the range colors are applied.

You can drag the point or bar gadget within the mapping control to give you many more possible variations, and much more control over the way the range is applied.

Lighten Drawing Mode

The Lighten drawing mode lightens the area of the screen where you apply paint.

When you draw in the Lighten mode
The current color is ignored. Paint is not actually applied, rather you are simply lightening the location where you draw.

When you stamp down a copy of a custom brush in Lighten mode
The area underneath the brush will be lightened. The colors of the brush are not used by Lighten, only the shape of the brush.

Tip: Lighten is very useful with the Redo command, so that you can lighten an area you've just drawn.

Important: Lighten and Darken are not mirror operations due to the fact that when you draw you may reach the upper or lower limits of possible pixel values. Therefore, if you use darken on an area of the screen five times, you will probably not be able to use Lighten on it five times to return it to its original state.

Darken Drawing Mode

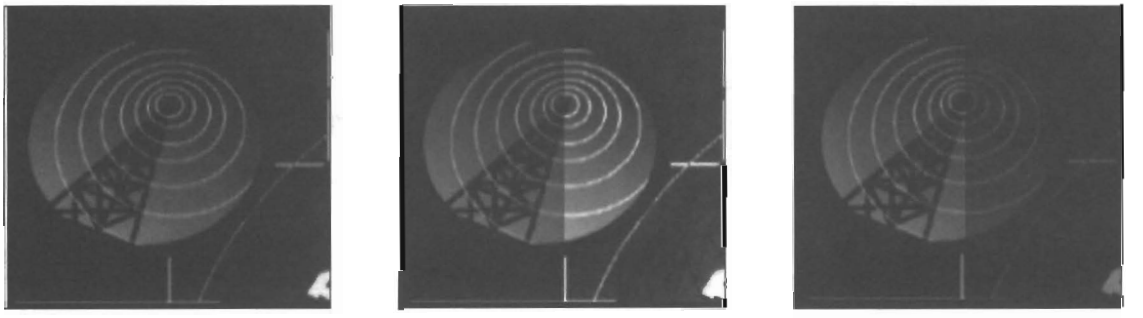
The Darken drawing mode darkens the area of the screen where you apply paint.

When you draw in the Darken mode
The current color is ignored. Paint is not actually applied, rather you are simply darkening the location where you draw.

When you stamp down a copy of a custom brush in Darken mode
The area underneath the brush will be darkened. The colors of the brush are not used by Darken, only the shape of the brush.

Tip: Darken is very useful with the Redo command, so that you can Darken an area you've just drawn.

Important: Lighten and Darken are not mirror operations due to the fact that when you draw you may reach the upper or lower limits of possible pixel values. Therefore, if you use darken on an area of the screen five times, you will probably not be able to use Lighten on it five times to return it to its original state.



Samples of Lighten and Darken drawing on a corner of the Video Toaster 4000 logo picture. The first image is as it normally appears. The second image shows the right half of the image Lightened. The third image shows the right half of the image Darkened.

Using the transparency mapping controls you can adjust how much lightening and darkening occurs, as well as whether the transition between the affected area is hard-edged (as shown) or softly blended.

Colorize Drawing Mode

The Colorize drawing mode changes the color of the area on screen where you apply paint, not the brightness. The colorized area takes on the shade of the current color while maintaining the brightness of the original image.

For example, suppose you had an image of a red apple. If you selected Colorize, and use the color green as your current color, you could change the red apple to a green apple just by drawing on it. The light and dark areas of the apple would remain as light and as dark as before, only now they would be colored various shades of green.

> **Tip:** Use Colorize on a black-and-white picture to give it a sepia-toned look, or draw with pale, faded colors to achieve a hand-tinted look. You can even try your hand at making a black-and-white image full color.

When you stamp down a copy of a custom brush in Colorize mode

The area underneath the brush will be colorized according to the current color. The colors of the brush are not used by Colorize, only the shape of the brush.

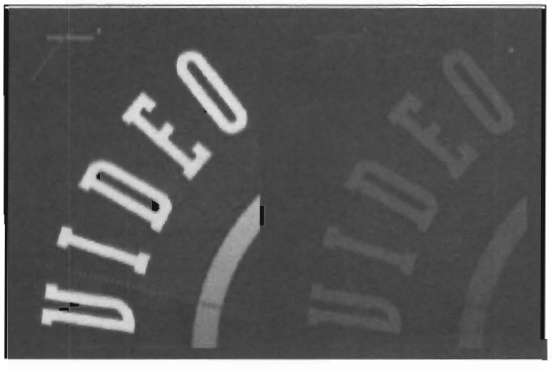
RubThru Drawing Mode

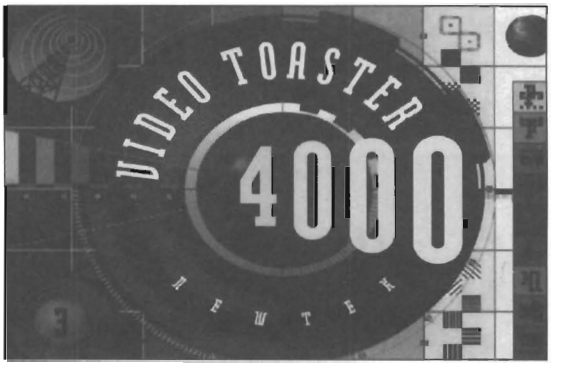
The RubThru drawing mode is a useful tool for compositing parts of different images into one. In the RubThru mode, wherever you draw on screen, the image from the other screen begins to show through.

RubThru requires that you had two images loaded, one into Screen 1 and one into Screen 2. The current drawing color is ignored, since the spare screen is providing the "paint" where you draw.

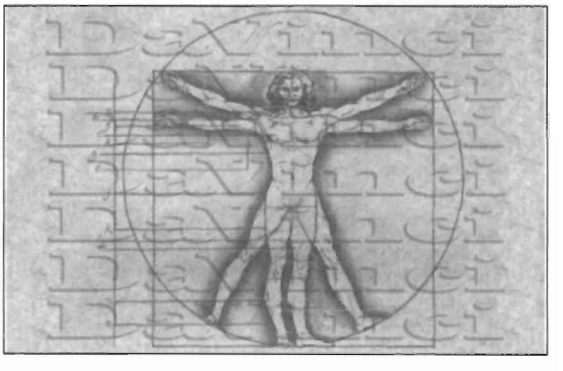
> **Note:** RubThru supports all transparency features, fill, or any brush (including the air brush). The transparency controls can be used with RubThru to create very misty montage effects.

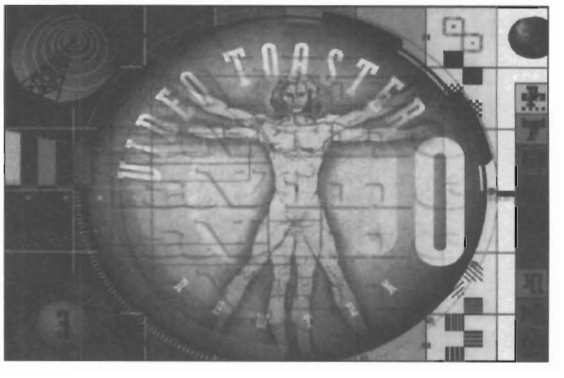
When you stamp down a copy of a custom brush in RubThru mode, the area underneath the brush will be rubbed through from the spare screen. The colors of the brush are not used by RubThru, only the shape of the brush.





(Above.) An example of Colorize, both before and after, on a portion of the Toaster 4000 logo picture. The lettering was originally white. On the right it has been colorized with a dark red. While the color change is not apparent in black-and-white, you should get the idea.





(Three images at right.) An example of the Rub Thru drawing mode using two full-screen images, one loaded to screen 1 (top) and the other to screen 2 (middle). The resulting image (bottom) was created using the Circle drawing tool, with Solid turned on, and point-type transparency mapping (with the edge set to 100% transparency.) Drawing on the logo image caused the other image to rub through the solid drawn circle with soft blending at its edges.

Blur Drawing Mode

The Blur drawing mode is used to soften or defocus an image (or portions of the image). The current color is not used by Blur. Paint is not actually applied, rather you are simply blurring the part of the screen where you draw.

> **Note:** Blur is a fairly subtle effect. You may need to apply Blur several times before you see a noticeable difference.

> **Tip:** Use this effect repeatedly to create a very watery effect.

> **Tip:** You can use the transparency controls to control the amount of blurring.

When you stamp down a copy of a custom brush in Blur mode, the area underneath the brush will be blurred. The colors of the brush are not used by Blur, only the shape of the brush.

Blur 2 Drawing Mode

The Blur2 drawing mode is an extension of the Blur mode; it blurs over a slightly greater area than Blur. Use it to soften or defocus an image (or portions of the image). The current color is not used by Blur2. Paint is not actually applied, rather you are simply blurring the part of the screen where you draw.

> **Tip:** Use this effect repeatedly to create a very watery effect.

> **Tip:** You can use the transparency controls to control the amount of blurring.

When you stamp down a copy of a custom brush in Blur2 mode, the area underneath the brush will be blurred. The colors of the brush are not used by Blur2, only the shape of the brush.



The effects of Blur and Blur2. The original image on the left shows a portion of the Toaster logo. The image at center exhibits a single application of Blur. The image on the right shows a single application of Blur2.

TxMap Drawing Mode

The TxMap drawing mode is used for drawing texture mapped or warped imagery using cut out brushes. You can also use it to resize brushes and images.

The TxMap mode is not available to you until you have cut out a brush, since TxMap requires the imagery of a custom brush to manipulate into the next shape you draw.

After cutting out a brush, go to the Options menu and select Copy to Swap from the brush options column. This tells ToasterPaint to place a copy of the brush in a special buffer used for TxMap mode. Select the TxMap drawing mode, a drawing tool, and paint with warped imagery.

The transparency mapping and warp mapping controls on the Transparency/Warp menu will be activated when you select TxMap mode. Use the warp mapping controls to set the amount of warping, smoothing, and tiling when you draw. Use the transparency mapping controls to determine the blend between the warped shape and the background.

Note: The brush you cut out for texture mapping may be any size, including the entire screen. Note that if you texture map a brush to a larger size than it was originally, it will looked somewhat chunky.

Tip: Here's a useful shortcut for resizing the full screen image. Load the image, select the scissors tool, then click on Full Image. The entire image will be cut out with the brush tool. Activate TxMap mode and you're free to warp, resize, whatever, with the next drawing tools you use.

Important: The first time you cut out a brush, you can go directly to the TxMap mode. However, for every brush that you cut out with the intention of texture mapping after that, you must go to the Options menu and select Copy to Alt before activating the TxMap draw mode. This places a copy of the newly cut brush into a special buffer that ToasterPaint reserves for the TxMap drawing mode. (Otherwise, the previously cut out brush may be used instead.)

For example, here are the steps for using TxMap draw mode to warp an image into a spherical shape:

1. Load an image (we chose the Video Toaster logo).

2. Use the Rectangle tool and cut out a brush that surrounds the part you want texture mapped. The brush will attach itself to your pointer. (We cut out the entire image as a brush.)

3. Go to Options, to the brush options column, and select Copy to Swap.

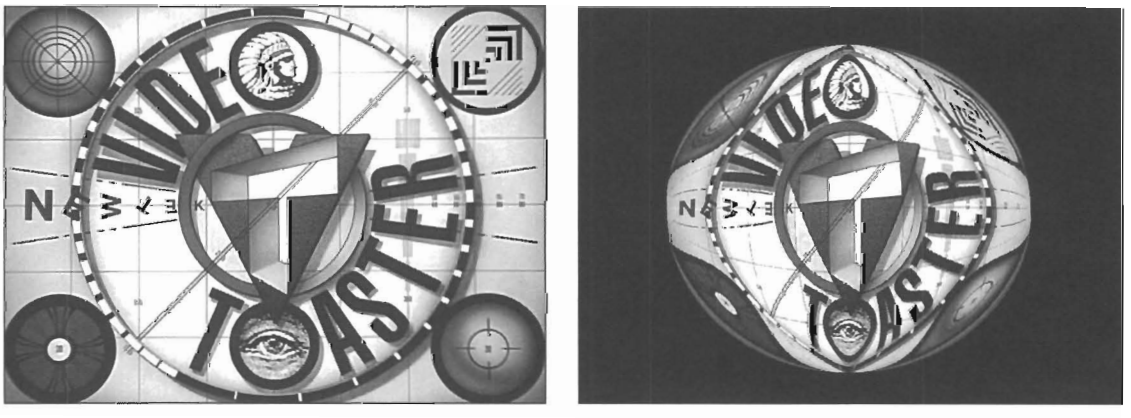
4. Go to Tools and select TxMap from the pop-up draw mode menu. The brush may disappear from your pointer, but ToasterPaint knows to use it for the next drawing operation (because you selected TxMap).

5. Click on the Transp/Warp button to go to the Transparency and Warping control panel. Click on the point warping button (it looks like a tiny sphere). Set the Warp Amount to 25%.

6. Click on the Tools button to return to the Tools panel. Select the Ellipse tool. Now select the Solid button so that the Ellipse tool will draw solid-filled circles.

7. Hold the Shift key and press k on the keyboard. This will clear the screen to the color black. Go to the center of the screen a drag out a circle.

   ToasterPaint will draw a filled circle with a fish-eye lens appearance. To alter the amount of warping, select the Transp/Warp button and try out the different settings.



The Video Toaster logo before and after the TxMap example listed above.

And Drawing Mode

The And drawing mode is similar to painting with a colored filter.

The effect of And is to change the affected colors to reflect the color you're drawing with. And compares the RGB values of each pixel on screen with those of the current drawing color, leaving behind only the values that can be found in both the screen and the applied color.

> **Tip:** And is also useful to remove other colors. For instance, if you And with Red 255 (Green 000 and Blue 000), the result will be the pure red separation of the picture.

When you stamp down a copy of a custom brush in And mode, both the shape of the brush and the current color are used. The shape of the brush is used to apply paint to the image, and the paint is applied using the current drawing color with And mode.

> **Note:** There are no example images of the And drawing mode, since the effects are most easily seen with color imagery. Experiment with this drawing mode using different colors to see its effects.

Or Drawing Mode

The Or drawing mode is similar to blending the current color with the colors on screen. The effect of Or is usually to add color. It works by leaving color that is in either the brush OR on the screen (or both).

When you stamp down a copy of a custom brush in Or mode, both the shape of the brush and the current color are used. The shape of the brush is used to apply paint to the image, and the paint is applied using the current drawing color with Or mode.

> **Note:** There are no example images of the Or drawing mode, since the effects are most easily seen with color imagery. Experiment with this drawing mode using different colors to see its effects.

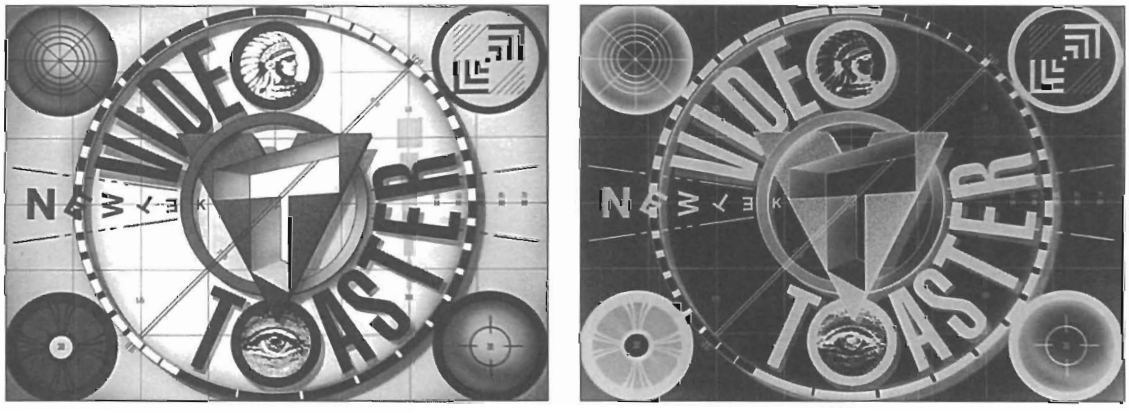
Xor Drawing Mode

Xor stands for an "exclusive-or" operation. The Xor (pronounced Ex-or) drawing mode reverses the colors of the area you draw on.

> **Tip:** Use pure white (255, 255, 255) and the Xor mode will make the area you draw on turn negative.

> **Tip:** Some very interesting false color effects can be created by using Xor with other colors like red or blue.

When you stamp down a copy of a custom brush in Xor mode, both the shape of the brush and the current color are used. The shape of the brush is used to apply paint to the image, and the paint is applied using the current drawing color with Xor mode.

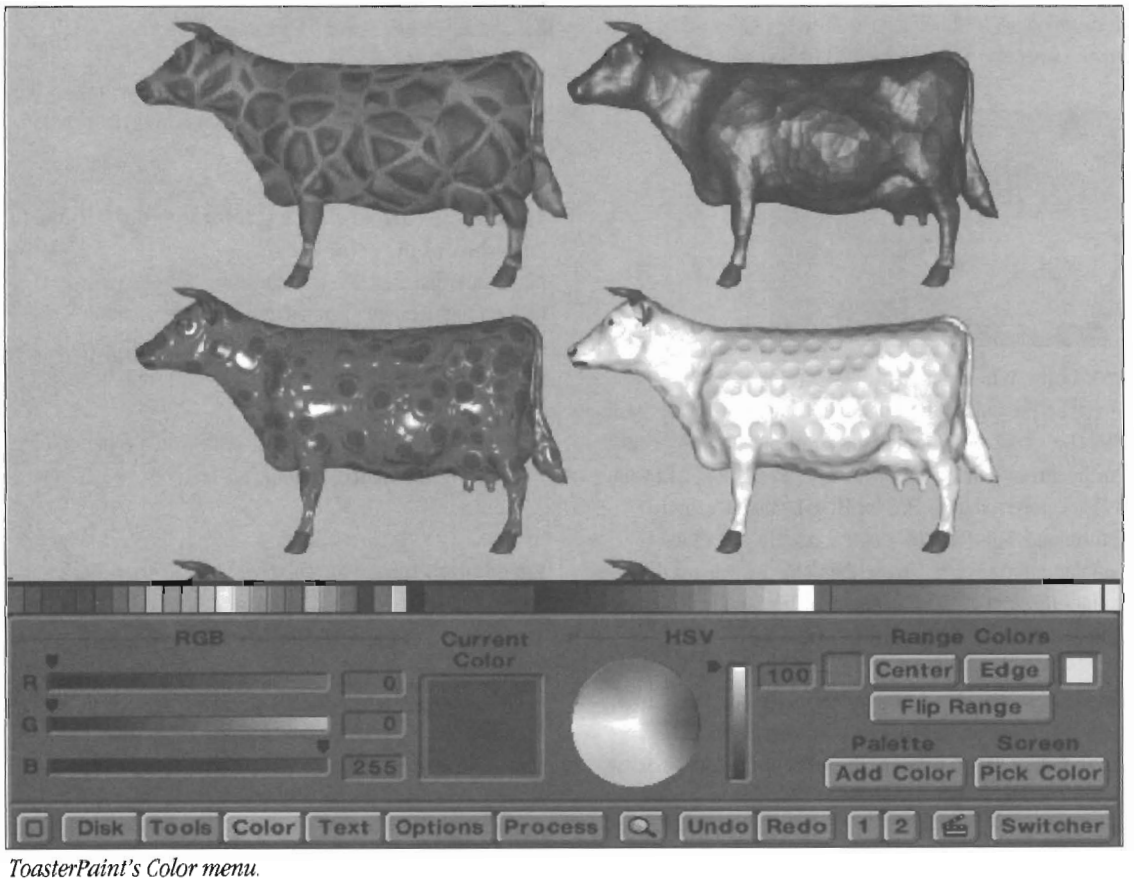


The effect of the Xor drawing mode when you select pure white (255, 255, 255) as the drawing color. A Negative image.

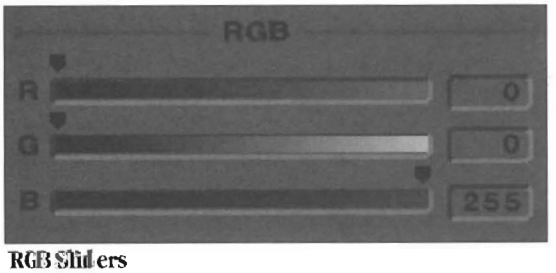
Mixing and Selecting Colors—the Color Panel

Television and computer color are actually an additive blend of the three primary colors, red, blue, and green. When you mix these colors in varying quantities, you can create any of the colors that you've seen on television. ToasterPaint offers you many ways to mix and select color:

- You can use the RGB sliders to add or subtract specific amounts of red, blue, or green.
- You can use the HSV color wheel to select a hue or adjust its saturation. Use the Value slider to adjust its intensity.
- You can create ramps of color by blending any two colors using the color range controls.
- You can select the color you want directly from the image on screen using the "pick color" function.



ToasterPaint's Color menu.



RGB Sliders

These three sliders control the red, green, and blue color components of the current color. For 24-bit color, each of the RGB sliders has a value range from 0-255 (providing 16,777,216 different possible combinations of color).

This control has two ways to adjust the current color value:

- Position the pointer over the small black slider beside the color you want to adjust, and drag it to the left or the right. Go right to increase its color value, go left to decrease it.
- Click in the gray area to either side of the small black slider to raise or lower its value 1 unit at a time.

If you are using an Amiga 4000

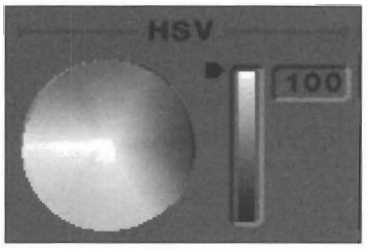
Although ToasterPaint is working with 16.7 million colors internally, there are only 256,000 distinct colors that can be displayed on screen. You will see color possibilities displayed on screen. Therefore, you should know that when you change a color value by any increment less than 4, you will not see a difference on screen, although that difference will occur in the actual RGB image.

If you are using an Amiga 2000/3000

Although ToasterPaint is working with 16.7 million colors internally, there are only 4,096 distinct colors that can be displayed on screen. Therefore, you should know that when you change a color value by any increment less than 16, you will not see a difference on screen, although that difference will occur in the actual RGB image.



Current Color box
This box shows a large sample swatch of the current drawing color. It will change to show the color that you are mixing whenever you use the RGB or HSV color controls.



HSV Color Wheel and Value Slider
Together, the Color Wheel and the Value Slider comprise the HSV color control portion of the Color menu. (HSV stands for the three color components, Hue, Saturation, and Value. It is also referred to as HLS for Hue, Luminance, and Saturation.) This form of "color space" as it is called is popular among artists. To use the Color Wheel, just drag the pointer through it. The current color box and RGB sliders will update as you drag through the Color Wheel.

The Color Wheel shows two aspects of the current color, hue and saturation. It's best to use the wheel to locate a color and set its saturation at the same time, since these two aspects of the current color cannot be adjusted separately with this control.

To select a color from the Color Wheel
Drag around the wheel in a clockwise or counterclockwise manner. You will see changing hues of color from red to magenta to blue to cyan to green to yellow (with others in between).

To adjust color saturation using the Color Wheel
Move the pointer in a straight line, in and out from the center of the wheel to the outer edge and you'll adust saturation. For example, if you moved from the outer edge where the color red resides directly to the center where white resides, the red would grow paler and paler until it became white.

The Value Slider adjusts the intensity of the color's ability to reflect light. This is similar to the Diffuse control found within LightWave 3D. All colors reflect light. A fully saturated red, reflecting a lot of light, will look bright red. However, if that red reflects little light, it will appear a dark brick red. This is controlled by the Value slider.

Tip: LightWave 3D users who wish to create luminosity maps, or other specialty maps that use luminance values between 0-100%, will find the Value slider invaluable when creating texture maps.



Center button
This is one of the Range drawing mode controls. It takes the current color and inserts it into the center well of the color ramp.

To copy the current drawing color into the left-most color box of the color range
Make sure that the current color is the one you want to insert into the range, then click on the Center button. The color range will update itself automatically to display the new range of colors used by the Range draw mode.

Tip: Remember that you should have the proper color showing in the current color box first, before selecting Center.

Edge button (image shown above)
This is one of the Range drawing mode controls. It takes the current color and inserts it into the edge well of the color ramp.

To copy the current drawing color into the right-most color box of the color range
Make sure that the current color is the one you want to insert into the range, then click on the Edge button. The color range will update itself automatically to display the new range of colors used by the Range draw mode.

Tip: Remember that you should have the proper color showing in the current color box first, before selecting Edge.

Flip Range button (image shown above)
This is one of the Range drawing mode controls. It swaps the two range colors, center and edge, so that they exchange positions.

To swap the two range colors
Click the Flip Range button. The two colors will change positions.



Add Color button

Use the Add Color button to insert the current drawing color into one of the 24 inkwells on the color strip. This makes a permanent change to the palette, which means that the next time you turn on ToasterPaint, any colors you changed in a previous session will still be present.

To insert a color into the adjustable palette

First make sure that the current color is the one you want (select or mix the color as necessary). Click on Add Color, then click on the inkwell where you want the color installed. The color box you select will change to the new color.

The color you insert into the palette is permanent, and will remain this color (unless you add a new color over it in the future).

> **Note:** ToasterPaint works with a 24-bit, or 16-million color, palette. The 24 inkwells of the color strip represent a selection of useful colors that you can change to suit your taste. They do not necessarily have to be used in the current image, or be taken from it. This is the reason why you can design your own preferred palette that will remain consistent from session to session. All colors are available to you at all times.



Pick Color

Select Pick Color when you wish to choose a color directly from the screen image itself. This is useful when you need to select a specific shade of color that might be difficult to mix with the color controls, such as a particular skin tone.

To pick a color from the screen image

Select Pick Color. The pointer turns into a left-pointing arrow. Move this pointer over the screen image. The Current Color box will change as you move around on the image, reflecting the color that is directly beneath the pointer tip. When you locate the color you want, click the left mouse button to pick it and make it the current drawing color.

> **Note:** If the menu is displayed over the portion of the image you want to select a color from, press Esc to hide it.

> **Tip:** You can also hide the menu first, then press the comma key on the keyboard. This is the keyboard shortcut for clicking on Pick Color.

> **Tip:** Another method for picking color is to click on the current color indicator on the color strip, then drag the pointer up into the picture area. This puts ToasterPaint into an automatic "Pick Color" mode for as long as you hold down the mouse button. When you let go, you will have selected the color beneath the pointer.

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Adding Text and Titles—the Text Panel

The Text menu is designed to let you create text brushes for use in your video graphic designs. ToasterPaint supports PostScript Type 1 fonts only. Text brushes may be created at any shear or rotation angle, and in a wide variety of sizes and widths. You can use text brushes with any of ToasterPaint's drawing modes, allowing you to create text with transparency, color ranges, texture mapping, and more.

When you select the Text menu for the first time, the only operation available to you is Load Font. You must first select a font before you can create a text brush. Once you have chosen a font, all of the controls on the Text menu are available.

To create a text brush, select a font, enter text into the text window, and click on Create Brush. If you wish to alter the size of the resulting brush, or change other aspects of its appearance, use the controls found on the lower portion of the panel before selecting Create Brush.



ToasterPaint's Text menu.



Load Font button

To select a font, click this button. ToasterPaint will display a file requester for you to locate and select a PostScript font. Only one font may be loaded into ToasterPaint at a time. It will remain available from the Text menu until such time as you load a new font or quit ToasterPaint.

To load a font

Click Load Font. Use the file requester to locate and load a PostScript font. You will be returned to this panel, with the remaining controls available for use.



Enter Text field

The text that you wish to convert into a brush should be entered here. When you press Return (or click the Create Brush button) ToasterPaint will create the brush.

To create a text brush

After loading a PS font, enter text into this field. Press Return. In a moment, the brush will be generated.

> **Note:** Depending on the size and width of the font itself, it is possible to create a brush that is too large to fit on screen. If so, make smaller brushes, a few words at a time so that you can work with them more easily.



Create Brush button
Select this button to convert the current text string into a text brush. Text brushes are always made with the color white, but you can use the appropriate drawing mode with any color of your choice to stamp the brush down as you desire.



Font Options (Bold, Outline)
These two buttons allow you to change the basic look of the font when you create a text brush. They are toggle controls which may be turned on or off in any combination.

Bold option
Turn this setting on to make the font thicker, as if it were bold.

Outline option
This setting generates only the outline of the characters in the text brush, as if the font itself transparent.



Height
PostScript fonts may be sized between 10-300 lines high. Use the button slider to set the font height that you would like to use in the text brush.



Width
The width of a font is designed at a specific ratio to its height. Therefore, the Width value always defaults to 1, or the normal width for the font given its current height setting (as designed by the font's original designer). When you enter a height value from 10-400, the correct width to maintain a 1:1 ratio will be set automatically.

To change the width of the current font use the numeric slider to enter a new value. For video graphics it's often useful to condense a font in order to get more characters on the screen. In such cases, you would use a number between 0 and 1. To widen or expand the font, use values above 1.

Note: A negative value (between 0 and -1) would do two things: affect the width of the font in the same manner as a positive value (between 0 and 1), but also flip the brush to create a mirror image of it.



Shear
Shear changes the angle of the font relative to a stationary baseline. If you could hold down the base of the letter and force it to lean to the left or right, you would have the rough equivalent of shear. Shear is used to italicize lettering.

Positive shear (from 1 to 60 degrees) will angle the text to the right so that it appears in a familiar italic form. Negative shear (-1 to -60 degrees) will angle the text to the left.

Tip: A neat trick with Shear is to create a font brush that is sheared at an extreme amount, say 60 degrees, and stamp it down using Darken mode. Then set Shear back to 0 degrees, create the text brush again, and stamp it down in Normal mode so that the baselines of the two brushes line up. The effect is that of a long angled shadow stretching back behind the font.



Rotate
Rotate will revolve the text brush so that it appears rotated at an angle.

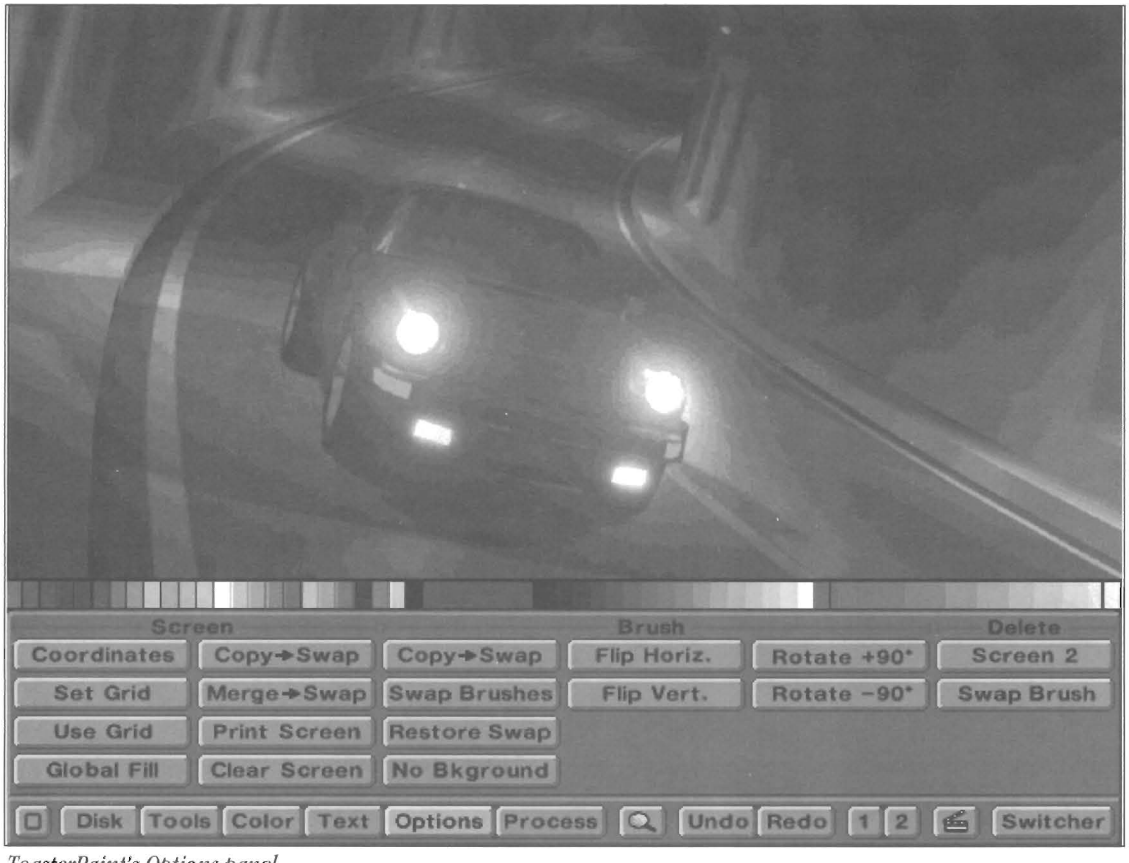
Positive rotation angles from 1 to 360 degrees will rotate the text brush in a counterclockwise direction. Negative values (from -1 to -360 degrees) are allowed.

Tip: A neat trick to create text where the characters appear upright, yet the word(s) look slanted on an angle, is to create a brush using the same values for Shear and Rotate. Try loading a font with a 20 degree Shear and a 20 degree Rotate and you'll see this useful effect.

Useful Functions—the Options Panel

The Options menu contains useful tools and utility functions that you're not likely to use often, but which are handy when you need them.

These abilities include turning on and off the screen coordinates, the global fill command, brush rotation commands, the "no background" command for picking up brushes, and more.



ToasterPaint's Options panel.

Screen Options



Coordinates
The Coordinate button switches on the coordinate display, which appears on the Draw Mode pop-up. The readout shows the pointer's distance from the upper left corner of the screen along two axes: X (left-right) and Y (up-down). The upper left-hand corner pixel is at 0x, 0y.

When you draw on screen, the coordinate display changes relative to the starting point of your drawing. In other words, if you begin drawing a rectangle at 124x, 50y, and you draw a box that 50 pixels by 60 pixels, the display will read 50x, 60y. If the menu has disappeared as you draw, click the right mouse button to bring it back so that you can see the coordinates.

The screen display of the television signal is made up of a grid work of tiny squares called pixels. This grid is 752 pixels across and 480 pixels high. Each pixel has an identifiable location, defined as the X and Y coordinates.



Set Grid
When you need to line up graphics along specific increments, it's useful to "lock" the pointer to an invisible grid so that it can move along specific lines only. The grid tool allows you to do this (see Use Grid, below).

Set Grid allows you to set the grid increment. Select Set Grid, move the pointer over the screen and click and hold the left mouse button. You will see a tiny array of points appear. Drag the mouse to change the spacing of the points in the grid array. When the spacing is at the desired size, release the button. Remember to select Use Grid to activate the grid spacing you've just set.



Use Grid
Select Use Grid to lock pointer movement to the current grid spacing. When the grid is activated, a number sign (#) appears next to the current paint mode or coordinate display on the Draw Mode pop-up menu button.

If you have a brush already cut out, the current brush size and shape are unaffected by the grid. However, if the grid is active, the drawing tools (which also act as brush-cutting tools) are constrained to cut brushes in the same manner that the tools are constrained to draw.

With the grid on, drawing tools are constrained in the following ways:

Freehand tool
Since this tool draws unconnected dots, dots will appear only at the grid points.

Freehand Continuous tool
You can draw straight lines from grid point to grid point, either horizontally, vertically or diagonally.

Polygon tool
You can make a polygon whose corners lie at any number of grid points.

Straight Line tool
You can connect any two grid points with a straight line.

Rectangle tool
You can make rectangles whose corners lie at any four grid points.

Circle tool
You can draw circles where the center is located at any grid point, and the radius extends from that point to another grid point.

Ellipse tool
You can draw an ellipse whose center is located at any grid point, with at least one point on the circumference passing through another grid point.



Global Fill
This option is related to the Flood Fill tool. It allows you to change the color of all of the flood-filled areas on screen (whether they are touching or not) that have the same RGB color value. Global Fill will change the color in all of those areas in one operation.

For example, suppose you have an image of a house. You have used Flood Fill to fill each of the windows with the color sky blue. The result is that you have five unconnected areas that contain the same shade of blue. Later, you decide to make that a darker shade of blue. Select the color blue that you want, select Flood Fill, turn on Global Fill, and click in any one of the five windows. All five will fill with the new shade of dark blue.



Copy to Swap
This button copies the current screen to the swap screen. Both screen 1 and screen 2 must be standard drawing screens for this option to function. If screen 2 is set to be an alpha channel screen, for example, this option will not be available.



Merge with Swap
Merge with Swap will merge screen 1 and screen 2using the operation chosen from the Mode menu. With Merge, the whole back picture is the "paint."



Print Screen
Select Print Screen to send the picture on screen to a printer. ToasterPaint uses the printer settings that have been set up from the Amiga's Workbench (printer control programs are found in the Preferences drawer of the Workbench), so you should make sure these settings are correct before trying to print. Refer to the Amiga Users Manual if you have any questions about how to set up Preferences to work with your particular printer. Also, make sure the printer is connected to the system and powered on.

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.



Clear Screen
Clear Screen blanks the entire screen with the current drawing color. Anything on screen will be cleared, however, Undo will retrieve the image if used immediately afterward.

Clear Screen will not affect the spare screen.

> **Note:** The keyboard shortcut for this command, Shift+k, always clears the screen using the color black.

Brush Options

ToasterPaint allows you to work with two custom brushes at a time, a current brush that is attached to the pointer and a swap brush that is held in memory. The swap brush is used as the texture image when you are texture mapping (see the TxMap drawing mode).



Copy to Swap
At any time while a brush is attached to the pointer, select Copy to Swap to make a copy of it in memory.



Swap brushes
Select Swap Brush to exchange the current brush with the brush in memory. This is useful when you want to alternate working with two brushes.



Restore Swap
When you have a brush in memory (i.e., you have used the Copy to Swap command) that you wish to use without removing it from memory, select Restore Swap. The current brush, if there is one, will be cleared from the pointer in order to bring back the swap brush.



NoBackground
NoBackground treats the current drawing color as if it were a stencil color during a brush cutting operation. This allows you to cut out a brush and pick up a copy of it without picking up the "background" on which it appears. Simply make sure the current color is the color you wish to consider the background, then select Nobackground and cut out the brush. It's very useful when you have an unusual shape to cut out from a normal background.

> **Note:** This command is designed specifically for cutting out brushes from the screen cleanly. As an example, when you try to cut out a white letter on a black background, ToasterPaint normally assumes that you want an exact copy of that area of the screen. Hence you cut out a white letter and its black background.

To pick up the letter without the black background, use the Pick Color command (Color menu) and select the black background to make it the current color. Select Nobackground. Now select the scissors tool and cut out the brush. In this case you would cut out the white letter without the black background.



Flip Horizontal
When you want to reverse the current brush to make it a mirror image of itself, select Flip Horizontal. This command flips the current custom brush from right to left.



Flip Vertical
When you want to turn the current brush upside down, select Flip Vertical. This command flips the current custom brush from top to bottom.



Rotate +90 degrees
When you want to rotate the current brush in a clockwise fashion, select Rotate +90 degrees.



Rotate -90 degrees
When you want to rotate the current brush in a counterclockwise fashion, select Rotate -90 degrees.

Delete Options

There are two delete options in this panel. Sometimes, to make more memory available for a drawing operation, you need to delete the swap brush in memory. If this is insufficient, you may need to delete the spare screen.

This is more effective than clearing the screen, since deleting it actually de-allocates the memory that is reserved for the spare screen. Having a blank spare screen and having no spare screen are two very different conditions. With no spare screen, you have more memory available.



Select Delete Screen 2 to remove screen 2 from memory. Any imagery that was on screen 2 will be erased from the screen, and the screen removed from use.

This option deletes whatever type of screen is being used as screen 2 (normal, alpha, or stencil).



Select Delete Swap Brush to remove the spare brush from memory. If you have recently cut out a large brush, particularly for a TxMap operation, it is likely taking up valuable memory. Use this option to recover that memory.

Image Processing—the Process Menu

The Process menu is designed to make image processing plug-in processes available to ToasterPaint. Image processes may be applied to the current image, to an image that has been extracted from a Flyer clip, or to an entire Flyer clip.

This panel is divided into three subsections. The top half is for processing Flyer clips. You have controls for selecting a clip, choosing which frames to process, selecting an image process, and starting the processing operation.

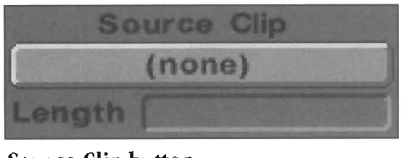
The lower left portion is for processing a frame that has been extracted from a Flyer clip. To extract a frame from a clip, first use the upper portion of the panel to select the clip. Then use the Frame # control to choose which frame you want to load. Finally, use one of the load field buttons to load an image into ToasterPaint.

The lower right portion of the panel is for processing just the current screen image, rather than a Flyer clip.



ToasterPaint's Process panel.

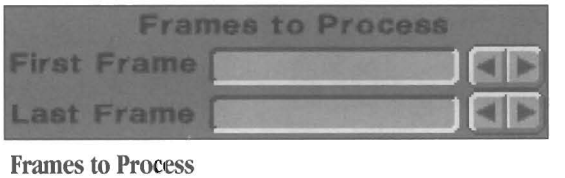
Clip Processing Controls



Source Clip button

This button allows you to select the source Flyer clip for image processing or image importing. To select a source clip, click this button. Use the file requester to locate and select the original Flyer clip. Only one clip may be active at a time. Its name will be displayed on the button once loaded.

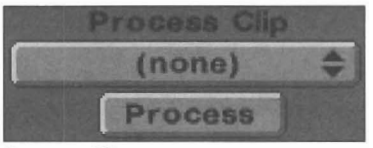
The length of the selected Flyer clip will be shown in the Length window below the Source Clip button. This window is for display only; you cannot edit or change the length of the original clip.



Frames to Process

Use these controls to select which portion of the source clip is going to be processed.

By default, the First Frame and Last Frame windows display the full length of the clip. Use the jog-shuttle button beside either window to skim through the clip and select up the portion to be processed, or type in time code values if you prefer.



Process Clip pop-up menu
This pop-up menu contains a list of the current image processes that can be applied to the current clip. Drag the pointer over it to select the process you wish to apply to the current clip.

This does not activate the image processing procedure. This simply selects which one you want to apply.

Process button (shown above)
This button begins processing the selected clip with the chosen image process. Once selected, it will display a file requester asking that you specify a location and a name for the selected output clip (you cannot save a processed clip over itself, or over another clip; you must create a new clip when image processing).

Loading a Single Image from a Clip

To load a single frame from a Flyer clip into ToasterPaint, follow these steps. Use the Source Clip button (on the upper portion of the panel) to select a clip. Now use the Frame # time code gadget to locate a specific frame (you'll see it displayed by the Flyer). Finally, select whether you wish to load Field 1 or Field 2 into ToasterPaint.



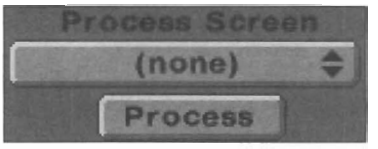
Frame # selector
If you wish to load a specific image from a video clip into ToasterPaint, select it using the controls on the upper portion of this panel. Then use the Frame # Selector to pick the frame that you wish to paint. Click one of the Load Field buttons (described below) to load the image.



Load Field 1 button
Select this button to load field 1 of the specified frame from the current clip into the current ToasterPaint screen.



Load Field 2 button
Select this button to load field 2 of the the specified frame from the current clip into the current ToasterPaint screen.

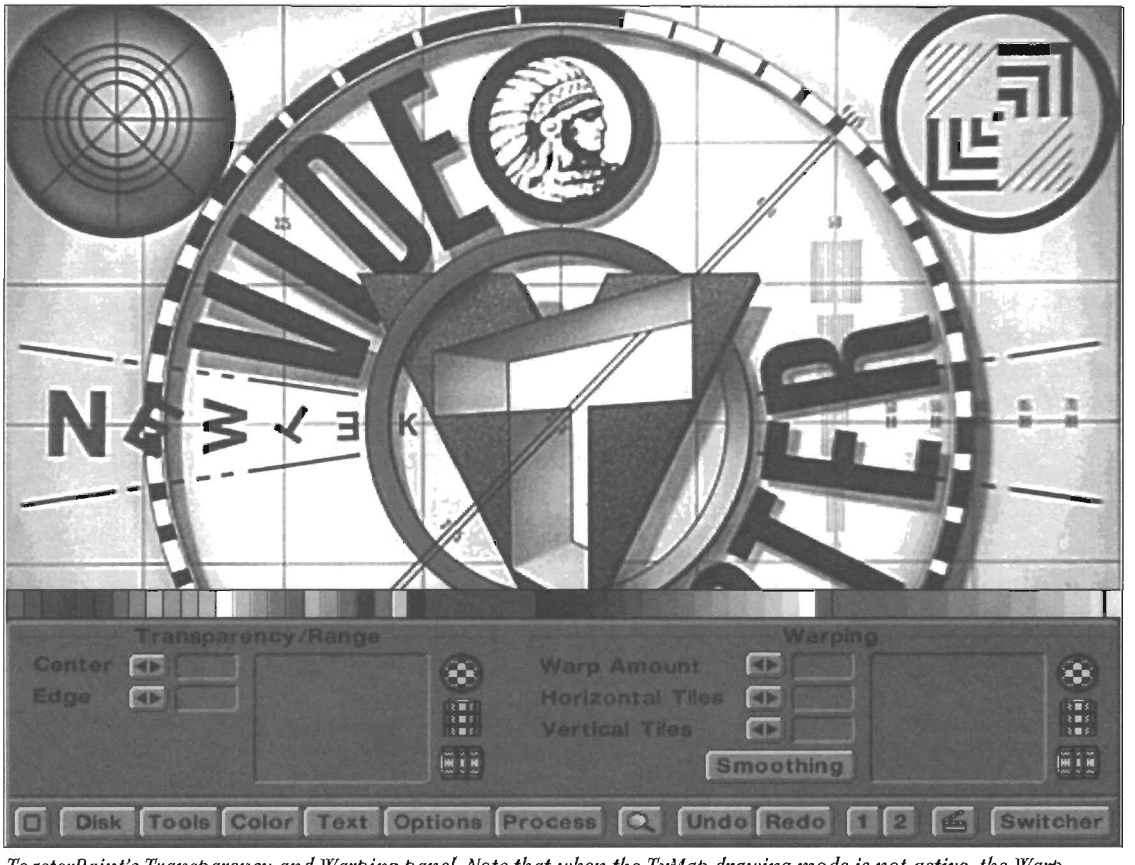


Process Screen pop-up menu
This pop-up menu contains a list of the current image processes available to ToasterPaint that can be applied to the current screen. Drag the pointer over it to select the process that you wish to apply to the current image.

Process button (shown above)
This button begins processing the screen image with the chosen image process.

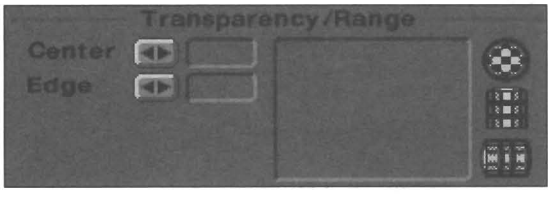
Blending and Warping Graphics—the Transparency & Warping Panel

The Transparency and Warp control panel contains controls for a variety of special effects. From this menu you can control the transparency of any painting or drawing operation, adjust the amount of warping (warpage?, warposity?, whatever!) and tiling used when texture mapping, and control the placement of the center and edge colors when using the Range drawing mode. This menu offers tremendous power to blend graphics seamlessly, warp and re-size images, and create three dimensional effects.



ToasterPaint's Transparency and Warping panel. Note that when the TxMap drawing mode is not active, the Warp controls (on the right side of the panel) will be dimmed and unavailable.

Transparency/Range Mapping Controls



The transparency mapping controls are available at all times and for all drawing modes in ToasterPaint. For all drawing modes, the Center and Edge sliders, in conjunction with the locator map, function to add transparency to the areas where you draw. In Range mode, the locator map also determines where the center and edge colors are placed.

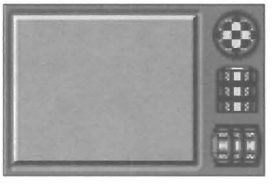
The Center and Edge buttons set the amount of transparency that is applied when drawing. The locator map controls are used to determine the placement of the transparent effect.

When you wish to use transparency, go to this menu and select the type of mapping you want: constant, point, horizontal, or vertical. Select the amount of transparency to be applied at the center and how much is applied at the edge of any drawing operation. As you go to draw, ToasterPaint will blend your drawing according to these settings.

Important: The Range mode does not make use of the Center and Edge controls on this panel; those are used for setting transparency only. Range mode makes use of the locator only. If you use the Center or Edge sliders, you will be setting a transparency value to either the center or the edge. This means that the next time you draw you'll be using the same mapping type (either point, horizontal, or vertical) to determine the placement of the center and edge colors *and* the placement of transparency. The center and edge colors will be mapped according to the map. The Center and Edge sliders will add some amount of transparency where those colors appear.

Six examples of stamping down a brush using different transparency types and settings.

Here, transparency was set to Constant (note the soldi block filling the map). The Center and Edge sliders were set to 0 (no transparency). The brush was stamped down. It appears fully solid.





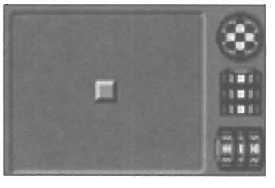
Here, transparency was set to Constant. The Center and Edge sliders were set to 50. The brush was stamped down. It is 50% transparent.

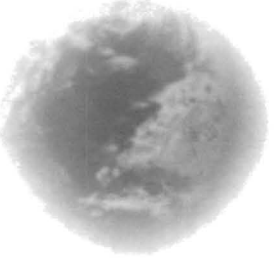




For this image, transparency was set to Point (using the sphere button) The Center slider was at 0, and the Edge slider at 100.

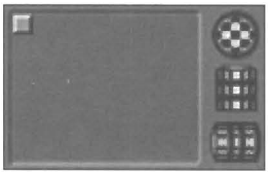
When the brush was stamped down, it was solid at its center, fading out to full transparency at the outer edges.





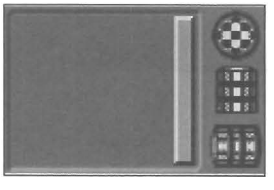
For this image, transparency was set to Point, the Center slider to 0, and the Edge slider to 100.

When the brush was stamped down, the Center portion (at the draggable box on the map) was solid, and the edge faded fully away toward the lower right.





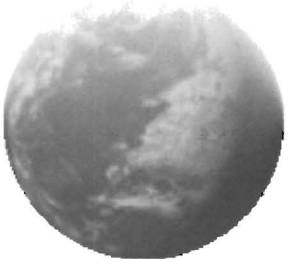
Here we selected Horizontal transparency. The Center was set to 0 and the Edge to 100.





Here we selected Vertical transparency. Again, the Center was set to 0 and the Edge to 100.







Center mini-slider
The Center numeric slider sets the amount of transparency applied for any drawing or painting operations (drawing, painting, stamping down a brush, texture mapping, etc.). This value ranges from 0-100%.

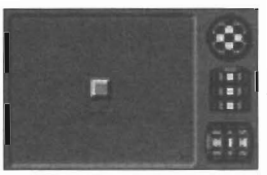
When point transparency mapping, "center" refers to the the hotspot indicator (that you can position freely). The value you set determines how transparent that point is, with a softly-blended falloff toward the outer edges.

When horizontal or vertical transparency mapping, "center" refers to the hotspot bar (that you can position). Again, the value set here determines the amount of transparency along the bar, with a soft falloff toward the edges.



Edge mini-slider
The Edge numeric slider sets the amount of transparency applied for any drawing or painting operations (drawing, painting, stamping down a brush, texture mapping, etc.). This value ranges from 0-100%.

When point transparency mapping, "edge" refers to the the hotspot indicator (that you can position freely). Here also, the value you set determines how transparent that bar is, with a softly-blended falloff toward the outer edges.



Point transparency

Horiztonal transparency

Vertical transparency

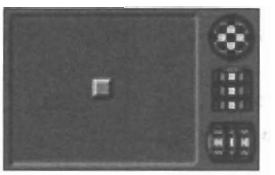
Transparency/Range locator map
This map allows you to set the type and location of settings used for applying transparency. The three buttons to the right of the map set the type of transparency mapping: point (the sphere), horizontal (sideways cylinder), and vertical (upright cylinder). There is a fourth setting, constant (solid-filled map), which is available any time one of these is toggled off.

Note: For all four types of transparency mapping, setting both the Center and Edge sliders to a value of 0 essentially turns off any of the effects of transparency.

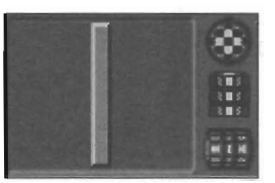


Constant Transparency ("Off" for Range drawing)
Constant transparency is the default setting for transparency. When this setting is active, the map appears filled with a solid gray block, and the Center and Edge controls are locked so that when you adjust one you are adjusting both. Any drawing operation that you carry out will be affected evenly by the transparency settings, from center to edge. A setting of 50% will result is drawing that is 50% transparent across the entire drawn area.

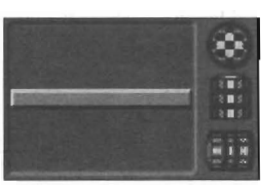
> **Note:** If you are in Range drawing and you set the map to this mode (by toggling off one of the other three), you have also turned off Range mode. You will need to return to the Tools menu to reselect it.



Point Transparency (Point Mode for Range drawing)
When you select point transparency, the map displays a tiny square block at its center. You can drag this square anywhere on the map, which sets the position of the hotspot, whose transparency is governed by the Center slider.
In this mode, the Center and Edge controls are freely and independently adjustable.

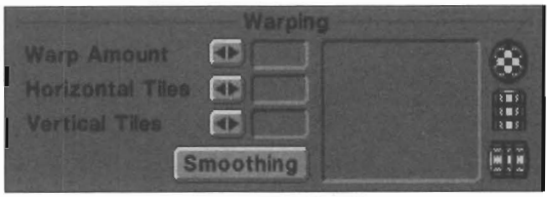


Horizontal Transparency (Horizontal Mode for Range Drawing)
When you select horizontal transparency, the Center and Edge controls are freely and independently adjustable. The map appears to have a tiny bar across its center. This bar represents the "center," which is affected by the value of the Center slider. You can drag this bar up or down the map, changing the area where the center transparency value is located.



Vertical Transparency (Vertical Mode for Range Drawing)
When you select vertical transparency, the Center and Edge controls are freely and independently adjustable. The map appears to have a tiny bar across its center. This bar represents the "center," which is affected by the value of the Center slider. You can drag this bar left or right on the map, changing the area where the center transparency value is located.

Warping Controls



When activated, the warp controls allow you to texture map or warp any brush into a new shape.

The warping controls on this menu are only available after you have cut out a custom brush, copied it to the swap screen, and then selected TxMap as the current draw mode. These steps are necessary since warping, which contains the controls for texture mapping, requires a custom brush to be placed in a special memory area so that it can work its magic.



Warp Amount
Think of the warp amount as the amount of "fisheye lens" effect you want to apply when drawing. The higher the setting, the greater the amount of bending will occur. Warping may be set from 0-100%.

If you only want to resize an image or map it into another shape without using any warping, leave this value set to 0.



Horizontal Tiles
Tiling allows you to repeat the custom brush pattern a number of times, making multiple copies within the area that you draw. Horizontal tiling affects the number of times the brush image is repeated from left to right. This value can be from 1-15.

> **Note:** How to use tiled drawing: After choosing tile settings, go back to the Tools menu and select a drawing tool (say, the solid filled rectangle). Draw out a rectangle. You'll see the original brush texture mapped and repeated within the rectangle. For a perspective effect, use the polygon tool and draw a pyramid shape. The result will be a repeated pattern that is squeezed toward the top, looking as though it stretches into the distance.

> **Tip:** A good use of tiling would be after you have cut out a brush of a red brick. Using the tiling feature of texture mapping, you could draw a large square and tile it with a wall of repeated red brick.



Vertical Tiles
Tiling allows you to repeat the custom brush pattern a number of times, making multiple copies within the area that you draw. Vertical tiling affects the number of times the brush image is repeated from top to bottom. This value can be from 1-15.

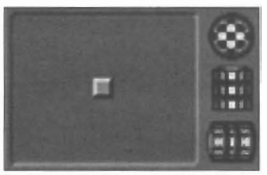
> **Note:** See the Note and Tip for Horizontal Tiling, above. They also relate to Vertical Tiling.



Smoothing
The Smoothing button affects texture mapped, or warp operations, only. Smoothing antialiases the custom texture-mapped brush and helps eliminate the jaggies that often occur when resizing graphics. The brush is automatically antialiased (using 16x oversampling and arranging to soften the edges) and given a much greater apparent resolution. When smoothing is on, texture mapping takes a little longer, but the results are generally worth the extra few seconds. With Smoothing inactive, no antialiasing is used.

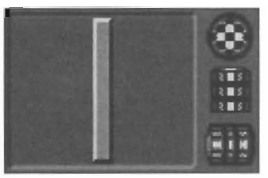
Warp Locator Map
This map allows you to set the type and location of settings used for applying texture mapping. The three buttons to the right of the map set the type of warp mapping: point (the sphere), horizontal (sideways cylinder), and vertical (upright cylinder).

> **Note:** For all three types of warp mapping, leaving all three sliders to their default values (Warp Amount 0, Horizontal Tiles 1, and Vertical Tiles 1) essentially turns off any warp and tiling effects, allowing you to remap/resize an image without these special effects.



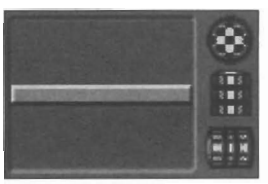
The Point Warping button is the checkered sphere at the upper right. Click on it to toggle Point Warping on or off. The locator map shows a tiny square when Point Warping is active.

Point Warping
When you select point warping, the warp map displays a small square in the center of the map. This block represents the "center" toward which the most warping will occur. You can drag this square around the map, changing the focal point for warping.



The Horizontal Warping button is the upright canister at right center. Click on it to turn Horizontal Warping on or off. When Horizontal Warping is active, the locator map displays an upright bar.

Horizontal Warping
When you select horizontal warping, the warp map displays a white bar across the center of the warp map. This bar represents an axis where the most warping will occur. You can drag this square left or right on the map, changing the focal point for warping.



The Vertical Warping button is the upright canister at right center. Click on it to turn Vertical Warping on or off. When Vertical Warping is active, the locator map displays a level bar.

Vertical Warping
When you select vertical warping, the warp map displays a white bar across the center of the warp map. This bar represents an axis where the most warping will occur. You can drag this square up or down the map, changing the focal point for warping.

How Warp Affects the Drawing Tools
Any drawing tool can be used with the TxMap drawing mode. In most cases, you'll want to use a tool with the Solid button turned on. Otherwise you'll draw unfilled areas, which probably is not what you want.

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 the Alt key as you drag out the box.

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.

ToasterPaint Tips and Tricks

The following pages constrain a set of tips and tricks that you'll find useful in working with ToasterPaint.

Cutting Out the Entire Screen

Here's a quick way to cut out the entire screen image for texture mapping.

1. Press the TAB key to reset all values.
2. Load the image.
3. Select the scissors.
4. Press REDO. In a moment , the entire screen will appear, attached to your pointer.

Now you can copy the brush to the swap buffer, select TxMap, and begin texture mapping. Just in case you need help...

5. Go to the Options panel and select Copy to Swap from the Brush options.
6. Go to the Tools panel and select the TxMap drawing mode.
7. Select any drawing shape, such as the circle tool. Turn on the Solid option. Now draw a shape. TxMap will use the buffered brush image and fill the drawn shape with it. Try out all the shapes to get more ideas on how to use this powerful feature.

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.

1. Press the TAB key to reset all values. Turn on the coordinates grid.
2. Load the image.
3. Draw a filled rectangle of any size, starting at 0x, 0y, and (for over-the-shoulder graphics) go to about 294x, 188y).
4. Press 7 on the keyboard (this turns on TxMap).
5. Click Undo.
6. Click Redo. ToasterPaint will use the loaded image as its source material for the TxMap operation.
7. Now cut out the resized image, clear the screen, and place it for your over-the-shoulder key graphic.

Note:
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-oriented or right-oriented over-the-shoulder graphic: left - 552x, 138y; right - 200x, 138y.

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 an image. 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 ToolBox 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.

Perspective Tricks

Darkening in the Distance

With texture mapping, when you draw, say, a pyramid, ToasterPaint "squeezes" the brush or image to fit the shape. This gives you an "extending into the distance" look.

To enhance that distant feel, right after the first operation select Darken mode, set the transparency mapping bar horizontally to the front of the drawn area, and click Redo. This will darken the rear edge of the brush and not the front edge, reinforcing 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.

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.

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 ToolBox is not showing, immediately press –.) 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.

Tiling Tip

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.

Range Drawing Tricks

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 Color 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 ToolBox. 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.

Miscellaneous Tips

Unexpected Results
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. Usually, unexpected results are caused by a control from another panel that has been "left on."

Press the Tab key to return ToasterPaint to its default settings and try again.

Canceling an Operation in Progress
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.

Merging Pictures
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.

Using Range to Create Colors
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. For example, if you want to find a nice gold hue, place yellow in one end of the range and brown in the other. The blend of color will give you a rich set of shades in the gold range.

Loading Files Faster
Files can be opened by double-clicking on the file name.

Faster Paint, Faster!
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
Freehand drawing works rapidly, but if you release the mouse button and draw again before the "Zzz" 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.

Undo/Redo
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.

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ToasterPaint Keyboard Shortcuts

Tools

Key	Function
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	Function
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	Function
`	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)

ToasterPaint Keyboard Shortcuts,continued

Transparency & Warping

Key	Function
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	Function
,	Pick Color

Text

Key	Function
$	Text Smoothing toggle
%	Bold toggle
^	Italics toggle
&	Underline toggle

Miscellaneous

Key	Function
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)

Rendering

Key	Function
F8	Render frame to DV1
F9	Render frame to DV2
F10	Render to framebuffer toggle
Del	Auto-render toggle

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ToasterCG™

ToasterCG

ToasterCG Character Generator

Table of Contents

Welcome to ToasterCG.ToasterCG uses both the keyboard and the mouse for fast and easy character generation. How do you use ToasterCG? There are only a few steps to learn.

- Select the page type. Each each page type is dedicated to a certain kind of display. Choose the appropriate page type for the manner you wish to display a graphic (scroll, crawl, etc.)
- Enter your text. This is the hard part, deciding what you want to say! Use ToasterFonts, Color ToasterFonts, PostScript fonts, and Amiga Outline fonts. You can even load your own graphic brushes.
- Fine-tune the page. Change fonts, sizes, colors, and shadows at any time by selecting an item with the mouse, and clicking on a button to make the change. Drag elements around the screen to compose the page to your liking.
- Save the screen as a generated image, ready for display by the Toaster.

That's it—you've learned ToasterCG! You'll find it surprisingly simple, friendly, and powerful.

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The Building Blocks of Character Generation

In television, the primary device used to convey program content is the screen itself. You look at the screen to view the program. With character generation, that device is text. You read the words on screen and understand their meaning. Therefore, video titling tends to borrow terminology from two fields, desktop publishing and television, to describe its functions.

With this in mind, here are the building blocks of character generation.

The page

A screen full of text is referred to as a page. Whether a page is completely filled with text or only contains one person's name at the bottom, it is considered a complete page.

A series of pages might be displayed in a sequence, one after another, at the beginning of a program. Page 1 might show the title of the program. Page 2 might say "Starring...(your name here)". And page 3 might include "Brought to you by..." information. Each of these individually-displayed graphic elements would be considered a page.

If the page contains text that scrolls up the screen or across the bottom of the screen, it is still a single element, a single page. The page is the method employed to display video graphics—whether those graphics will be static or moving. Therefore, if you have to create one graphic for a title, another graphic for a station ID, and another graphic of scrolling credits, you would create each of these items on a different page. You would have three pages of graphic elements.

There are four page types in ToasterCG, one for each of the methods of displaying graphics. They are discussed in detail in the section called "Choosing a Page Type."

The book

A group of pages, say from the awards program example, can be saved in a single file called a book. This is a convenience of organization and a convention left over from earlier versions of the Toaster system software. It allows you to save related graphics and text in one place for easy editing later on.

When you start ToasterCG, you arrive on page 0 of a blank book that contains 100 pages. Whether you actually use them all or just a few, there are always 100 pages available to work with in ToasterCG. When you complete the design of one page, you can go on to another and another all in the same session. For ease of use and organization, you can then save the entire book. Whether you actually entered text for all 100 pages or not, 100 pages are always saved within the book.

When Should I Use a Book or Page?

Those users who have a Flyer may prefer to save independent pages rather than books. Using a page within a sequence requires that each page be saved individually. This allows you to locate the crouton for that page and drag it into the project sequence where it belongs. Saving a page as a crouton actually generates the page as a video graphic and includes the information that was used to create the page. Each page is therefore a self-contained unit.

If you wish to make changes to a page, you need only load the page itself into ToasterCG. This is much more convenient than the older method, which required editing books every time a single page change was required. (Note that if you choose to save data in both formats anyway, you'll need to remember to update both formats yourself. Since this can cause easy confusion, we recommend using the page format exclusively.)

It's important to make the distinction between the uses and purposes of the page and the book early on. If you are a new user of the Toaster, we recommend that you save individual pages rather than books. Saving a page at a time causes the Flyer to generate a crouton with a small icon that represents the page image. (Croutons are easily dragged and edited when you edit a project. Plus, you can always load individual croutons back into ToasterCG and make changes to them! This is a new feature of Toaster 4.0 that makes page saving a compelling idea.) If you save your work in the book format, you are simply saving a file of data that describes the contents and appearance of the page. This file must be loaded into ToasterCG in order to edit or render any page. The page, on the other hand, contains this information as well as the rendered image within itself.

Previous users of the Toaster will likely have many book files, since this aspect of the page did not exist before. Prior owners will probably want to set aside some time to convert their most often used books into sets of individual pages (stored in separate folders).

ToasterCG Basics

Keyboard Controls

F1
Drop shadow/Cast shadow/No shadow
F2
Shadow direction
F3
Shadow length
F4
Thin outline/Medium outline/Thick outline/No outline
F5
Outline position
F6
Justification
F7
Save as buffer page
F8
Render line to preview out
F9
Render page to preview out
F10
Take page to program out

Alt + F1 through F10 (also Shift+Alt)
User-assigned macro shortcut command. *See Appendices.*
Alt + Arrow (Left or Right)
Kern to the left or right.
Shift + Arrow (Left, Right, Up or Down)
Move selected item left, right, up, or down

Del
Delete character at the cursor's location (delete entire lines with the Delete Line button)

Backspace key
Backspace over previous character on line

Esc
In menus—Cancel operation.
On main menu—Go to Switcher.

Help
Displays the major ToasterCG keyboard equivalents.

Right-Amiga (to the right of the spacebar)
Toggles between Main menu and Controls menu

Alt+Help
Toggle 2/3 monitor display mode.

Shift+Help
Display/Hide the Main menu bar.

Mouse Functions

You select text, boxes, and brushes with the mouse. There are several different mouse functions in ToasterCG.

To interrupt the rendering of a page, or the display of scrolling/crawling pages
Click once with the right mouse button. This is the only right mouse button function within ToasterCG. All other operations are performed with the left mouse button.

To select a single item (font)
Click on it. It will turn gray to show that it is selected.

To select a graphic (a brush or a box)
Click on it twice. Your first click places the text cursor for text entry, your second click selects the graphic that is there. It will turn gray to show that it is selected.

To select all characters on a line
Double-click any unselected character in the group. The entire group will turn gray to show that it is selected.
-or-
Drag across several items in the group (the entire group, or several groups). Each item will highlight as the mouse passes over it.

To select several items on the screen
Hold the Shift key and click on each of the items on screen. Each item will highlight. Shift-click on any item a second time to deselect it.

To select the entire page
Hold the Shift key and double-click on any unselected item on the screen. All items will highlight.

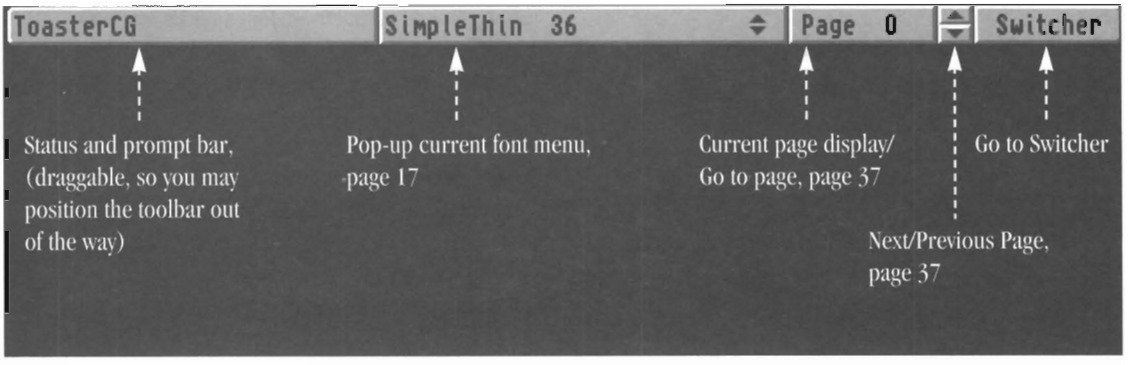
To deselect any highlighted item
Click once anywhere on the screen where there are no items.

Keyboard Shortcuts on the keyboard's numeric keypad:
7
Top of page
9
Previous page
1
Bottom of page
3
Next page

A Tour of the ToasterCG Screen

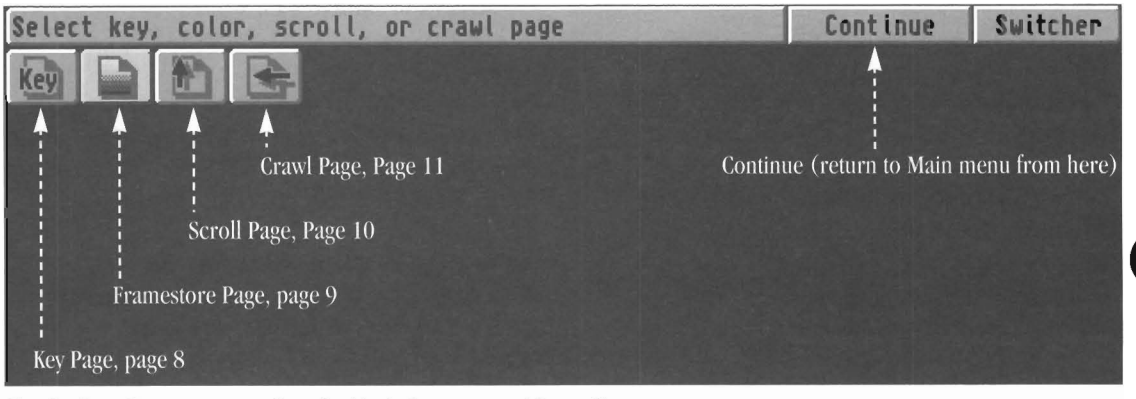
The next three pages show the main elements of the ToasterCG interface for each page type. Many notations include the page number where you can find more information about a specific button or control.

The Toolbar



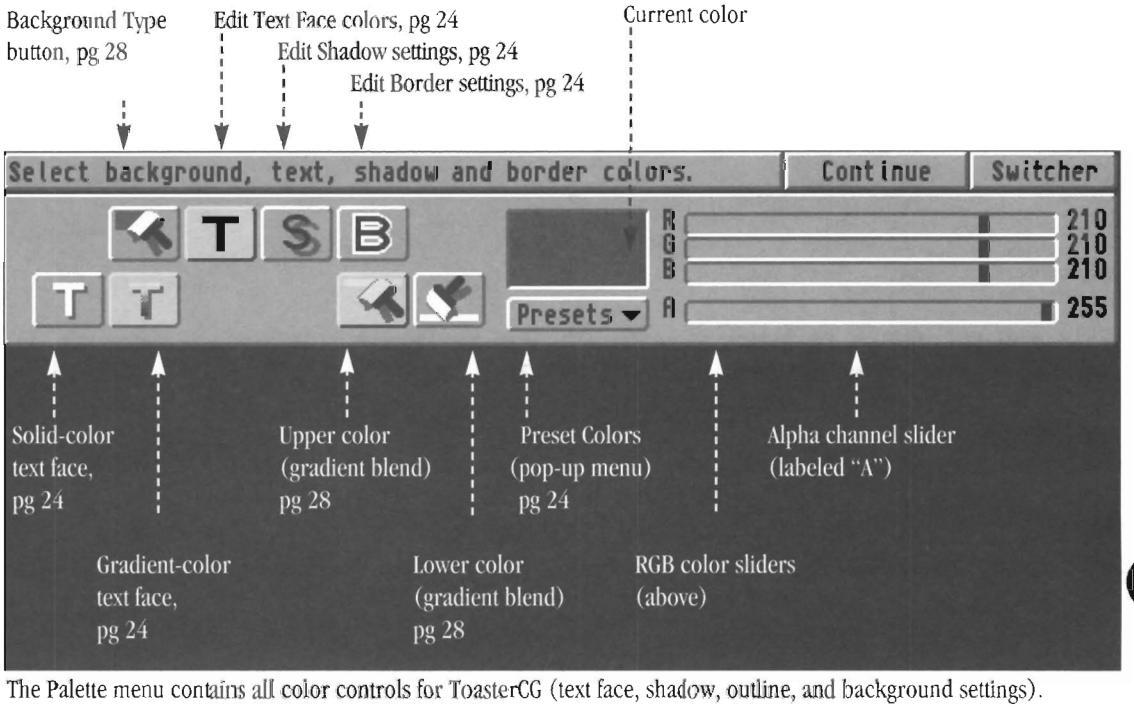
The toolbar appears at the top of every menu.

Page Type Menu



Use the Page Type menu to select the kind of page you wish to edit.

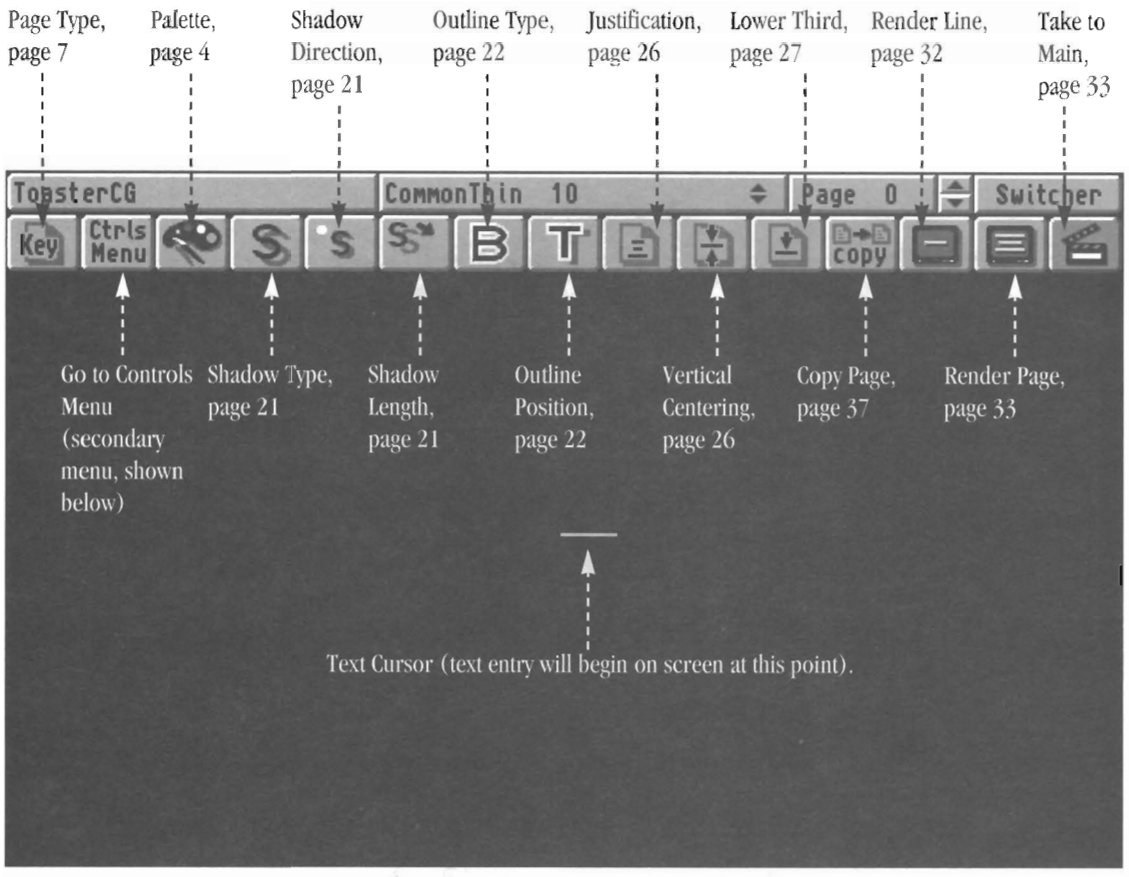
Palette Menu



The Palette menu contains all color controls for ToasterCG (text face, shadow, outline, and background settings).

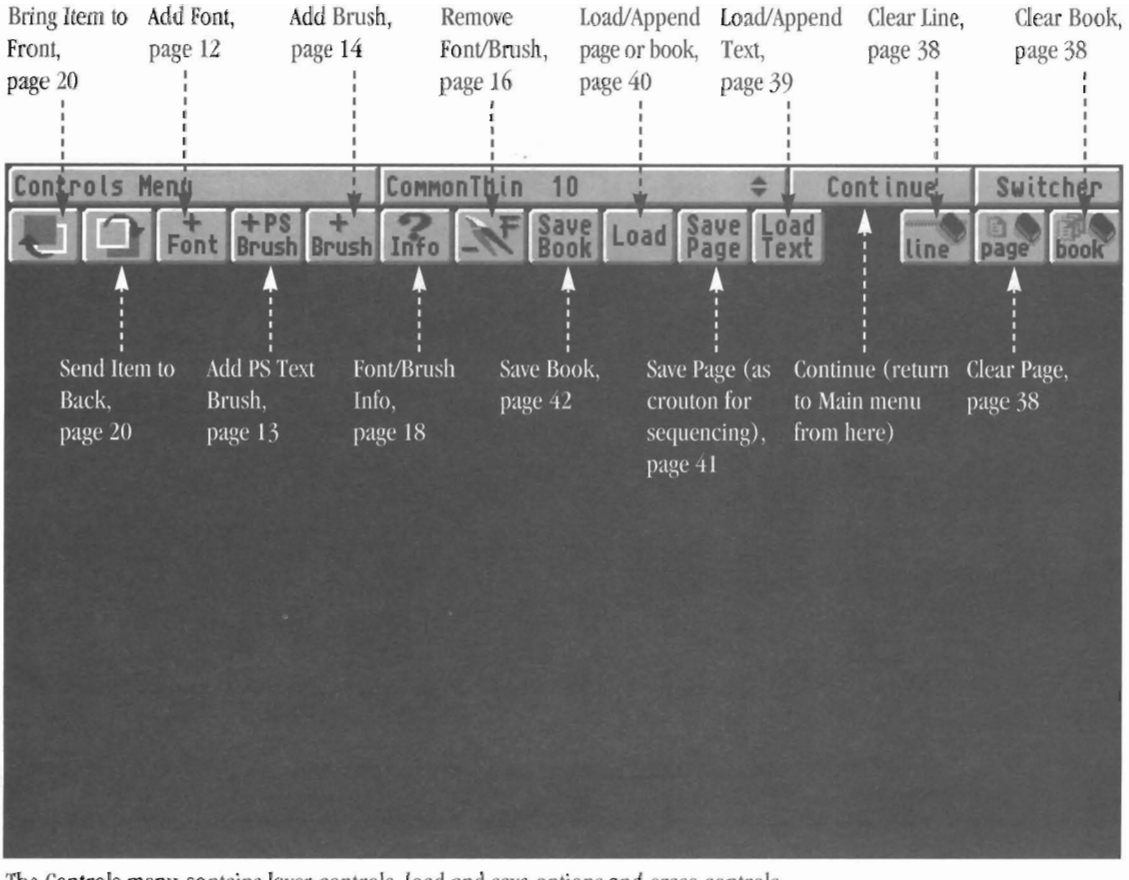
Main Menu

(Key and Framestore Pages)



The Main menu contains the majority of commonly-used tools you need for editing video text.

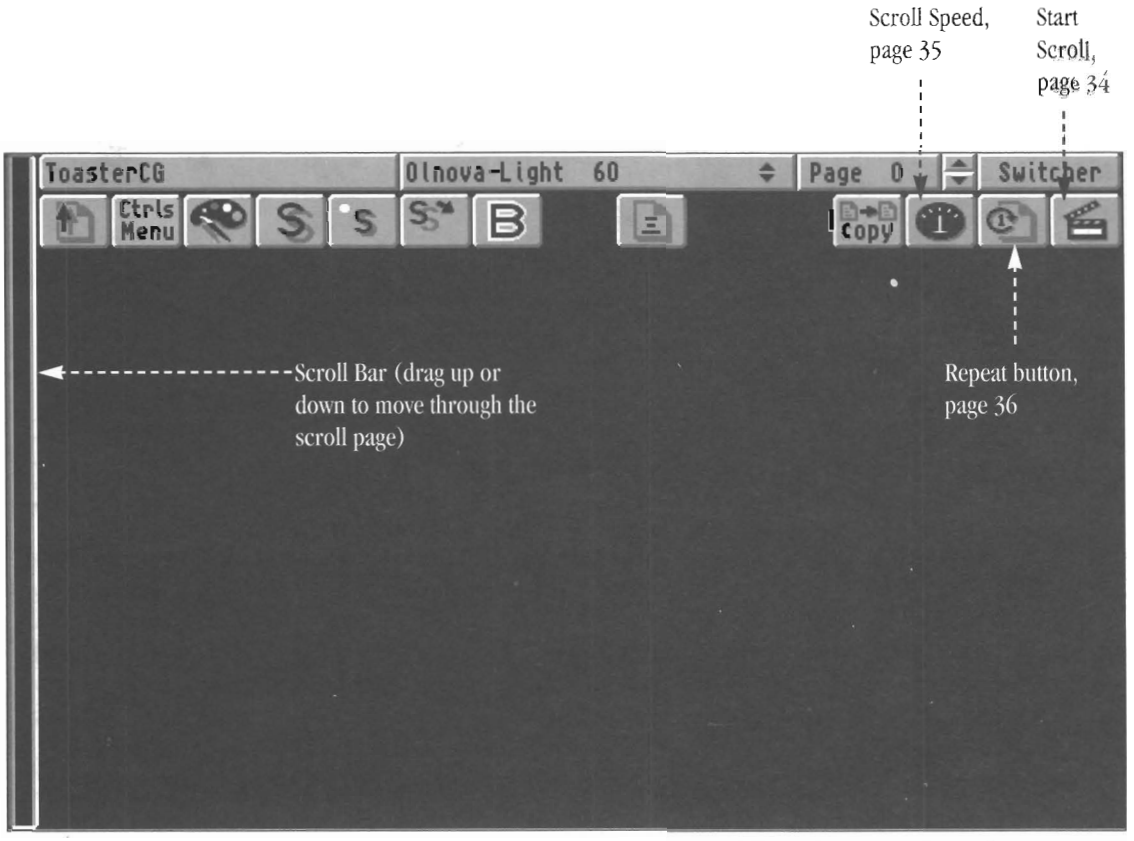
Page & Book Controls Menu



The Controls menu contains layer controls, load and save options,and erase controls.

Main Menu

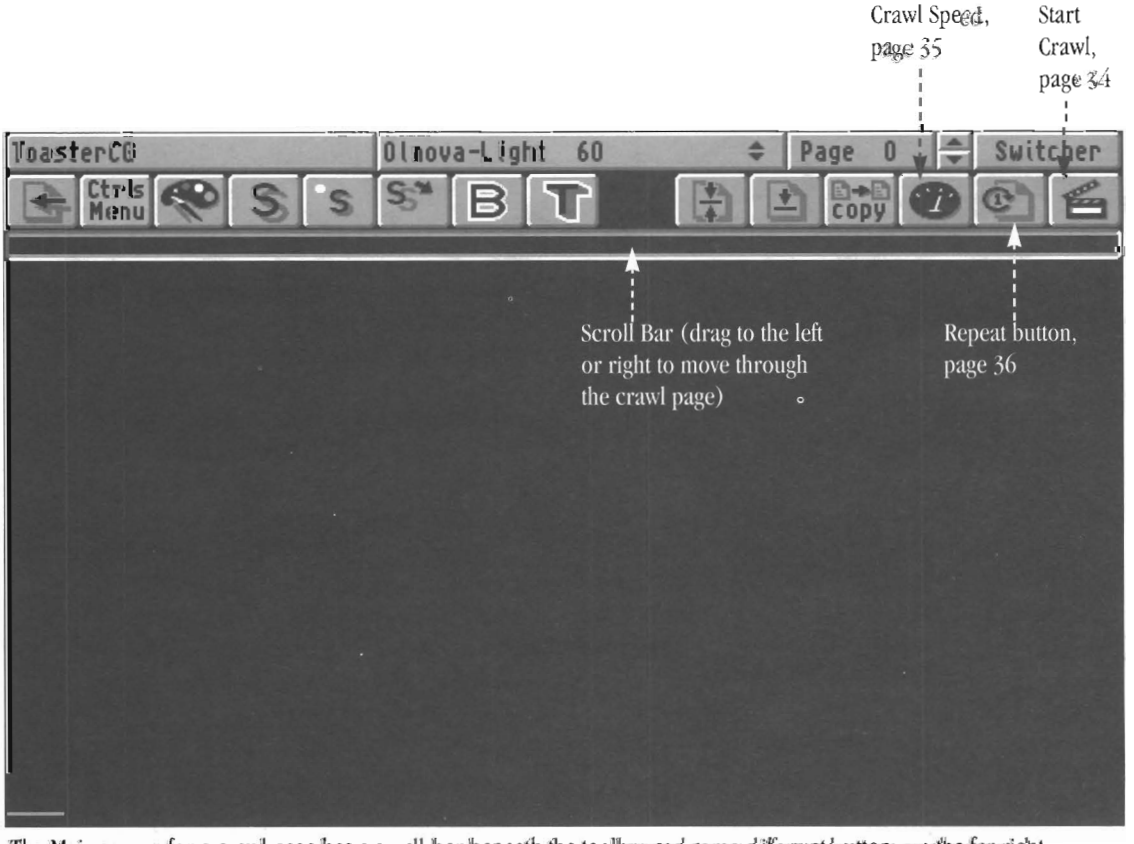
(Scroll Page)



The Main screen for a scroll page has a scroll bar down the left side and some different buttons on the toolbar.

Main Menu

(Crawl Page)



The Main screen for a crawl page has a scroll bar beneath the toolbar and some different buttons on the far right.

Getting Started: Entering and Exiting ToasterCG

To enter ToasterCG
Use the Programs pop-up menu from any editor screen and select ToasterCG.

To exit ToasterCG
Select the Switcher button at the right end of the toolbar. The program remains active and in memory, along with its contents.

To quit ToasterCG
Go to any editor screen, hold the Shift key and select ToasterCG from the pop-up menu.

Selecting the Type of Page

Choosing the Page Type

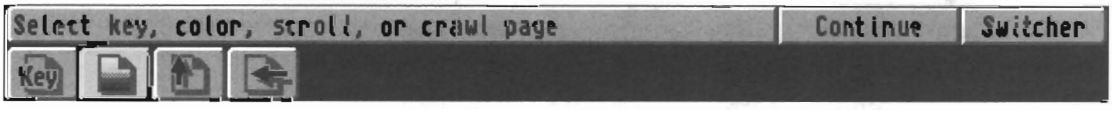
The first step in creating a CG page is to select the kind of page you wish to create. You do this by clicking on the Page Type button (this is the first button on the main control panel). ToasterCG will present you with a menu of four buttons, one for each page type. Choose the page type of your choice depending on the manner in which it will be displayed, and then you can begin editing text and adding graphics to it.



The very first button on the main menu is the page type button. It always shows the current type of page by the appearance of its icon. This is a Framestore page. Click on it to change to a different page type.

The Page Type Buttons

Choose the kind of character generator page you wish to create with the Page Type button. This step is important, since a page's type determines the manner in its text and graphics are displayed on screen. ToasterCG will display a menu with four buttons, one for each page type. From left to right, they are Key page, Framestore (Backdrop) page, Scroll page, and Crawl page. Click on a page type button to make the current page that type. The image on the button will be transferred to the Page Type button on the main control panel to serve as a reminder of the kind of page you created.



Once you click the Page Type button, you'll see this menu. Here you can select the type of page you wish to work with: Key page, Framestore page, Scroll page, or Crawl page.

ToasterCG's video page types are described in the next few pages.

What about changing the Page Type?

Note that you can change page types at any time, even after you have entered text on a page. ToasterCG will always try to maintain the characters when you do so, so that the text you have on a Key page will remain if you change it to a Scroll page. Take note, however, that a Scroll page containing many pages' worth of text will be cut off if you convert it to a Backdrop or Key page. The video screen just isn't that long!

Q. What's that dotted line box on every page...

A. The Safe Title Area.

The Safe Title Area is a guideline for placing text on screen. If you keep text within this area, you can be certain that all viewers of your program will be able to read it regardless of the kind of TV they have.

Since all television screens are different (with varying case designs, different screen sizes, and unique bezel shapes), broadcasters invented the Safe Title Area as a "safety zone" for character generation.

The safe area encloses a box that lies well inside the total picture area of the TV signal. While it's not a hard and fast rule that all text must stay within the guide, it's a good rule of thumb. For most titling keep the safe area in mind when you create your graphics.

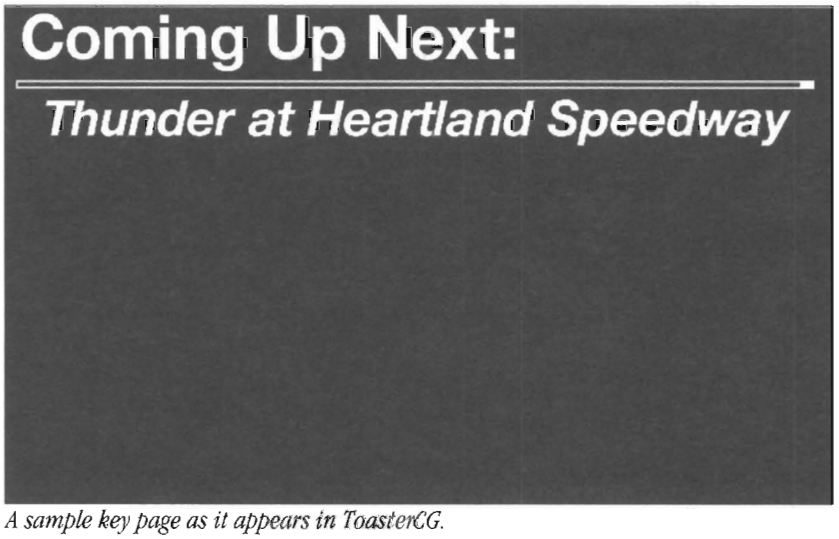


The Key Page button.

The key page is the most commonly used character generator graphic in television. Usually it contains text arranged on a black background. The black background portion is transparent, so when the key page is overlayed on top of another video source, the text appears as part of the image. Today, the key page is often designed with graphics as well as text.

The process of overlaying text on video is referred to as "keying," although you may also hear of it as "superimposing." Television slang has even shortened these to "key" and "super" for faster work when in the heat of production.

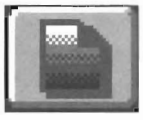
The key page is used for titling on newscasts, prices in commercials, scores for sporting events, and more.



A sample key page as it appears in ToasterCG.



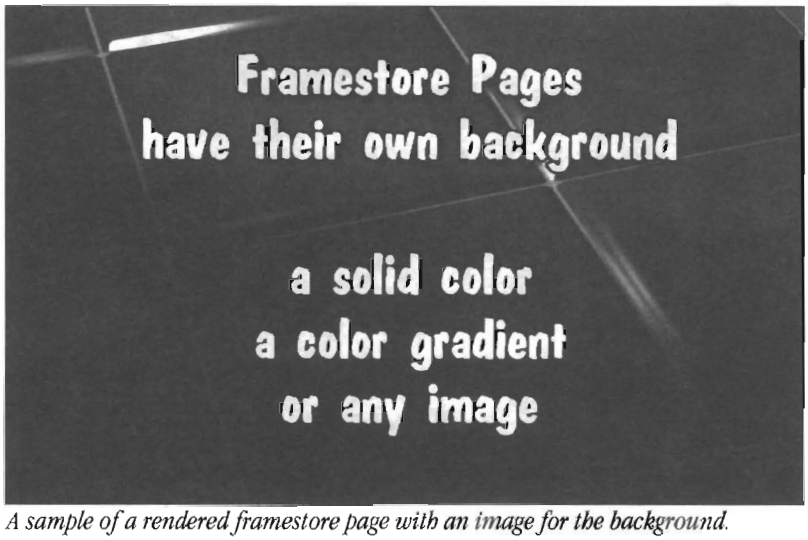
The same key page as it appears when keyed over live video.



The Framestore Page button.

A framestore page, also called a backdrop page, is a complete graphic that fills the screen. Unlike a key page, which has portions where the underlying video shows through, the framestore page does not. It consists of text and graphics over a background pattern or image.

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.



A sample of a rendered framestore page with an image for the background.

Framestore pages are unique in that they can have any one of three different backgrounds. You can select the type of background from the palette menu within ToasterCG.

- A solid color. This can be any one of 16.7 million colors.
- A gradient blend between any two colors.
- An image. This can be a freeze frame, a framestore, an RGB image from ToasterPaint or LightWave 3D, even a ChromaFX filter that has been saved as a crouton.

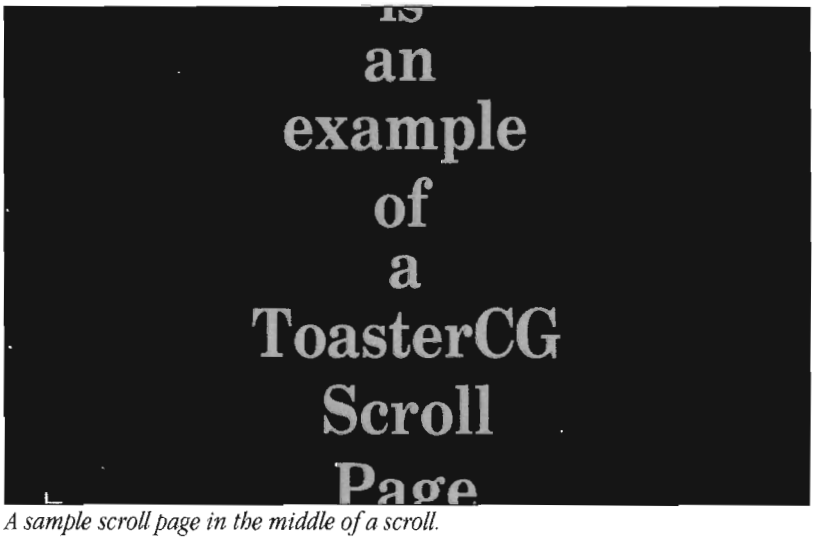
The Scroll Page



The Scroll Page button.

The scroll page overlays a very long, moving page of text. The text scrolls from the bottom of the screen to the top, over the main output of the Video Toaster. This is sometimes called a roll. The scroll page is widely used in television and film to roll credits at the end of a production.

The scroll page in ToasterCG extends off of the bottom of the screen. As you enter text, simply press Return to add new lines to the bottom of the page. The display will shift so that you are always working on the screen.



A sample scroll page in the middle of a scroll.

Scroll pages have the following special features:

- Scroll pages move at one of five speeds.
- To interrupt a scroll click the right mouse button.
- Scroll pages can roll once, repeat indefinitely, or roll once with a pause at the end. To return to Toaster after a paused scroll, click the right mouse button.

- 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.

- You cannot use graphic (i.e., ToasterPaint) brushes on Scroll pages.
- You cannot layer or overlap text or graphic elements on Scroll pages.

- Scroll Pages are limited to fonts of 300 lines in height.
- Scroll pages are limited 1 font color for the entire page, although different fonts and font sizes are allowed..

The Crawl Page

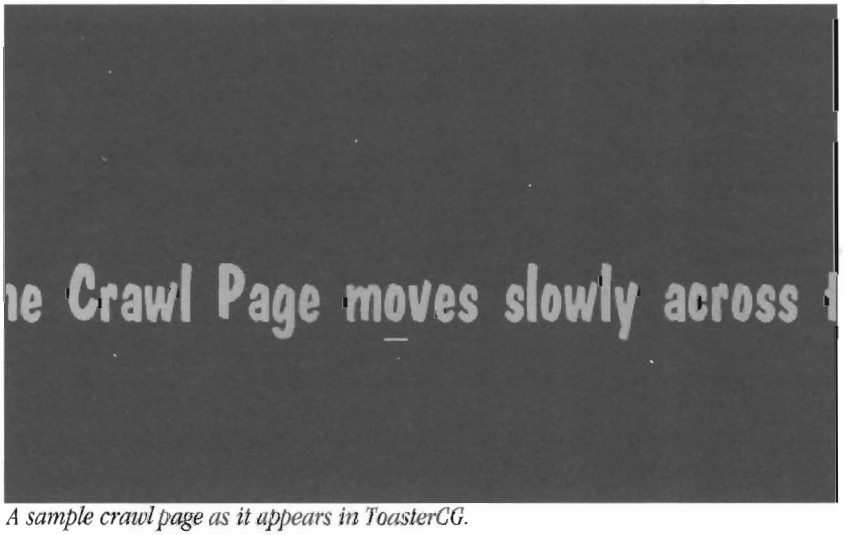


The Crawl Page button.

The crawl page consists of a very long single line of text that moves across the screen. Although you can place the line at any height on screen, usually a crawl moves across the bottom edge of the screen.

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.

As you type on the crawl page, it extends off screen so that you may type a line of any length.



A sample crawl page as it appears in ToasterCG.

Crawl pages have the following special features:

- Crawl pages move at one of four speeds.
- To interrupt a crawl click the right mouse button.
- Crawl pages can run once or, repeat indefinitely.

- Shift-left arrow key moves the cursor five spaces to the left.
- Shift-right-Arrow moves the cursor five spaces to the right.

- The Home key (7 on the numeric keypad) moves the cursor to the beginning of the crawl page.
- The End key (1 on the numeric keypad) moves the cursor to the end of the crawl page.

- You cannot use multiple fonts, font colors, mixed font sizes, boxes or brushes on crawl pages.

Adding Fonts

If you have just started ToasterCG, there will be only a few fonts available for your use. You will probably want to add a selection of useful fonts pop-up font menu so that you may use them in your work.

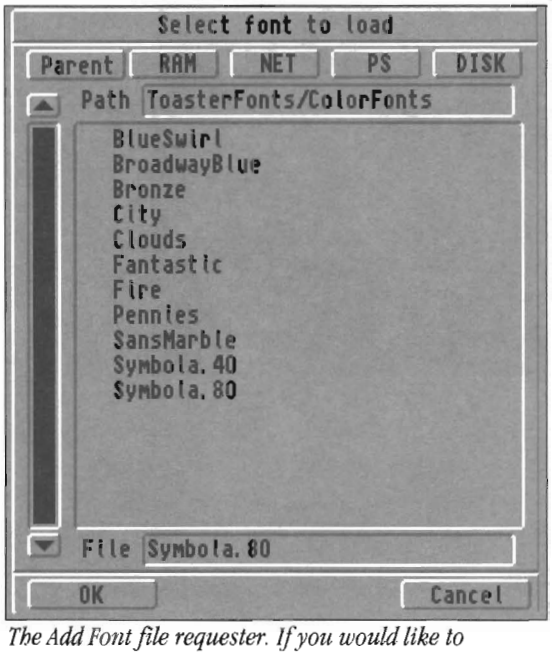
To add a font to the pop-up font list

Select the controls button (shown below, or toggle to the Controls menu using the Right-Amiga key) then select the Add Font button. ToasterCG will display a file requester containing the names of all fonts in storage on the hard drive. If you do not store all of your fonts in one directory, use the file requester to navigate to the appropriate location. Double-click on a font name to add it to ToasterCG's pop-up font menu. If you select a PostScript font, ToasterCG will also ask you to select a size between 10-400 lines. Enter a number and press Return.

There is a limit to the number of fonts and brushes you may add to the pop-up font menu, based on the amount of RAM in your computer. Depending on which fonts you load, this limit will vary somewhat.



The Controls menu button (main menu), and the Add Font button (secondary menu).



The Add Font file requester. If you would like to customize the directory buttons, see the Appendices at the back of the Toaster manual.

The Add Font button allows you to add fonts into ToasterCG. Depending on the amount of memory your system may have, there will be a limit to the number of Fonts you can add at one time. The limit is pretty high, so you should have no difficulty using as many fonts as you wish for a project.

When you select a PostScript font or Outline font, ToasterCG will ask you for the size you wish, from 10 to 400 lines high. Enter the number and press the Return key. (You do not need to clear the field of the number it contains—just type in a new one in front of the old one.) In a moment, you'll be able to begin typing with this new font. (When you add a PostScript font or an Outline font, ToasterCG takes 10-15 seconds to create the font size you specify.)

When you select an old-format ToasterFont or a Color ToasterFont, you must select the font in one of the pre-made sizes in which it is available. These fonts are based on bitmapped graphic artwork, so they cannot be freely sized. They are usable only in their preset sizes. Usually, the size of a bitmap font is included in its name, such as Typewriter.50. This indicates that the font is a bitmapped font, and the size is 50 lines tall.

About PostScript fonts

ToasterCG supports both Type 1 and Type 3 PostScript fonts. Typically, PostScript fonts come with three files, each with a different suffix as in Garrett.afm, Garrett.pfb, Garrett.pfm. You need only two files: the file with the ".pfb" suffix, which is the actual font, and the file with the ".afm" suffix, which is a metric file containing width and kerning data (automatic kerning pairs will be used by ToasterCG, and created if the .afm file is missing). The ".pfm" file is not needed. The file you should choose when adding a font is the file with the ".pfb" suffix. (You can also rename these files and remove the suffix, if you do not wish to see it as part of the font name.)

About Outline fonts

The Amiga Operating System supports what it calls Outline fonts using "Fountain" from AmigaDOS 2.04, or "Intellifont" from later releases. A properly installed font of this type will appear in your font list twice, each entry with its own suffix—such as Garrett.font and Garrett.otag. If one of these files is missing, you will not be able to use that font.

Where available within the font structure, kerning pairs (for automatic kerning) will be used by ToasterCG.

Adding Text Brushes

In addition to creating regular text lines of text, ToasterCG can create *text brushes* using Postscript fonts. The text in a text brush can be rotated to any angle, and the letters may be sheared as well (see the examples on this page).

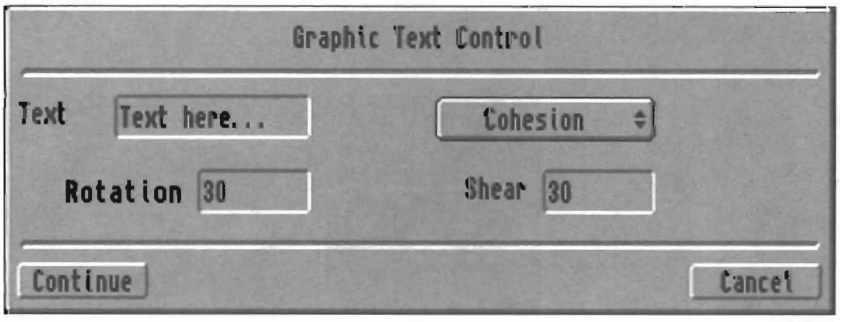
To create a text brush

- Select a PostScript font from the pop-up font menu (text brushes require PostScript fonts).
- Select the Controls Menu button (or press the Right-Amiga key to toggle to the Controls menu), and select the Text Brush button.
- Enter the text you wish converted into a brush.
- Enter the rotation angle for the brush.
- Enter the shear angle for the brush.
- Select Continue (or Cancel, if you change your mind).
- Go to the pop-up font menu and select the text brush you have just created (it will appear at the bottom of the pop-up, with the text label that you entered). The text brush will appear on screen, ready for use.



The Add Text Brush button.

As with boxes and other graphic brushes, text brushes may be layered in front of or behind any other graphic element, but will always appear behind standard text.





Three text brushes showing the different sample combinations of rotation and slant (also called shear). The Rotate brush was rotated at 30° (without shearing). The Shear brush was slanted at 20° (with no rotation). The Dynamic brush was both rotated and slanted at 30°.

Note that whenever you rotate and slant to the same degree, the text remains upright and very readable. Also, the Dynamic brush is selected, (i.,e., gray), so that you can see its square outline. Its resizing handle is in the lower right -hand corner.

Note:

If you wish to use several repetitions of a single brush, each in a different size or orientation, you will need to load the same word or phrase once for each use. The reason is that ToasterCG uses one font size description per text brush, so if you use the same brush twice, then attempt to size one differently from the other, both will change size. Simply re-enter the item from the Add Text Brush button and use a separate instance for each "new look."

Adding Brushes, Boxes, and Underlines

Before you can use graphic brushes such as ones made with ToasterPaint or LightWave 3D you must add them into ToasterCG. Once added, they will appear on the pop-up font menu. You can then select it and use it many times over. In this manner you can use and re-use a brush as much as you want, using only the RAM necessary to add it into the pop-up menu once.

See "Inserting Brushes, Boxes, and Underlines on Screen" (facing page) for information on how to use these items once they have been added into ToasterCG.

To load a brush to the pop-up font list

Select the controls button (or toggle to the Controls menu using the Right-Amiga key), then select the Add Brush button. ToasterCG will display a file requester containing the names of the brushes in storage on the hard drive. Double-click on a brush name to add it.

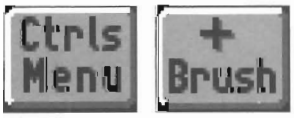
The only limit to the number of fonts and brushes you may have on the pop-up font menu at any time is the amount of RAM on your system.

To add a box

Boxes are built-in to the pop-up menu, so you do not need to add one before being able to use it. There is only one size of box, but you can use a resizing handle in the lower right-hand corner of any box to stretch it to just about any dimensions you wish.

To add an underline

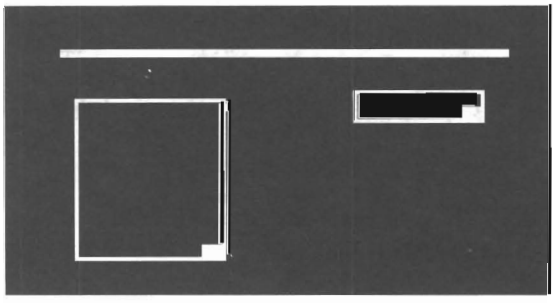
ToasterCG does not directly support underlining, but you can use a box that has been stretched very thin as an underline.. Since boxes are built-in you do not need to add them, just select them from the pop-up.



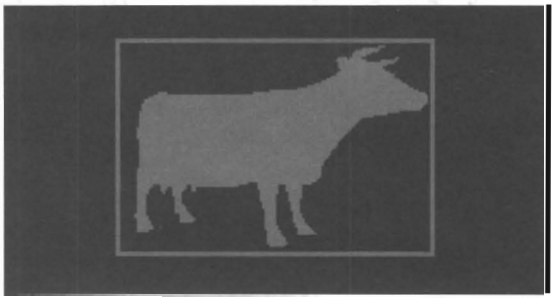
The Page & Book Controls menu button from the main menu, and the Add Brush button from the secondary menu.

The Add Brush button allows you to add brushes into the ToasterCG pop-up font menu. This means that a brush may be used on several pages, just like a font. Depending on the amount of memory your system may have, there will be a limit to the number of brushes you can load at one time, since graphics and text require memory for online use.

You may use a brush as long as it is a 24-bit IFF brush. ToasterCG does not support other formats. Brushes may be any height between 1 and 400 pixels tall, and any width from 1 to 752 pixels across.



Three boxes. The small one on the right is the standard box. The top one has been sized long and thin, as an underline. Note the resizing handle in the lower right-and corner of each box.



This is now a brush appears on screen. The area between the brush's true shape itself and its rectangular bounding box is transparent, which aids in lining up text and graphics with greater precision.

Related Topics

To remove a brush or a box from the screen, see "Removing Fonts, Brushes and Boxes."

Inserting Brushes, Boxes, and Underlines on screen

This section describes how to place boxes and brushes on screen.

To add a brush, see "Adding Brushes, Boxes, and Underlines" (facing page). Note that ToasterCG does not utilize the underline character. Instead, when you wish to underline something, use the built-in graphic device called Box, which appears on the pop-up font menu, to create underlines (as well as boxes of most any size and dimension).

To Insert a Brush

Once a brush has been added, the name of the brush will be added to the pop-up font menu (see "Adding Brushes, Boxes, and Underlines" for instructions).

Click in an open area of the screen to place the text cursor. Go to the pop-up menu and select the brush name. The brush will appear at the cursor's location on screen.

Brushes may be assigned alpha channel transparency (via the Face button), shadows (via the Shadow button), and outlines (via the Outline button); but not text face colors. Since brushes have their own colors, the RGB sliders for the Face button have no effect on a brush.

Note:
If you have a box highlighted on screen when you select a brush from the menu, the box will be converted into the brush.

Note:
To make multiple copies of a box or brush, after you make the first one, press Enter repeatedly to add more just below.

To Insert a Box or Underline

First click in an open area of the screen to place the text cursor. Go to the pop-up font menu and choose Box (Box is a built-in option that always appears on the pop-up). A small box will appear at the text cursor's location (where you clicked on screen). You can drag the box just like any text, and size it by grabbing and dragging the "handle" in the lower right hand corner of the box.

To make an underline, simply use the handle to size the box long and thin, then place it below the text you wish underlined.

In terms of color, shadow, outline, and alpha channel capabilities, boxes may be given any of these attributes, just like text.

Note:
If you have a brush highlighted on screen when you select Box from the menu, the brush will be converted into a box. Make sure to click elsewhere on screen before selecting Box from the pop-up menu.

Note:
To make multiple copies of a box or brush, after you make the first one, press Enter repeatedly to add more just below.

Removing Fonts, Brushes and Boxes from the Screen

To remove a font from the pop-up list
Select a word or phrase from the screen that uses this font (or choose it from the pop-up menu). Go to the Page & Book controls menu and choose the Remove Fonts and Brushes button.

A quick and easy way to remove a box or brush is to select it from the screen then press the Del key to delete it. This allows you to remove a single use of a brush or box from the screen. If you wish to remove all uses of a particular brush, select the brush from the screen, call up the Page & Book controls menu, then select Remove Fonts and Brushes. This action will remove all instances of the brush from the page (and book).



The Remove Fonts and Brushes button.

Important: Remember to check that the name of the item you *want* to remove is displayed on the pop-up menu *before* you remove it. Usually, you need to select a box or a brush twice in order to select it correctly.

Why?

Because ToasterCG's first impression is that you may be clicking on the screen in order to enter text that will lie on top of the graphic, not to perform an action of the graphic itself. Therefore, when you first click on a box or a brush, ToasterCG thinks you want to enter text. The second time you click confirms that you wish to edit the graphic.

To be certain which item is selected, just glance at the pop-up font menu. It will always show the name of the currently selected item (either the font name, or the word Box, or the brush name). When you see the right name shown on the pop-up, you can be certain that your next action will affect that item.

When a box is the only item on screen, it cannot be removed. You must select a font (any font), enter text elsewhere on screen, then reselect the box and press the Del key to delete it. This is the only way to remove a lone box.

Choosing Fonts and Font Sizes

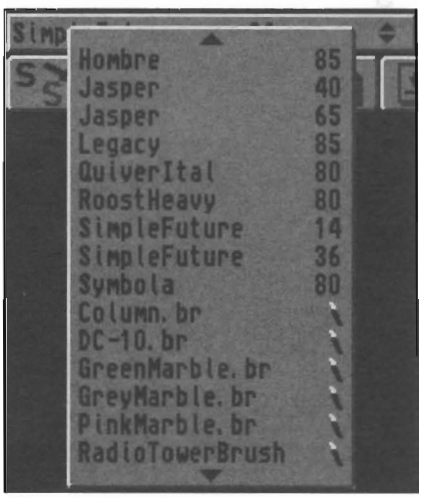
To choose a font

Move the pointer over the pop-up menu and click the left mouse button. The pop-up list appears. This list displays the currently online fonts and brushes (use the Add Font or Add Brush buttons to add more from offline hard disk storage). Move the pointer to highlight the font you desire, then click the button. To enter new text with this font, click the pointer anywhere on screen and begin typing.

If an existing text element was highlighted before you accessed the selector, it will be converted to the new font selection. This is how you can change an element from font to font in ToasterCG.



The pop-up font menu button.



The pop-up font menu, popped-up. Notice that the size of each font appears beside the name, and brushes are identified by small paint brush icons.

The Pop-up Font menu

The pop-up font menu enables you to select a font from the list of online fonts. ToasterCG supports these kinds of fonts: regular ToasterFonts, Color ToasterFonts, PostScript fonts, and Amiga Outline fonts. (To place more fonts on the font menu, you must load them. See "Adding Fonts to the Available Font List.")

Notes about entering/deleting text

To delete text, highlight the letters you want removed, then press the Del key. While the cursor is on a line, use the Del key to delete the current letter, or the Backspace Key to backspace over the previous character.

Related Topics

To add more fonts to the available list, see "Adding Fonts to the Font List."

To change text size within the same line of text, see "Sizing and Resizing Text."

Sizing and Resizing Text

In order to change a font size, you must essentially replace one font with another. Load the replacement font (in its replacement size) to the pop-up menu. Now select the text that should be sized differently. It should highlight in gray. Now simply select the new font size from the pop-up menu to convert the selected text to that font and size.

Sizing PostScript Fonts and Amiga Outline Fonts

To size a PostScript font, after you select it from the pop-up font menu, simply enter the two- or three-digit number of the size you want, from 10 lines to 400 lines tall (300 lines on Scroll pages). ToasterCG will instantly create it and make it the current font. You can begin entering text almost immediately.

To change the size of a text line, you must first select it, then select the new size from the pop-up font menu. (If the size you want is not available, then you must load the font you want in the size you desire. Then select the text to change, followed by the font you wish.)

Sizing Standard and Color ToasterFonts

When you select a regular or Color ToasterFont, you select the font from one of the pre-made sizes in which it is available. These fonts may only be loaded in the sizes in which they were created, and they cannot be resized.

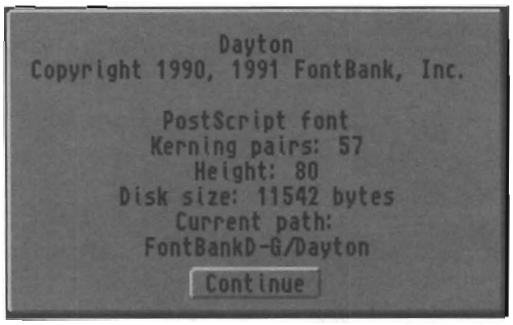
Obtaining Information about a Font or a Brush

To get information about a font or a brush
Select the font or brush from the pop-up menu (or from the screen itself) and click on the Information button.



The Info button.

The accompanying illustration shows you a sample of the information provided by the Info button.



Moving Text and Graphics Around the Screen

To reposition text, or a graphic element such as a brush

Double-click on it, then drag the item to its new location.

- To select a letter, move the pointer to it and click on it.
- To select several adjacent letters, drag the pointer across them.
- To select several non-adjacent letters or brushes, hold the Shift key and click on them. Click a second time on any items you wish to deselect.
- To select an entire phrase typed on the same line, double-click on any letter in the line.
- To select all elements on the entire page, hold the Shift key and double-click on any item.
- To deselect any highlighted item(s), click anywhere on screen where there is no text.

Information about Letters, Words and Lines

In terms of positioning text, ToasterCG considers items on screen as *lines*. ToasterCG defines a line as one or more letters typed on the same line (without a Return keypress). For example, if you enter the word "ToasterCG" on one line, press the Return key, then type the phrase "is a character generator" on the next line, then each of these is considered a separate line. All of the letters in a single line will be affected as a group when being positioned or moved, since they were originally created on a single line.

You can, however, select letters within that group independently for palette or font changes.

When selecting text for positioning
Selecting a single letter within a word or a phrase is the same as selecting the entire word or phrase when you go to move it to a new position. Select any letter or the entire item, then drag it, and the entire line will move.

When selecting text for attribute editing
You can select any number of items (letters, words, brushes) freely. Each item is considered distinct. Therefore, different letters within a word may have different colors, shadows, etc.

Tips for text generation

If you wish to make the first letter of a word oversized, select only that letter alone, then select a different font or font size from the pop-up font menu.

If you wish to have an oversized first letter on a different baseline, like a drop cap, you will need to enter the first letter on one line, press the Return key, then enter the remainder of the word on the next line. Then position the two text lines as one.

Questions about Letters, Words and Lines

What's a line?
A line is the word ToasterCG uses to describe all text typed on a single line, before pressing the Return key.

How do lines work when changing attributes?
You have complete freedom when changing attributes. Any items in any combination may be selected and given new attributes of color, shadow, etc.

How do lines work when positioning them on screen?
Lines are repositioned as a whole only. Therefore, selecting a single letter within a word is the same as selecting the entire word when you go to move it to a new position. The entire line will move.

What if I want a larger sized letter at the beginning of a word or phrase?
If you already entered the text, just select the letter(s) you wish to resize, and choose a different font from the pop-up font menu.

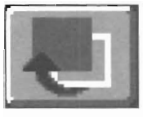
If not, you should first make sure that the two font sizes already exist in the pop-up font menu. Add them if you need to. Then use the large type size and enter the first letter. Select the smaller type size, and enter the remaining letters.

What if I want a larger letter with a different baseline position?
Use a large type size and enter the first letter. Press the Return key. On the next line, use a smaller type size and enter the remaining letters. Then select each item and position them as you wish. Remember to always select both when you want to move them as a unit in the future.

Layering Text and Graphics

ToasterCG automatically layers the lines that you place on screen. Text always appears in front of brushes and boxes. However, when you overlap multiple brushes and boxes, or multiple text lines, ToasterCG is going to need to know which items are in front of which other items.

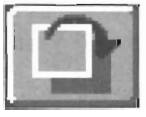
To assign layers to different items
Select the item, then select either the Front or Back button.



The bring-item-to-front button.

The Bring-to-Front button
The Bring-to-Front button brings the selected item (in gray) to the frontmost layer, in front of all other lines. With brushes and boxes, you will see the outline of the item come to the foreground. You will not see this with text lines, although the button will work on them.

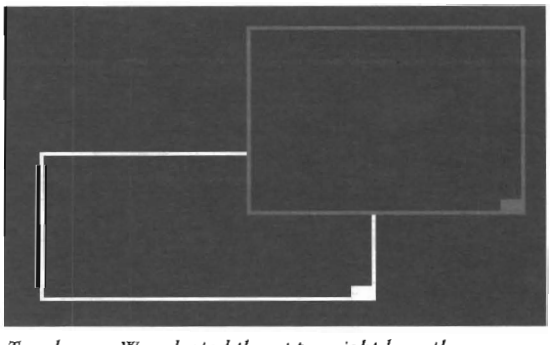
If you have difficulty remembering which button is which, remember this: a selected item is gray. The Front button shows the gray box (the selected color) in front of the white box (the unselected color).



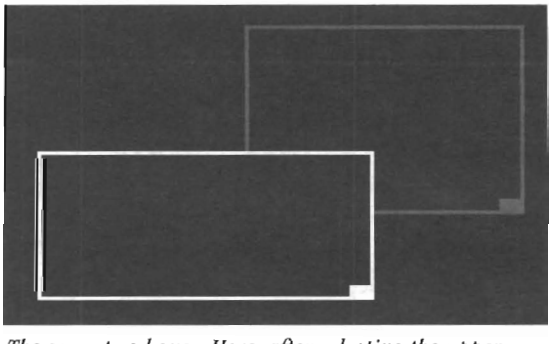
The send-item-to-back button.

The Send-to-Back button
The Send-to-Back button pushes the selected item (in gray) to the back layer, beneath all other lines. With brushes and boxes, you will see the outline of the item go to the background. You will not see this with text lines, although the button will work on them.

Important:
*Text **always** lies in front of graphics. You can create multiple layers of text, and mix text with graphics, but text will always lie in front of graphics in ToasterCG.*



Two boxes. We selected the upper right box, then clicked on the Bring-to-Front button. Notice how the box now overlaps its neighbor.



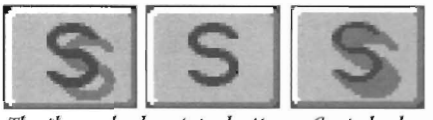
The same two boxes. Here, after selecting the upper right box, we clicked on the Send-to-Back button. Now the box lies behind its neighbor.

Layering Tip: To select among several overlapping items
Often, items may overlap, making it difficult to select the correct letter or graphic. If this is the case, and you cannot select the item you want, hold the Alt key and click on the "stacked" items. With each click of the mouse, a different element in the stack will highlight. When the item you want is highlighted, make the editing changes you wish. Only it will be affected.

Adding Shadows to Text and Graphics

By default, shadows and outlines are automatically active in ToasterCG.

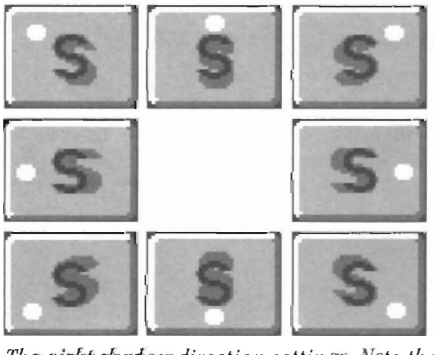
To change shadow settings for existing text or graphic lines
First select the item to edit. Click Shadow Type to choose drop or cast shadows. Click Shadow Direction to change the direction that the shadow falls. Click Shadow Length to choose the size of the shadow. These settings will be used for all newly entered text.



The three shadow type buttons: Cast shadow, No shadow, and Drop Shadow.

Shadow Type (F1)
Press this button to select the type of shadow for the currently highlighted text, or for newly entered text. There are three settings for this button: Drop shadow, Cast shadow, and No shadow, any of which can be assigned on a character-by-character basis. You can tell at a glance if a character has shadow setting by glancing at this button when the character is selected.

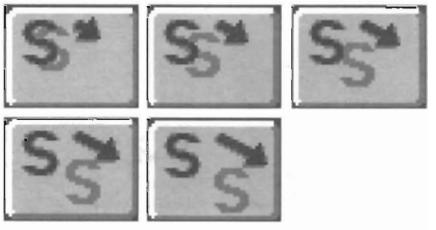
Cast Shadow is the default setting.



The eight shadow direction settings. Note that the shadow always falls away from the direction of the light.

Press this button repeatedly to choose the direction in which the shadow falls. There are eight settings for shadow direction, any of which can be assigned on a character-by-character basis. You can tell the shadow direction for a character by glancing at this button when the character is selected.

Shadows falling to the lower right (the first button above) is the default setting.



The five shadow length settings.

The Shadow Length button (F3)
Press this button repeatedly to change the length of the shadow. There are five Shadow Lengths available, any of which can be assigned on a character-by-character basis. You can tell at a glance what length the shadow is by glancing at this button when a character is selected.

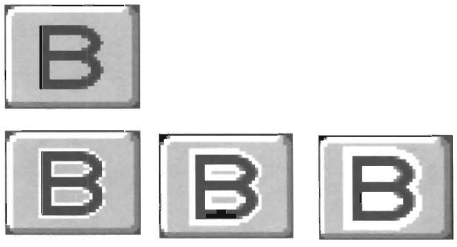
The second size is the default setting.

Related Topics
To change shadow color or transparency, see "Selecting Colors for Text, Shadows, and Border."

Placing Outlines around Text and Graphics

Outlines are automatically on for all fonts and graphics.

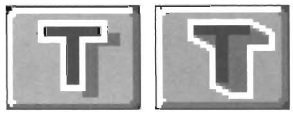
To change the outline thickness (or to turn it off)
First select the item by clicking on it. Select Outline Size to choose an outline setting (three sizes, or off). Select the Outline Position button to select the outline placement. These settings will also be used for new text and graphics.



The outline size button has four settings: Off, Thin, Medium, Thick.

The Outline Size button (F4)
Select Outline Size to pick the size of the outline around the currently selected item. There are four settings for outline size: No outline, Thin outline, Medium outline, or Thick outline. These settings will also be used for newly entered text. You can tell what the outline size is by glancing at the button when a character is selected.

The default setting is Medium thickness.



The two outline position settings: text face only, or text plus shadow.

The Outline Position button (F5)
Select the Outline Position button to choose the placement of the outline around the selected character or graphic.

There are two settings for outline placement: text face only, or the text and shadow. These settings will also be used for all newly entered text. You can tell whether the outline surrounds the entire character or just the face by checking this button when a character is highlighted.

Outlining characters is especially useful as it serves to accentuate them, making them more readable against a background.

The default border setting outlines the text face only.

Setting Color and Transparency for Text, Shadows, and Outlines

To set the color or transparency levels for face, shadow, or outline
Select the text first, then select the Palette button. Choose one of the three attribute buttons (T for Text face, S for Shadow, and B for Border). Adjust the color sliders to alter the color accordingly, adjust the alpha slider to set the level of transparency. Exit the panel and your settings have been assigned.

Note:
For Key Pages, transparency is limited to four levels. For Framestore Pages, it is fully adjustable. See "About Transparency and Key Pages," below.

Important:
If you select text first, then make Palette changes, the selected text will accept your changes, as will all text entered afterward. If you do not select anything before making Palette changes, all text entered afterward will accept the settings you made.

Use the Palette menu to edit the following aspects of ToasterCG graphics:

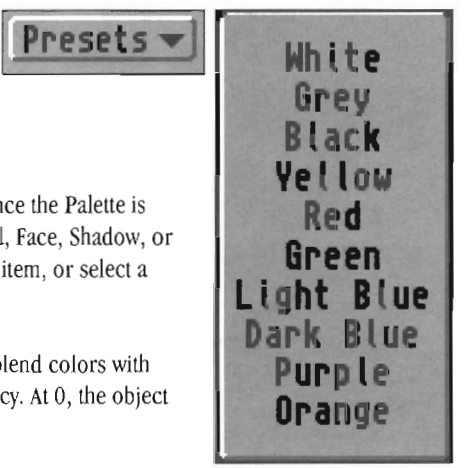
- For all page types, the four attributes that describe the appearance of video text (face color, outline color, and shadow color, and transparency).
- Additional item for Framestore pages: the background color scheme (solid, ramped, or image).



The palette menu as it appears for a Framestore page. (The first button in the top row is for choosing a background color or image. Its presence indicates that this is a Framestore page. The other page types do not have this button.)



The palette button.



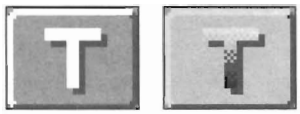
Select the palette button from the toolbar to access the color menu. Once the Palette is displayed, select the attribute button that you wish to edit (Background, Face, Shadow, or Outline). Use the RGB sliders to adjust the color value for the selected item, or select a color from the Presets pop-up menu (shown at right).

The color box on the Palette menu will display the color value as you blend colors with the RGB sliders. Use the A slider to adjust its alpha channel transparency. At 0, the object is completely transparent. At 255, it is completely visible.

Once you have set the Palette attributes, all new text will use these settings. To alter any text after it has been entered and positioned on screen, simply highlight it and re-enter the Palette. Changes will affect all highlighted items.



The Edit Text Face button



The Solid Face and the Gradient Face buttons

Face button
Select the Face button to adjust the color for text or boxes. Also select it to adjust the transparency settings for text, boxes, or brushes.

Select the Solid Face button to create solid-color text. Select the Gradient Face button to create two-color blended text. When you select the Gradient Face button, two additional buttons appear: the High Color and Low Color buttons. Choose each one and set the color values for the top and bottom of the text gradient. When using the Gradient Face button on Key Pages, you will note that only the alpha channel slider associated with the High Color button is active, since the entire face, whether text or graphic, must have the same transparency level. This is not the case for Framestore pages, which support all levels of transparency all the time.

Use the RGB sliders to alter the color for text or boxes only (since brushes are small images, they have their own colors and cannot be changed). Use the A slider to adjust transparency for text, boxes, or brushes.

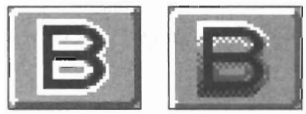


The Edit Shadow button

Shadow button
Select the Shadow button to adjust the color and/or transparency setting for text or brush shadows. Note that shadows should also be made transparent when the face of an line has been made transparent (see below for details). When this button is selected, the RGB sliders alter the color for drop and cast shadows, and the A slider adjusts transparency (transparency can not be set separate for top and bottom for brushes).



The Edit Outline button



The Solid Border and Gradient Border buttons

Outline button
Select the Outline button to adjust the color and/or transparency setting for text or brush outlines. Outlines help define the edges of character generated text, helping letters to stand out against the background. Note that outlines should also be made transparent when the face of an line has been made transparent (see below for details). When this button is selected, the RGB sliders alter the color for the outline border that surrounds text, and the A slider adjusts transparency.

Select the Solid Outline button to create text with a solid-color outline. Select the Gradient Outline button to create two-color outline blends. When you select the Gradient Outline button, two additional buttons appear: the High Color and Low Color buttons. Choose each one and set the color values for the top and bottom of the outline gradient.

When using the Gradient Outline on Key pages, you will note that only the alpha channel slider associated with the High Color button is active, since the entire outline must have the same transparency level. This does not occur on Framestore pages, which support all levels of transparency all the time.

Related Topics
More about the Palette buttons and background types—solid color background, ramped color background (with high color and low color buttons), and ToasterPaint image background—can be found in "Selecting Colors for the Background."

For information about transparency and how to create semi-transparent characters, turn the page and read "Notes About Transparency," on the next page.

Notes About Transparency

To make a graphic box or brush transparent
First select the item then select the Palette button. Select the Face button. Drag the A slider to adjust transparency between 0 (fully transparent) and 255 (fully opaque). Do the same with the A slider for the Shadow and Outline buttons.

For Key Pages
There are four levels of transparency available for Key pages: 100%, 66%, 33%, and 0% (solid). The alpha channel slider shows the four ranges as grey bars. When the slider is placed above any bar it is considered within that range.

For Framestore Pages
You have full control over alpha channel levels, from 0 to 255.

If Transparency Does Not Seem to Work Right

If you do not get the results you expect with transparent characters, you may need to know more about how ToasterCG's alpha channel functions. Shadows and outlines are duplicates of the letters they appear behind, only slightly larger (or slightly offset), and colored differently. A character with a drop shadow and an outline is really three overlapping characters. The face may be white, the drop shadow gray, and the outline may be black. Each can have different color and transparency attributes that affect the overall appearance of the character.

Therefore, if you set the face of a character to be 25% transparent, and leave its shadow and outline at 100% (solid), the character will not appear transparent. It will appear dark, or dim. The reason is that the character face is rendered with 25% solidity while its shadow is rendered with 100% solidity. A semi-transparent character over a solid shadow makes the character appear solid, but dark, and not transparent.

Generally, you should set shadow and outline transparency to the same level as that of the face, if not a lower level. If either shadow or outline transparency is set to a higher level, such as 100% solid, then the character itself will be rendered over that solid color, and you will not have a fully transparent character. You should take the time to experiment and decide which settings you prefer to use to get the results you want.

See also the note about transparency and gradient blends, below.

About Gradient Colors

ToasterCG allows you to use color blends in the following instances:

- Two-color blends are allowed on Key and Framestore pages only
- Text faces may be blended (all fonts, except Color Toasterfonts)
- Text outlines may be blended (all fonts, including Color Toasterfonts)
- Box faces and outlines may be blended
- Brush outlines may be blended

For appealing graphics, you may wish to try various combinations of blends. For example, reverse the two colors you use for the face and the outline. Or, reverse the color scheme on every other line of text, or for every other letter.

Note that on Key Pages you can adjust the High Color and Low Color RGB values independently, but that you cannot adjust the high or low alpha channel independently (the way you can on Framestore pages). You may wish to read the note, "About Transparency," above, for assistance in getting the results you desire.

Page Composition Tools

Justifying and Centering Text

To justify text lines or graphics horizontally (left-to-right)
Click the Justify button to cycle through the justification settings.

To center all text and graphics on the entire page vertically (up and down)
Select the Vertical Center button. Instantly, all items will be centered vertically on the page.



The justify center, left and right buttons.



The justify (tab) button setting.

The Justify button (F6)
Select this button to justify the text on the current line. If you wish to justify the entire page of text, make sure to select all items on the page first.

There are four justification modes: center, left, right and none. The selected text will shift position as you press the button.

Press this button repeatedly to cycle through the different settings. The button changes appearance as you select it, so that you can tell at a glance how the line is justified.

Note:
The (tab) setting is designed to allow you to line up text on a line-by-line basis, as if you had set up tabs (or a left margin). This setting is useful when you need to lay out a series of items or bullet points, and you want them lined up as you enter text.

Simply select this setting first. Then click on screen and begin entering text. Press Return after each line, and the next line will line up with the line above it.



The vertical center button.

The Vertical Center button
The Vertical Center button moves the currently selected text on screen so that it is centered between the top and bottom of the screen, with equal space above and below. Any line spacing between lines will be lost, as ToasterCG readjusts all lines for proper vertical spacing.

If you wish to center the entire page of text, make sure to select all items on the page first.

Creating Lower One-Third Graphics

To create a lower one-third (or lower-third) graphic instantly
Select the Lower-Third button. ToasterCG will immediately position all text on the page as a lower one-third graphic. This is a convenient shortcut button.



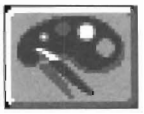
The lower third button.

The Lower Third button
Lower-third graphics are among the most commonly-used graphics in television. Since you too will probably be creating them, ToasterCG has this built-in function to center and place the selected text at the appropriate location for a lower-third graphic.

Note:
*Lower Third affects **all** items on the page, regardless of whether they are selected or unselected.*

Selecting Colors or Images for the Background (Framestore Page only)

To choose the background colors for a Framestore page
Select the Palette button. From the palette menu, choose the background type, and adjust the RGB sliders as desired.



The palette button.





Background Type button



Above right. The palette menu with the background colors button selected, and the gradient blend button chosen. Below right. The palette menu with the background colors button selected, and the "paint" background image button chosen.

The Palette button

ToasterCG's Palette menu governs all color settings for text and backgrounds. You can select background colors at any time while working in ToasterCG, either before or after entering text on the page.

The Palette menu contains a set of buttons for three background attributes: solid color background, ramped color background, or image background. Select one to switch it on and edit its settings. The color indicator on the Palette menu displays the color value as you work.

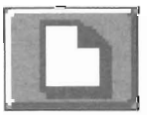
To select a background type and set its colors

1. Select the Palette button to display the palette menu.

2. Click on the Background Type button.

3. Select one of the three background types available:
   3a. Solid Color
   3b. Ramped Color
   3c. Painted Image

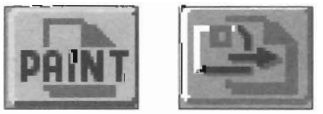
4. Select the color for the background.
   4a. If you select Solid Color, adjust the RGB sliders to the desired color.
   4b. If you select Ramped Color, select either the High Color or Low Color buttons and adjust the RGB sliders to the two colors you desire for the blend.
   4c. If you selected Painted Image, click on the Disk Access icon that appeared and use the file requester to select an image. Only RGB and Framestore images are acceptable.



Solid Color button
This option uses a single color for the entire background. Select the Solid Color button to choose this background, then adjust the RGB sliders choose the background color. Select Continue to accept these settings and exit the palette.



Ramped Color button
This option uses a top-to-bottom blend of two colors for the entire background. Select the Ramped Color button to choose this background. When this button is selected, two additional buttons appear, the High Color and Low Color buttons. Select the High Color button and adjust the RGB sliders for the color at the top of the background screen. Select the Low Color and adjust the RGB sliders for the color at the bottom of the background screen. ToasterCG will generate a color ramp between these two values when it renders the page.



ToasterPaint (RGB buffer) button
This button offers you two choices for selecting a background. You can select the image currently residing within the ToasterPaint program (if you've previously loaded an image into it), or you can use a file requester to locate and select an image from disk.

1) If ToasterPaint is not active, yet you wish to use a background image
Select the Paint button, then select the Load Image button to access a file requester and select a Framestore or RGB image.

You will not see the image on the RGB monitor. However, you can change the Toaster's display to see a composite image of the background and the ToasterCG screen, which will aid you in lining up text. See "Lining Up Text over Background Images," next.

Important! If you intend to create a series of pages where each has a different image background, you should use the Save Page button to save each page as its own rendered image before going to the next page. Otherwise, each new page will write its own background image into the buffer, clearing out the previous one.

2) If ToasterPaint is active, and you have previously loaded an image into it
Select the Paint button—this chooses the ToasterPaint image for the background. With this option, you can return to ToasterPaint and modify the image, then go to CG and adjust the text, as much as you wish.

You will not see the image on the RGB monitor. However, you can alter the Toaster's display to see a composite image of the background and the ToasterCG screen, which will aid you in lining up text. See "Lining Up Text over Background Images."

More About Background Images
When you render this page, ToasterCG will take the image, add its own text, and display the result on the preview output. You may render the image to check positioning and spacing as many times as you wish. The background image is unaffected by rerendering.

When you have the image you like, we recommend you save the combined image as a buffer page. You may not always have ToasterPaint active, containing that image, when you need to display the page. In addition, you may have several different pages in a given book that use different ToasterPaint backgrounds. Therefore, save ToasterPaint-background Framestore pages as buffer pages.

Related Topics: More about the Palette buttons and text attributes (Text color, Shadow color, and Border color) can be found in "Selecting Colors for Text, Shadows, and Borders."

Lining Up Text over Background Images

When you select an image as the background for a Framestore Page, you can use a special display mode for seeing both your text and the background on one screen at the same time. This makes it easier to line up text with specific lines of text falling exactly where you want them in relationship to the background image.

To activate this display mode, press Alt+Help. The RGB monitor screen will change colors, and the preview output will show the ToasterCG interface half-dissolved over the preview buffer. At the moment, the preview buffer is probably black, so there will be little to see.

Now select the Render Page button (F9). The ToasterPaint background image will be rendered into the preview buffer, and you will be able to see it beneath the CG overlay on the preview output. Adjust the monitor's brightness or contrast if it is too dim to see.

Now you can enter text and place graphic lines as you wish, since you can see where to position them. Select the Render Page button to rerender the image. If things don't look quite right, reposition the text and render again until they are.

Note about the Render Page and Take buttons
If you press the Take button after rendering the page, the preview buffer image will be switched to the main output. This will clear the underlying preview buffer beneath the CG screen overlay. You will need to select Render Page again to recreate the background image in the buffer for you to line up text again.

Display Operations

There are essentially three ways to display ToasterCG pages: from within ToasterCG itself, from the Switcher, or from the Flyer sequencer. How you choose to display the pages made by ToasterCG is going to vary depending whether you are in a production situation, of whether you use a Flyer's built-in sequencer or the Switcher. The difference is primarily one of automated control versus manual control.

- From within CG you can render pages and view them using the F9 and F10 keys, respectively. This allows you to see your work as you design it. And, if you're "working the CG" during a production, and connected to a master switching system, you can ready pages for the master operator to take when he needs them. These rendering functions are discussed here in the ToasterCG manual.

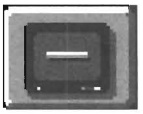
- From within the Flyer sequencer, all display operations are handled for you. You simply arrange the croutons in the proper order and the Flyer does the rest. This kind of operation is discussed in the Switcher/Sequencer portion of the Toaster manual.

- From within the Switcher, you must perform several steps in order to display a page. You can either access and display pages directly from a Files display (by double-clicking on them), or you can create a project that contains these pages and display them from the Project/Switcher view (this allows you to more direct control over when and how pages are brought to the main output).

  See the Sequencer/Switcher portion of the manual for details on displaying CG pages from the Project/Switcher view.

Test-Rendering a Single Line (Key and Framestore Pages)

To test-render a single line or text line
Select the Render Line button. ToasterCG will render the line where the text cursor currently resides to the Toaster's preview output.



The Render Line button.

The Render Line button (F8)
The Render Line button will render the current line to the preview monitor. The message "Working . . ." will be displayed on the Menu bar until the rendering is complete.

To cancel 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.

The Render Line button will only render lines to the preview output. You cannot switch them to the main output with the Take button. Also, if you do not have or use a preview monitor, this button will appear to have no effect.

Related Topics
The Test Render button converts to the Speed button on Scroll and Crawl Pages, where it selects the speed for scrolling or crawling text. See "Changing the Speed of Scroll or Crawl Pages" for information about the Speed button.

Displaying Key and Framestore Pages from ToasterCG or Switcher

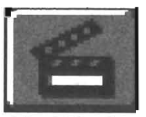
To display a Key or Framestore page from within ToasterCG
Select the Render page button. ToasterCG will render the page and display it for you on the Toaster's preview output. To switch this screen to the main output, select the Take button. Images must be rendered to preview before they can be taken to main.


The Render Page button.

The Render Page button (for Key and Framestore pages) (F9)
Select Render Page 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 main output, since the image must be generated before it can be displayed.

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 entire page in order to take it to main. The indicator will show the current speed selected.


The Take button.

The Take button (F10)
This button is not visible on screen until a page has been rendered. Once a page is ready to be displayed on the main output, the Take button appears. Click it to send the rendered graphic to the current main output. Key pages will be displayed over the current video source. Framestore pages will replace the current main source.

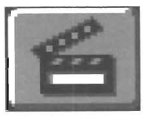
Related Topics
Different page types load to different locations on the Switcher. Key and Framestore pages load into the framestores, DV1 or DV2, depending on whichever is available. Scroll and Crawl pages load into the matte generator input, BKG. Select the appropriate button to display the page. Select it again to remove the display.

For specific instructions and information on where CG pages load, and the various methods for displaying them, see "Loading and Displaying CG Pages" in the Switcher portion of the manual.

Displaying Scroll and Crawl Pages

To display a Scroll or Crawl page

Select the Take button. Scroll and Crawl pages do not need to be rendered to the preview output, so you do not need to press F9 first. They can be rendered instantly to the main output.



The Take button.

The Take button (F10)

For Scroll and Crawl pages, the Take button always available. Select it to send the Scroll or Crawl directly to the main output.

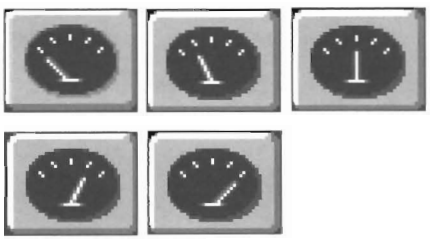
Related Topics

To change the speed of the scroll or crawl, see "Changing the Speed of Scroll and Crawl pages."

For specific instructions and information on where CG pages load, and the various methods for displaying them, see "Loading and Displaying CG Pages" in the Switcher portion of the manual.

Changing the Speed of Scroll or Crawl Pages

Scroll and crawl pages move at several different speeds. These speeds are set within ToasterCG when you design the page (although you can change them via the crouton control panel within the Switcher/Sequencer). To set the speed of a scroll or crawl page, click the Speed button. Click it repeatedly to cycle through the 5 scroll speeds and 4 crawl speeds.



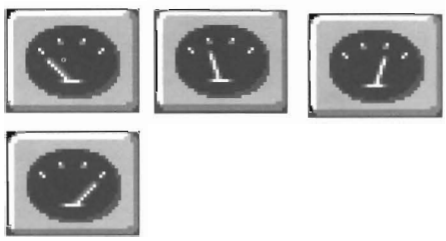
The five speed settings for the Scroll page, from fast to slow.

The Speed button (Scroll Page)
This button allows you to select the speed of the scroll or crawl. Since scroll and crawl pages do not need to be rendered to preview before going to main output, this button takes the place of the Render Line button.

There are 5 scroll speeds.

When the needle on the Speed button is to the left, the speed is at its fastest setting. When the needle is to the right, it is at its slowest setting.

You cannot change the speed of Scroll or Crawl pages while they are running.



The five speed settings for the Crawl page, from fast to slow.

The Speed button (Crawl Page)
This button allows you to select the speed of the scroll or crawl. Since scroll and crawl pages do not need to be rendered to preview before going to main output, this button takes the place of the Render Line button.

There are 4 crawl speeds.

When the needle on the Speed button is to the left, the speed is at its fastest setting. When the needle is to the right, it is at its slowest setting.

You cannot change the speed of Scroll or Crawl pages while they are running.

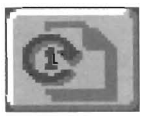
Making Scroll or Crawl Pages Roll Once or Many Times

To change the repeat mode of a Scroll or Crawl page

Choose the Repeat button to select the repeat mode you prefer. Your choices are Run Once, Run Once and Pause, or Run Continuously, which are explained below.

The Repeat button

Click on the Repeat button repeatedly to cycle through the three repeat settings. There are three repeat modes for Scroll pages, and only two for Crawl pages. Interrupt any scroll or crawl, from either the Switcher or ToasterCG, by clicking the right mouse button.



The Run Once option for scroll and crawl pages.

Run Once

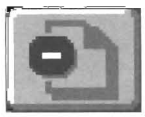
This setting instructs the scroll or crawl page to display the entire screen from start to finish, one time only.



The Run Continuously option for scroll and crawl pages.

Run Continuously

This setting instructs the scroll or crawl page to display the entire screen from start to finish, then repeat again and again until interrupted (by a click of the right mouse button).



The Run Once and Pause option for scroll and crawl pages.

Run Once and Pause (Scroll page only)

This setting instructs the scroll or crawl page to display the entire screen from start to finish, then halt at the end of the page (remaining on screen until interrupted by a click of the right mouse button. At that point, whatever text is still shown on screen will fade off.

This setting is useful when you want to have a telephone number or copyright information remain on screen for an additional length of time. The final line of the page will hold at the bottom of the screen.

The "holding point" is determined by the location of the last line of the page. To make the last line of text hold in mid-screen, you may need to enter a few empty lines by hitting the return key a few times after the last line of text.

If you enter too many empty lines, you can delete an empty line by simply moving the cursor to the line using the cursor keys, and hitting the Del key.

Important:

The Flyer does **not** support the repeat modes of Scroll and Crawl Pages. If you wish to have a particular page run several times in succession, simply duplicate the crouton for the page as many times as you wish to have it repeat.

Related Topics

To change the speed of the Scroll or Crawl page, see "Changing the Speed of Scroll and Crawl pages."

Page and Book Operations

Changing and Copying Pages

Page operations are simple in ToasterCG. The controls you need are most often displayed on screen on the toolbar, so they're easy to get to.



The Current Page button and the Next/Previous Page buttons.

To go to an adjacent page
(either the next page or the previous page)
Click on the up or down arrow beside the Current Page button. Up will take you to the next higher-numbered page (from 2 to 3). Down will take you to the next lower-numbered page (from 2 to 1).

To go to a new page that is further away than the click of a button
Click on the Current Page button. A menu will ask you to enter the new page number. Type in the two-digit number of the page to which you wish to go, and press return. You will jump to that page.

Note that you do not have to clear out the numeric field of the number that shows in the requester. Simply enter the new number in front of the existing one and press Return.



The Copy Page button.

To copy the current page to any other page,
Select the Copy Page button. A window will pop up, requesting "Copy page ## to which page number?" Type in the two-digit number of the destination page (between 00 and 99) and press the Return key. The current page will be copied to that page number.

Note that you do not need to erase the existing numbers in the window. Simply enter the new numbers and press the Return Key to go to the new page.

This is useful when you are making several pages with the same basic format (colors, text qualities, etc.) but different messages.

Clearing Lines, Pages, and Books

Three buttons on the Controls menu allow you to clear lines, clear entire pages, or clear the current book currently held in the computer's memory.

To clear a line of text
Click on any character in the line so that it highlights. Select the Clear Line button. The line will be cleared instantly.

To clear the current page of all text and graphics
Select the controls button (or toggle to the Controls menu using the Right-Amiga key), then select the Clear Page button. ToasterCG will ask you to confirm the request. Select OK or Cancel.

To clear the current book of all fonts, text and graphics
Select the controls button (or toggle to the Controls menu using the Right-Amiga key), then select the Clear Book button. ToasterCG will ask you to confirm the request. Select OK or Cancel.



The Clear Line Button.

The Clear Line button
To clear a line of text, click on any character in the line, then select Clear Line. Clear Line will erase the current line of text instantly, without asking for confirmation, so be sure that this is what you wish to do.



The Clear Page button.

The Clear Page button
Select Clear Page to erase the current page of all settings and text. This function cannot be undone, therefore ToasterCG will ask you to confirm the action.

This command clears only the current page of text and graphics. It does not remove fonts and brushes from the pop-up font menu.



The Clear Book button.

The Clear Book button
Select Clear Book to erase the entire book of 100 pages.

This command does not erase the book from the hard drive. Nor does it remove fonts and brushes from the pop-up font menu. It merely clears the contents of ToasterCG's pages.

This function cannot be undone, therefore ToasterCG will ask you to confirm the action.

To load the contents of a text file to the current page
Select the Controls button (or toggle to the Controls menu using the Right-Amiga key), then select the Load Text button. ToasterCG presents you with a file requester, allowing you to locate and select the text file to be loaded. The incoming text will use the current settings for font, shadow, color, etc.



The Load Text button.

The Load Text button
If you have a lengthy list of names or other information that was provided to you in the form of an ASCII text file, you can load that file into ToasterCG. This saves you time since you do not have to re-enter all that data.

When you select Load Text, ToasterCG will automatically list the contents of a directory called CGTextFiles. This is to support prior versions of ToasterCG, which looked for this specific directory and a specific file name for each page (**page##.text**, where the ## sign indicates the two-digit page number of the current page).

ToasterCG now allows you to locate and load text files from anywhere on your system, using a navigable file requester. Simply locate the file and double-click it to load it into the current page.

About ASCII Text Files
Text files should be plain ASCII text, without formatting or font codes. Most word processors or database software can create this form of file using an ASCII Save or Save Text Only option, so that text or data can be imported into ToasterCG. If your word processor cannot save in this manner, you may see additional characters among the imported text.

About Formatting the Page
The line where the ToasterCG text cursor resides will be used for formatting and font information. So, if the current line is the font Cohesion, size 50, with yellow text, then the text file will be formatted using this font, size, and color. Therefore, you might want to make sure that your font and palette information are set up before you load the file.

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 text to a Framestore or Key type page, there may be more text than will fit on the page (both vertically and horizontally). You may have to set the font to a smaller size, and reload the text.

Loading Pages and Books

To Load a Page

Select the Controls button (or toggle to the Controls menu using the Right-Amiga key), then select the Load button (this button loads both books and pages, whichever you select from the file requester). Locate the page you wish to load and double-click its file name. ToasterCG will load this page to the current page.



The Load button, which you also use for loading individual pages.

The Load button is used to load both individual pages and books. You can also insert a page into a blank one in another book, and to append one book to another.

In each of the situations noted below, any additional fonts or graphics needed by the page or book will be loaded to the pop-up menu as well.

When you load a page

- The selected page will be loaded to the current ToasterCG page number.

When you load a book

- If ToasterCG is empty (i.e., no pages have been used yet), the selected book will be loaded in, taking up as many pages as it contains.
- If ToasterCG has any data (i.e., one or more pages have been used, or a book is currently loaded), the selected book will be appended to the end of the current book.

When you select Load, a file requester will appear. The requester is preset to list the directories where ToasterCG pages are stored, although you may load items from anywhere they are located. Go to the directory of your choice, find the file and double-click on its name.

The page or book, with its fonts and graphics (if any), will be loaded into the current ToasterCG page.

Important Note

The Load function will *always* append a book if there is any data currently in ToasterCG. If you are working in one book, and wish to work on another, save the current book, clear the book from memory, and then load the new book you wish to work on.

Otherwise, you may end up appending the new book to the current one.

About Loading Time

Books and pages that use PostScript or Outline fonts may take a few extra moments to load, as ToasterCG needs to create the font sizes used within the book.

If ToasterCG Cannot Locate a Font or Brush

When loading a page or a book, if ToasterCG cannot locate a font or a brush that was used, it will present you with the inquiry: "Unable to find (file name). Would you like to replace it with another font/brush?" If you respond no, you will be able to continue without that item. If you respond yes, you may use a file requester to locate the missing item or a replacement item.

Why is this so? When you save a page or a book, the available font/brush list is saved also (not the actual fonts themselves, just the list of their names and the locations where they were when this page or book was created). If you remove or delete these items from the hard disk, when ToasterCG tries to load the file it will not be able to find them.

Saving a Page

To Save a Page

Select the Controls button (or toggle to the Controls menu using the Right-Amiga key), then select the Save Page button. Enter a name for the page in the file requester that appears, then press Return. ToasterCG will save the page and generate a crouton so that you may use this page in a project.



The Save Page button.

The Save Page button will save the current page as a rendered image, with all of the font and graphic information needed so that you can reload it any time you wish to make changes to it. The page will also have a crouton created for it.

In other words, a saved page is a complete entity unto itself. It can be loaded and saved independently at any time. In addition, since it contains the rendered image within itself, it can be loaded very quickly by the Switcher. The image does not need to be generated before being displayed.

When you go to save a page, a file requester will appear. The requester is preset to list the directories where ToasterCG pages are stored, although you may save pages elsewhere is you prefer. Go to the directory of your choice, enter a name for the page and press Return (or click OK).

ToasterCG will save the page and generate a crouton so that you may use it in a project.

Saving a Book

Note: Although it is convenient to use Save Book as a form of archiving a set of pages that you may use for a given project, if you normally archive entire Flyer Projects it is not necessary. The convention of loading and saving books is no longer necessary within ToasterCG. The Save Book button is provided primarily to support earlier versions of ToasterCG software and the work you may have created with it.

To Save a Book

Select the Controls button (or toggle to the Controls menu using the Right-Amiga key), then select the Save Book button. ToasterCG will display a file requester containing the names of the all the books in storage on the hard drive. Double-click on a book name to load that book.



The Save Book button.

Select Save Book when you wish to save all 100 of the current pages loaded into ToasterCG as a single file. This option is provided mainly to support the older method of loading and saving files in ToasterCG, before drag-and-drop page support was added to projects.

The book file is simply a data file containing the information necessary to inform ToasterCG how each page appears. Unlike a saved page crouton file, this file contains no imagery. It is not capable of being dragged into a project. It can only be loaded into ToasterCG for editing, then resaved.

If it is convenient, you may wish to continue to use book files as archival backups of your ToasterCG pages. Book files are much smaller than rendered page files, so they will take up less space on your hard disk.

After you have made a series of pages for use in a project, save the book as a safety backup. Otherwise, make sure you back up your project so that all pages are saved with it.

With ToasterCG's ability to load and save pages independently, you can rearrange the pages within a book. This allows you to organize books more efficiently, which you may find beneficial if you continue using them.

Special Characters and Symbols

ToasterCG supports the full realm of PostScript font characters *provided they are a part of the font, and the Amiga supports them*. Not all fonts contain all of the possible characters that can be displayed, and many fonts contain only the characters that the designer needed when he created the font. Therefore, if you purchase or install a font that does not contain a specific character, ToasterCG (as well as the Amiga) will be unable to display it since it does not exist within the font description.

How to Access Special Characters

To find out the combination of keys you should press to gain access to specific characters, go to the Workbench on your Amiga. Locate and open the Tools drawer, and start the program KeyShow. The initial display shows the characters that appear when a single key is pressed. To see what other characters are available, press one of the qualifier keys (Ctrl, Shift, or Alt) and KeyShow will display them. Combine qualifier keys to show additional characters. The Amiga and ToasterCG also support the Dead Keys (discussed below). Additional (or different) characters may exist in the fonts you have.

KeyShow displays the current keymap on your Amiga (which was selected when your system software was installed). Depending on which keymap is installed on your system, you may have different characters available to you. You can select a different keymap via the Input editor found in the Workbench Preferences drawer.

Remember that the fonts you use in ToasterCG many or may not support all of the characters that the Amiga supports, nor may the keymap support all of the characters found in the fonts you use.

The Dead Keys

One set of special characters that is supported by the Amiga and ToasterCG with PostScript fonts is that known as the Dead Keys. These keys are displayed via a particular combination of keys pressed on the keyboard: Alt+(1st key), (2nd key). That is, hold Alt and press the first key, then **let go** of Alt and press the second key. When you press this key, you will see the dead key character appear on screen. Below is a partial list of the dead keys and characters (from the American keymap).

á = Alt+f, a
à = Alt+g, a
â = Alt+h, a
ã = Alt+j, a
ä = Alt+k, a

é = Alt+f, e
è = Alt+g, e
ê = Alt+h, e
ë = Alt+k, e

í = Alt+f, i = í
ì = Alt+g, i = ì
î = Alt+h, i = î
ï = Alt+k, i = ï

ó = Alt+f, o
ò = Alt+g, o
ô = Alt+h, o
õ = Alt+j, o
ö = Alt+k, o

ú = Alt+f, u
ù = Alt+g, u
û = Alt+h, u
ü = Alt+k, u

ÿ= Alt+k, y

Note that the **uppercase** versions of the dead keys, where supported, can also be used. For example, where Alt+k, e gives you ë, you can press Alt+k, then Shift+e to get Ë.

About Special Symbols

Additional (or different) characters and symbols may exist in the fonts you have. Depending on your source for fonts, you may have received a chart that display the characters in the font set. If so, use that as your reference. If not, the best way to find "hidden" or otherwise-unknown characters is to sit down at the keyboard and type through the majority of the keys on the keyboard, holding down either the Shift, Alt, or both, keys at the same time. In this manner you should be able to locate all of the characters that a particular font has to offer you. While this is admittedly a crude method, it is effective, and exhibits the not-yet-mature nature of some of the tools in the desktop publishing field (out of which PostScript fonts grew). Below is a partial list of some symbols you may find useful from the supplied SoftMaker font sampler (from the American keymap).

ª = Alt+v
æ = Alt+a
° = Alt+b
ç = Alt+e
© = Alt+e
• = Alt+8

¡ = Alt+i
£ = Alt+l
ø = Alt+o
¶ = Alt+p
å = Alt+q

® = Alt+r
§ = Alt+Shift+s
° = Alt+w
¤= Alt+y
¥= Alt+Shift+y

ToasterCG Tips and Tricks

There are a lot of unexpected tricks in ToasterCG that you will discover as you work with the program. Here's a collection we came up with.

Spacing Graphic Elements (i.e., Boxes & Brushes)

Boxes and brushes, including text brushes, can be duplicated on screen by hitting the Return key. With any one of these items selected, press Return to create another copy of it. This is useful for creating rows of stripes, or a grid-like pattern. With special symbol fonts, the possibilities are endless.

The spacing between each copy is determined by the settings for shadow and border. In other words, if a box has shadows and borders turned off, then the copy will be created immediately below the original. In fact, when you render the image, they will appear as one box because they are touching edge-to-edge.

If you turn on shadows, or borders, and then duplicate the brush, each copy will be spaced a small distance away from the original—based on that shadow or border setting. So if you want a small space between copies, turn on the smallest shadow or border setting. If you want slightly more, use a higher setting. For maximum distance, use the largest shadow setting and the largest border setting.

The benefit of this is that you can create rows of stripes or other shapes with perfect spacing (something that is otherwise difficult to do in ToasterCG). These make for nice design elements that you can place text over.

Stretchy Graphics

The new text brush function is incredibly flexible. It allows you to make resizable graphics out of most anything that you can find in a PostScript font.

Hyphens
For example, make a text brush out of the hyphen character, rotated by 40 degrees. Now add it to the screen, stretch it out so that it's long and thin, and make a couple of copies of it. In no time you have some diagonal stripes you can use as a background for titling.

Bullets
Here's another one. Make a text brush out of the bullet character (press Alt+8; most fonts should have this character), which is often used when you need to place three or more equally-important lines of text on a page and you don't want to number them.

When you press Alt+8 in the PS Brush menu, you will not see anything appear, although the text cursor will move over one space. (The reason for this is that the system has accepted your input as a valid character, but since its own internal set of displayable characters does not include that figure, it just shows a blank space.) Go ahead and enter any rotation or shear values, then click Continue.

In a second or so, you can go into the font pop-up and select this text brush, which will place a copy of it on the screen. Now you can position it, resize it, stretch it at will.

Dingbats
There is a group of fonts in the publishing industry known collectively as dingbats (Zapf Dingbats is the most well-known). A dingbat is usually a symbol of some sort, like these (✔, ✘, ❄, ✳, ❍, ❑, ✦). Take a moment and think about how useful it would be to have symbols like these (and many more) in a form that you can size, stretch, and rotate freely. All of a sudden you begin to see a much bigger picture, don't you?

The checkmark symbol shown above would be really useful for a series of images where a list of items is checked off. Plus, there are special fonts of road sign symbols, arrows, clip art, universal signs, countries, logos, and a lot more.

Contact your dealer or a font distributor/manufacturer for details.

Acquiring More PostScript Fonts

ToasterCG accepts PostScript Type 1 and Type 3 fonts, as well as Intellifonts (the Amiga's supported outline font format), ToasterFonts (bitmapped black and white fonts that have been converted to a special format), and Color ToasterFonts (bitmapped color fonts that have been converted to a special format).

If you purchase additional fonts from a vendor, we highly recommend that you purchase them the following way: on a floppy disk formatted for PC clones, in the PC PostScript format. Since the Amiga's operating system (since version 2.1) has the ability to read PC formatted floppies, this method is economical and reliable. (CD-ROM font collections in the PC format are also acceptable.)

For our purposes, there are effectively two types of PostScript fonts, those for the Macintosh and those for PC clones. The PostScript format for Macintosh computers is different from that of the PC. ToasterCG cannot read the Macintosh PostScript format unless the font has been converted (see below for details). However, ToasterCG and the Amiga can read the PC PostScript format.

(In case you are wondering, there is no PostScript format for Amigas, it is not necessary since the Amiga can accept the PC PostScript format.)

If you have access to Macintosh PostScript fonts, you'll need two support programs on the Amiga to get them into ToasterCG. You'll need either CrossMac (Consultron, 313-459-7271) or MaxDOS (Media4 Productions, 515-225-7409), plus TypeSmith (Soft-Logik, 314-256-9595). Both CrossMac and MaxDOS allow the Amiga to read Macintosh formatted diskettes. TypeSmith can read Mac PostScript fonts, and save them as PC PostScript fonts. Use these programs to convert the Macintosh PS fonts for ToasterCG use.

Note that you can also use TypeSmith to convert the TrueType format fonts (used by both the Mac and the PC) to PC PostScript as well.

For further information regarding PostScript and Outline fonts, see the bottom of page 12.

Troubleshooting PostScript Fonts

Occasionally you will come across a font that ToasterCG will not accept, even though it is a PostScript font. Although there is a standard for the PostScript format, standards are often changed or even ignored over time. The result is that you will come across the occasional problem.

Previous versions of ToasterCG would not accept certain fonts that had been created by certain Macintosh programs and saved in a PC-compatible format. This has been corrected by the support library that ToasterCG uses for PostScript.

On your own, you might try the following troubleshooting tips.

1) Turn off your system. Restart it, enter ToasterCG, and try loading the font right away (as the first font you load). This simple action will ensure that you did not encounter a problem such as an out-of-memory situation instead of a genuine bug.

2) Try loading the font into LightWave Modeler. Modeler also accepts PS fonts. If Modeler accepts it, and ToasterCG does not, then it may be a problem in ToasterCG. If so, contact Technical Support to report the problem.

3) If you have the Amiga font editor called TypeSmith (Soft-Logik, 314-256-9595), load the font using the option Import/PFB PostScript Type 1 Outline.... Select the file name with the letters .pfb after it (this is the outline file of the font itself).

Once it has loaded, press a variety of characters on the keyboard to see if they are there. If they are not, then the font may be incomplete or empty. Call the font maker or distributor. If they are, save the font using the option Export/PFB PostScript Type 1 Outline... (sometimes the act of saving a questionable font from TypeSmith will make it acceptable to ToasterCG). Now load the font in ToasterCG to see if it will work.

4) If you still have trouble with a font, contact NewTek Technical Support at the number listed in the front of the manual. You may need to send the font to NewTek so that we can study the format and locate the problem. If your need is urgent, you may wish to use a modem and send the font to NewTek's bulletin board system (BBS). This will help speed our response.

Notes

Notes

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LightWave 3D Layout

LightWave 3D Layout

LightWave Introduction

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What is 3D? A little background...

The human animal is a visually oriented creature. Three-dimensional animation (3D) has become a powerful tool for visualization—for both entertainment and education. It is employed in a wide and ever-increasing variety of applications. Still images help us to explain the world we live in, while illusion of animated movement helps us to understand and appreciate it further.

The most common 3D work created today includes:

- business graphics (company logos with animated growth charts)
- the flying logo (where a company name flies onto the screen amidst foggy beams of light and gleaming metallic highlights)
- commercials, where animated products fighting mock battles (a popular mouthwash, for example)
- high-tech film work (such as pseudopods made entirely of water, or robot humans of liquid metal).

However, these are only the most visible examples of animation work. Three-dimensional animation recreates automobile accidents in the courtroom, designs architectural walk-throughs of yet-to-be-constructed buildings, and visualizes complex scientific processes such as air flow aerodynamics for high-speed aircraft. On a more down-to-earth level, 3D may plan city projects such as new parks, design product packaging for test marketing, lend added dimension to a print and graphics campaign, or teach your children in schools. It is also used to visualize 3D databases, study numerical data sets, and emulate virtual reality in research facilities.

Three-dimensional animation demands a great deal from the individual, imposing its own set of disciplines. The elements that make up a 3D animation involve visualization, modeling, set and scene design, animation, lighting, direction, camera movement, color and texture, art skills, storytelling, and more. Many professional animation facilities hire artists who specialize in one aspect of 3D, such as lighting, modeling, or character motion. It is a testament to the allure and excitement of 3D animation that more people enter this field every day. The demand for—and appreciation of—this type of realism is growing ever more prevalent.

What is LightWave 3D?

LightWave 3D and the Video Toaster form the basis for a very high quality animation workstation. With it, you can design animated graphics like those described above. More and more of the animation you see in television today is created by the Video Toaster in one form or another. Television programs such as *Star Trek: Voyager*, *Unsolved Mysteries*, *Babylon 5*, and *seaQuest* testify to the power and versatility of LightWave. The Video Toaster offers frame acquisition, paint, and output of broadcast quality video imagery. LightWave 3D consists of LightWave Modeler and LightWave Layout, offering the most affordable and complete collection of modeling and animation tools ever brought to the desktop. LightWave Modeler is a general-purpose solid modeling program with an extensive selection of manipulating and sculpting tools. LightWave Layout is a rendering and animation program with an exhaustive collection of effects and motion controls.

One of the beauties of LightWave is its textbook simplicity. Even if you know little of 3D, creating 3D scenery is easier through LightWave's straightforward implementation. Many controls are automatic, such as lighting and focus, resulting in realistic images right away. For the novice animator, this smooths out the learning curve. For the more discriminating professional, the vast majority of LightWave's tools may be operated manually for precise control over special effects too numerous to mention.

Few systems can match this versatility while, at the same time, matching its affordability.

Getting Started in 3D

There is a rule of thumb that applies to LightWave 3D: *the more you know about the process, the easier it will be, and the better your results.* In fact, the more you know and understand 3D graphics in general, the more you will know about LightWave 3D. LightWave's textbook design and easy-to-use interface have already been praised by 3D professionals. Now the power of high-quality 3D graphics is in your hands.

If you already work in computer graphics, you know that different applications approach 3D differently. Therefore, you'll understand why we recommend that you read this section thoroughly, because it explains 3D graphics *according to LightWave*. Nowhere else will you find as complete an insight into LightWave as in these pages.

Typically, the creation of a 3D image or a 3D animation follows the general progression listed below. Each of these topics, as it relates to LightWave 3D, is discussed in detail in this chapter.

- Plan the animation (storyboarding)
- Create the objects you will need (modeling)
- Setting the scene (placement of objects)
- Test-render surface attributes to achieve the right look
- Add motion (assign motion paths)
- Render the images and record them

Or, you just might sit down and whip it up spur of the moment. That comes with time.

Whether you are creating a still frame or a full animation, you will find that breaking the process down into these logical steps makes it much more manageable. What follows is an introduction to 3D according to LightWave, following the five steps outlined above. Armed with this introduction, you'll have an understanding of each of the underlying concepts of 3D graphics and how they fit within the LightWave 3D universe.

Storyboarding - In the beginning, there was this idea....

Probably the most difficult of these steps is the planning stage that comes before you sit down to LightWave. What are you going to do? What story do you wish to tell? You have probably heard that one of the most commonly asked questions of authors, playwrites, and directors is, *Where do you get your ideas?* The answer is not difficult, it is a combination of inspiration, thought, and planning. And a major contributor is trial and error! From the moment the first idea springs forth, you play with it, add to it, study it, throw it into a new light, look at it from a different direction, bring it to a conclusion, or not. All of these actions build upon one another until the idea has grown into a scene, a simple plot, or a fully developed storyline. From there, LightWave 3D can help bring your idea to life.

Here are some basic tips for storyboarding. A good story flows consistently, generally in a straight line and in a compelling manner. It may have some surprise elements as well. Many popular 3D animations consist of very simple plots: a locomotive tries to cross a bridge with a broken rail, primitive archetypal characters run and dance to a tribal beat in a courtyard, a baby unwraps a new toy soldier, or a unicycle has a dream late one night. The stories are simple, and can be summarized in a single sentence. What makes them unique and compelling are further aspects of the animation, the details and characterizations that you remember when the animation is over. Why do you remember the locomotive's brave attempt to cross the bridge? What is so intriguing about the ritual movement of the dancers? How does the tiny toy's fear of the baby make you laugh? Do you identify with the unicycle's dream of fame? Elements such as these are less tangible, but nonetheless potent. The characters are often attempting the simple act of overcoming an obstacle. Their steadfast beliefs and determined actions draw the viewer into the story, lingering even as the credits roll.

You may want to populate your stories or characterizations with elements such as humor, surprise, fear, anticipation, and mystery. Once you have such an idea, support it with objects, motions, and lighting appropriate to the story you have to tell. If you are a beginning animator, concentrate on simpler, single-theme animations. What kinds of things can you do with a bouncing ball? What sort of story could surround a salt shaker? What might motivate a bee, or bother a flower? From these straightforward themes you'll find an abundance of ideas.

Modeling Objects

Once you have an idea or a complete story line, you'll need to decide what items take part in the scene. You'll need to populate the scene with *objects*.

All 3D scenes and animations are composed of objects. Modeling is the design and creation of wireframe objects, from a simple model such as an apple to a complex one such as a finely detailed sports car. What makes up the 3D object? Two things—its physical shape and its visual appearance. Shape consists of the points and lines that comprise faces, called polygons. These make up its visible form. Appearance consists of color and texture qualities that connote realism to the eye, called *surface attributes*, or *material properties*. When you enter a room and look at your desk, you see a certain shape (that of a desk) and a certain surface (that of wood grain) so you think *desk*. In LightWave 3D, you have the tools to create simple or complex objects, and to define their surface qualities with precision and detail.

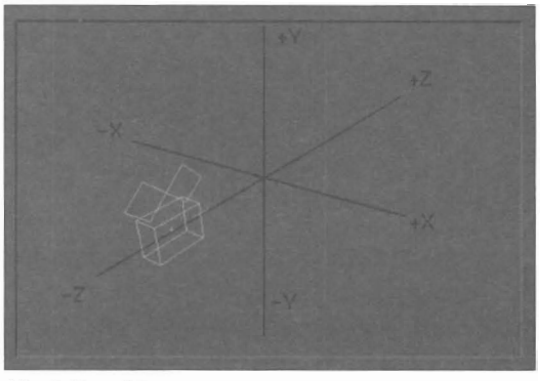
How would you create a mug? As a sculptor, you would mold a lump of clay on a potter's wheel. As a designer, you would draft it on paper. But suppose you weren't molding or drawing a mug? Suppose you were using a computer... how would you do it then? What tools would you use? The answer is, pretty much the same tools you'd use if you were a sculptor or an artist. Surprised? Well, LightWave recreates those very tools so that non-sculptors and non-artists can use them just as easily as sculptors and artists do. In fact, LightWave's tools do *more* than their real-life counterparts. And there's no mess to clean up.

Three-dimensional modeling is based on two simple elements: points and polygons. The process of creating 3D objects is a lot like drawing in dot-to-dot coloring books. Remember connect-the-dots? With 3D modeling systems, you place the dots, connect them with lines to form a recognizable shape, use some special-purpose tools to mold them further, and *viola!* That collection of polygons now forms a shape that the computer can draw, color, and shade on screen. Once you get the hang of using the elements and tools in LightWave Modeler, you can begin to create objects for 3D rendering and animation.

If you were a woodworker building a desk, you would work from a sketch, a photograph, plans, or a small model of the desk you intended to build. In modeling objects for 3D work, this approach is also best. Having the actual shape or a representation of it in front of you while you design is invaluable, and will aid in you determining size, shape, angle, color, and more. Whenever possible, work from pictures or small-scale models.

As in any project, you either begin from scratch or modify an existing object. If you're new to 3D, doing it from scratch will appear tedious at first. The Modeler tutorials start off by modifying existing objects, so you can get the hang of how things work.

You communicate your desires to Modeler by manipulating the **mouse**, which moves a cursor directly on the screen, choosing commands and directing graphic input by clicking on either the **left mouse button** or the **right mouse button**.



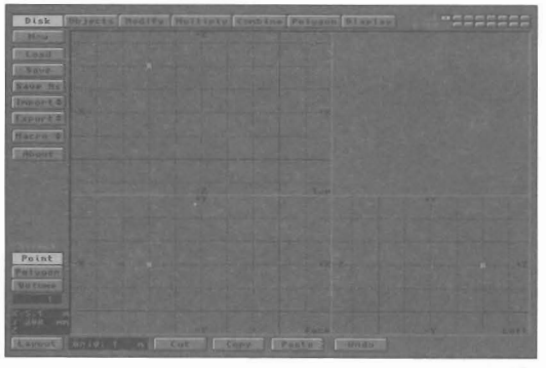
The X, Y, and Z axes.

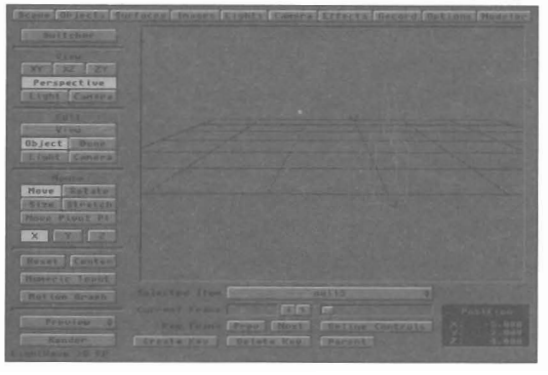
You create or edit all objects on the planes of a **coordinate system**. LightWave Modeler (the object creation package) and Layout (the image rendering package) use the system for object placement in their on-screen workspace, also known as **world space**. To be able to refer to the position and orientation of all objects, we must have a known reference location. We call this the **origin**, and it resides at the very center of space at the coordinates (0, 0, 0). This the central location where three imaginary planes, arbitrarily named **X**, **Y**, and **Z**, cross. Knowing that the origin is at (0, 0, 0), the position of all things in space can be determined. For example, a 3D object may be placed 5 meters to the left of the origin, 2 meters above the origin, and 4 meters away from the origin. Therefore, you could say that this 3D object is located at (5, 2, 4). Objects on the opposite ends of the axes are designated with negative numbers, such as (-5, -2, -4). Using these figures, called **coordinates**, you can describe the location of any object. Positioning can be controlled loosely or with critical precision. Both Layout and Modeler use the same coordinate system, with the (0, 0, 0) origin at center.

Sidebar:

All 3D graphics take place within a coordinate system, which allows for precise movement and positioning of all things on screen with height, width, and depth. These are referred to as axes known as X, Y, and Z. For clarity and simplicity, the coordinate locations of all objects are referred to in this (X, Y, Z) form as (3, 6, 7). You read this coordinate as X=3.

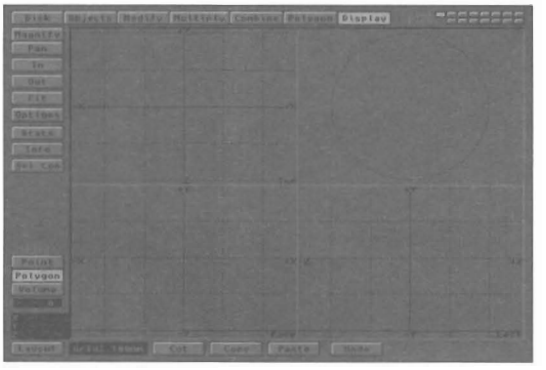
The origin also plays another important role in LightWave—it acts as the "handle" for objects. When an object is created in Modeler, its location in relation to the origin is known and saved as part of the object description. This known point acts as the pivot point for the object. For example, when you model an object so that the origin is at its center, then save the object and load it into Layout, it will move and rotate around that point as its center of gravity. However, if you model the same object so that the origin is 5 meters away, then save the object and load it into Layout, it will move and rotate erratically as if it were lopsided. Its pivot point is off-center, so the object moves in an off-center fashion. You can resave the object in a new position to alter the pivot point, or change it in Layout. The tutorials will provide you with a graphic example of this concept if it seems a bit fuzzy to you now.



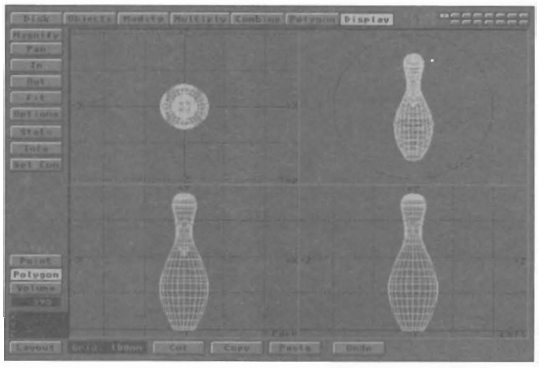


While working in Modeler, you can adjust the screen to see as much or as little detail as you desire by turning various options on or off to suit your preference, and by rearranging the edit screens. For certain operations, this can be handy. Use the fourth editing and viewing window, called the **preview window**, to display objects either as see-through wire or solid wire forms. Further, you can specify whether you prefer a static and unmoving view, or a slightly rotating view to give you a clearer feel for the 3D structure of an object.

The Modeler screen contains multiple **edit windows** that allow for three simultaneous views of the object. A static or moving **preview window** is also available. As you grow familiar and gain experience with Modeler, you will find yourself switching back and forth among these windows to obtain the most advantageous view from which to use a particular tool.



One of the most important 3D concepts to understand is that of the *model*, also called an object. Objects consists of polygons. Polygons are formed when you place points in space and join them together. Together, they form the shape of 3D models. It's as if the outer surface on an object, say a television, consisted of a collection of different-colored panels that you had to assemble. You might think of polygons in this way.



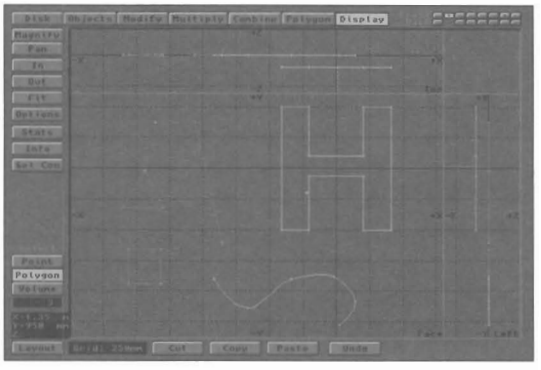
Polygons are then formed into recognizable shapes. All objects appear on screen in a **wire frame** form in Modeler, as if they were made up of wire skeletons. This makes display and computation manageable. These wireframe polygons are usually three-sided triangles or four-sided quadrangles (although they can consist of more sides) because these simple shapes are most efficiently calculated. All polygons can be given color and texture characteristics, which is how the objects they form take on color and texture, when the 3D camera renders an image.

Therefore, to build a 3D model, you create, combine, and modify simple shapes into more complex shapes. This is known as editing. The basic building blocks include cubes, spheres, cylinders and other shapes. Using tools not unlike those found in a wood or metal shop, you form a realistic wireframe representation of the envisioned object.

The process of editing involves manipulating points and polygons. It will include *selecting* some portion of an existing object, choosing the operation to perform, adjusting any parameters for that operation, then carrying out the operation. The concept of "select and do" is very important to Modeler. Selection is the act of specifying either the object itself or a portion of it that you intend to edit next. The most basic elements you can modify include points and polygons, the dots and lines that make up all

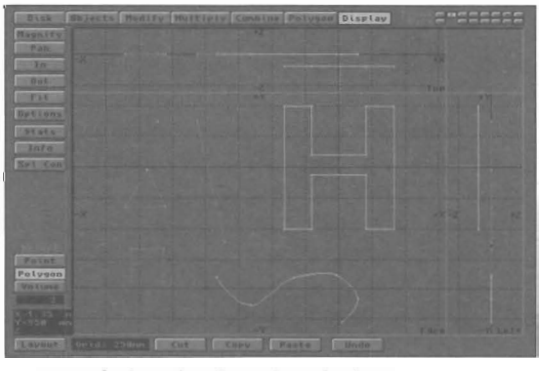
objects. Any number of points, polygons, or objects, in any combination, may be selected for a specific operation. Additional selection tools are available to select specific portions of objects for editing operations.

Here's a description of the basics as used by Modeler.



Selected and unselected points.

A *point* is a location in space, just as a point in a dot-to-dot coloring book represented a location on the page. A point will appear in two ways on screen, *selected* and *unselected*. Points are used as anchors to create polygons. Since points alone do not have height, width, or depth, they cannot be "seen" or rendered. However, you can load them into Layout and use points as invisible influences on other objects: as a center of rotation, or to play an invisible role of influence in an object hierarchy, for example.



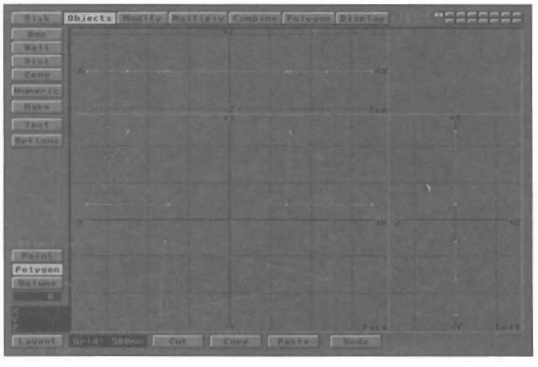
Picture of selected and unselected polygons.

A *polygon* is some number of points joined by lines to form a solid face. A polygon also appears in two ways on the Modeler screen, *selected* and *unselected*. Notice that the selected polygon has a dotted line extending from it. This is a surface normal, an unusual-sounding name that has great importance in 3D. Here's why. A feature of polygons is that they can be one-sided or two-sided. They have the unique ability to be *invisible* from one side while *visible* from the other, or they can be *visible* from both sides. The surface normal, which appears whenever a polygon is selected, projects away from the *visible* side of a polygon.

Since LightWave needs to calculate the appearance of *all* polygons that make up an object, it helps for you to determine beforehand whether the polygons you need for an object will actually be seen from both sides. Why is this important? Because it takes LightWave longer to calculate *both* sides of the polygon. If LightWave knows, from the presence of one or two surface normals, that a polygon is only one-sided, then it can render images more quickly.

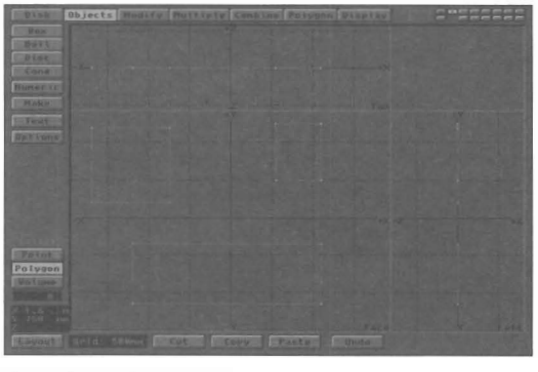
How can you determine whether to use a one-sided or two-sided polygon? Easy. Suppose you're making an apple. Will the scene require that the viewer see the inside of the apple? If not, then you only need to model the outside of the apple. There's a simple rule of thumb for modeling: *build only what your animation requires*. The author of LightWave once created a model of the Golden Gate Bridge in San Francisco for an animation. However, since the back side of the bridge was not seen in the animation, he did not model it. It wasn't needed. This concept can save you a great deal of time and work.

There are several types of polygons you can create.



A triangular polygon.

A *triangular polygon* is a three-point polygon. No matter how it is oriented or manipulated, it is always perfectly flat. In Modeler, this kind of polygon is most useful for complex modeling involving smoothly-curved or highly-rounded object shapes, or objects that require greater flexibility when they are character-animated with Bones (a feature of Layout that you will learn about later).



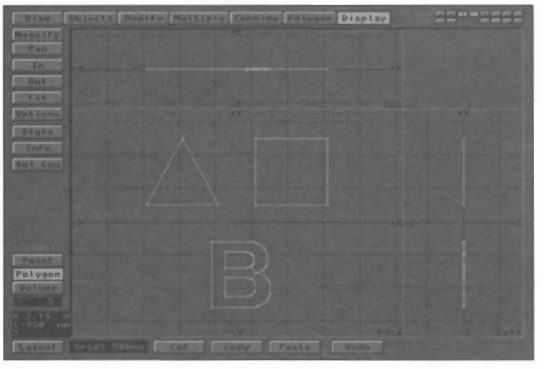
A quadrangular polygon.

A *quadrangular polygon* is a four-point polygon. Four-point polygons are useful for objects that will not be bent or twisted very much (objects such as flying logos, for example). Bending or twisting polygons that consist of four or more points may distort their planarity (flatness),

Note:

The majority of Modeler's editing tools can operate on points or polygons individually, in groups, or the points and polygons within a specified volume of space. Therefore, rather than continually repeat the phrase "points, polygons, or volume" when referring to the entities that a tool may affect, we'll call them *items* as an all-inclusive term. When you see the word items, you'll know what that we mean something that may include points, polygons, or a volume.

causing rendering errors. It is best to model with a combination of polygons when you model, using three- and four-sided polygons where necessary. Use the type of polygon that best fits the needs of the animation.

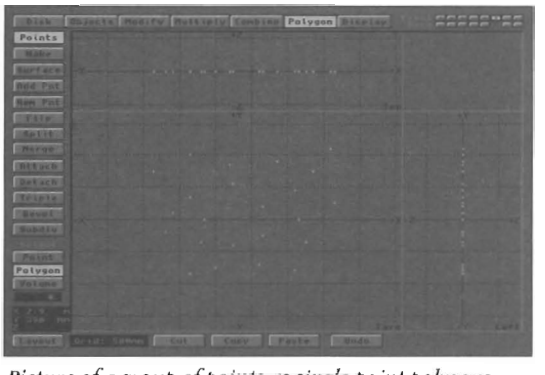


Polygon attributes (triangular, quadrangular, and many-sided)

A *multi-sided polygon* is a complex polygon, one with many points. As long as the points that make up this polygon remain in one plane, the polygon will render properly. If Bones or Displacement Maps (features of the Layout screen) are not used on a multi-sided polygon, rendering problems will likely result. These forms of mapping cause physical changes in the flatness of objects, and would not work on such large polygons. Polygons that consist of more than three points can be bent out of planarity, causing rendering errors. Modeler has the ability to subdivide large polygons into smaller ones, which would help in such a case.

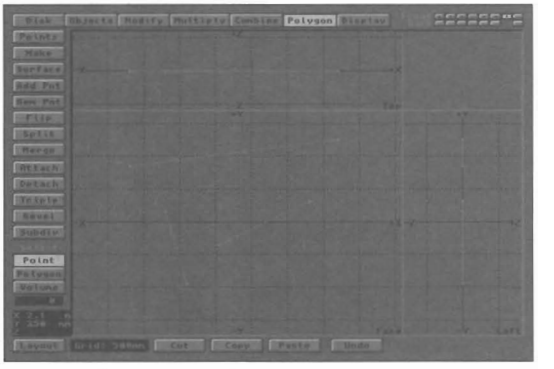
Special-Use Polygons

A few types of polygons are useful for very specific purposes. Because of this, you needn't worry about learning them at this time. In the interests of completeness, they are included here.



Picture of a group of points as single point polygons.

Single point polygons (special range of special uses)
This group of points has been selected, then made into individual polygons, each comprised of a single point. They appear to be normal point, except that you can select them and assign them surface qualities like any polygon. Unless single point polygons are assigned luminous or motion blur attributes, like the Random Stars or Actual Stars objects included with LightWave, they will not be "seen" or rendered. With luminosity and/or motion blur, they will appear as a pinpoints or streaks of lights in images or animations. This is highly useful for emulating rain, stars, fireworks effects, and more.



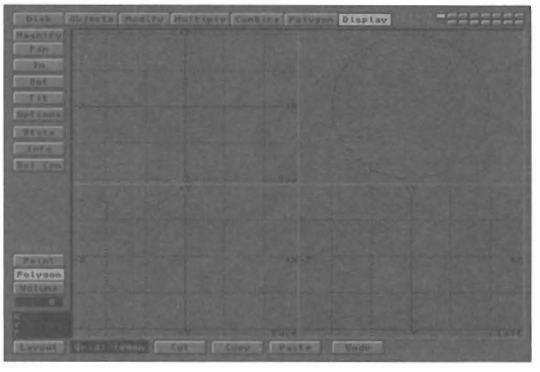
Picture of two-point polygons, or lines.

Two-point polygons, or lines (special range of uses)
A pair of points that has been selected, then made into a polygon, forms what is best described as a line. Such polygon segments are useful for strings, such as on stringed instruments. Technically, the line has no measurable thickness, and will always render as a thin line no matter how near or how far from the camera.

Tools for Modeling

If you were limited to points and polygons for creating objects, you would soon go mad. Even simple object shapes like a salt shaker, a football, or a tire would be tedious beyond belief to create. You would need to place points in several locations, and you would need some way to specify *depth*, as in *this point lies a few inches behind this other point*. And, how many of us can draw smooth curves naturally?

LightWave changes all that. Designing objects in 3D becomes more fun as you become familiar with the tools of LightWave Modeler.

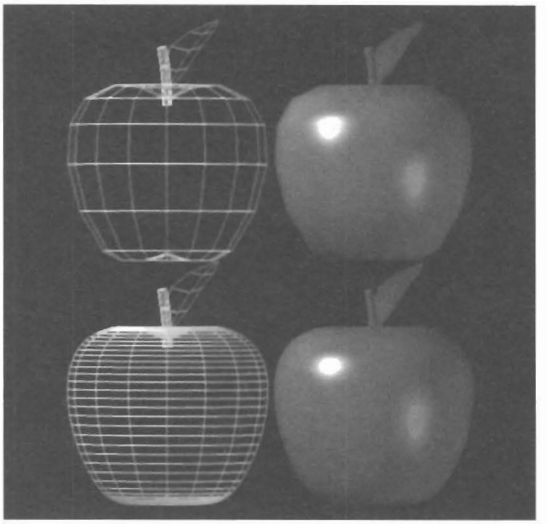


The first tool for modelmaking is the screen. The modeling screen features three views of the object-in-progress: from the back, left, and bottom. With these views, you can place a point (or orient a polygon) *behind* other portions of the object, at a certain *depth*, simply by positioning a crosshair at the right location in the back view, and moving it to the right depth in the left view. For added clarity in designing it more accurately, use the preview window to view the object in a solid wireframe format to accent its 3D shape. The screen also features *layers* that allow you to work on portions of an object separately, before combining them into one piece.

The next two tools you've been introduced to—points and polygons. You know them already.

The remaining tools within Modeler are the power tools, used for special purposes. They take their names and functions from tools in real life—like drill, lathe, and bevel—only they're much easier to use. Some of them you will use often—like Move to move a point to another position; some you will seldom use—like Skin to place outer surface polygons over a framework. The important thing for you to know is that they are there in case you need them. At first it will seem as though LightWave has a thousand buttons, and you'll never learn them all. However, from experience we can tell you that you'll use 1/4th of those buttons most of the time, and the remaining buttons only occasionally. You don't need to learn them all. And the manual's nearby when you need to learn a new operation.

The final tools for modeling are a keen eye and your imagination. Look around you at the shapes in the room you are in. Many of them are simple, based on square or round shapes combined to make furniture or other items. How would you model these? Ideally, with the simplest shapes you can. Much of 3D modeling is a kind of game, a test between "how good can it look" and "how little can I do to make it look like that?" If you design an animation of a hot air balloon flying overhead, and the entire back side of the balloon is not seen during the animation, guess what work you won't need to do? Once you begin working in 3D, you'll develop the "eye" for determining what elements you need in a model, and you'll gain speed.



Wireframe and rendered apples

Making Models that look good

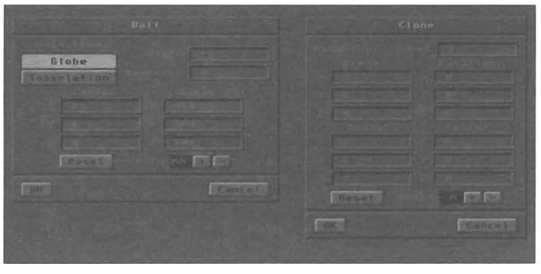
If you've ventured into the Modeler, or looked at several objects in LightWave, you may be wondering how to make models that are smooth and realistic. Take a moment and load the Apple object (in the Food directory) into Modeler (use the Load button found under the Disk menu). Notice how the apple is composed of straight lines, still it looks round. Yet, if you load this into LightWave and render the image, these straight edges appear around the outline of the apple. Although the face of the apple is smooth (due to a special smoothing function), the edges look straight. Apples don't have straight edges. Is there a way to correct this? *Yes!*

Earlier, we spoke of the trade-off between modeling a great amount of detail into an object and modeling just enough so that it looks realistic. The apple is a fairly simple object without much detail. If this object were to play an important part of an animation where it appears close-up on screen, its edges wouldn't look that good. However, if it were in the background of an animation, where it never appeared very large, it probably would be fine. Therefore, the question is, how do you model an object so that it looks good for close-ups? The answer is, add more detail when modeling it. In modeling, you approximate a smooth curve by breaking the curve up into smaller straight-line segments. The more segments, the smoother the appearance of the curve.

Take a close look at the image of the two apples. The first apple was made with only a few sections. The front looks fine, but the edges appear segmented. Now study the second apple. More sections make for smaller segments. The result is a smoother apple. Of course, the more points and polygons there are in an object, the more complex it is, and the longer it can take for LightWave to render the image. This is a trade-off in 3D, and one of the areas where you will develop a sense of "how much detail" versus "how important is an object's smoothness." It filters down to the issue of how much time you want to spend modeling, which is an answer only you can provide.

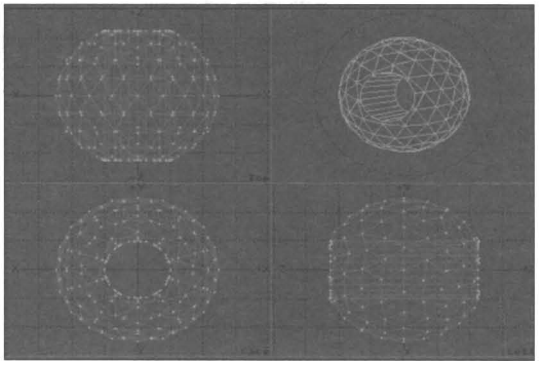
There is an essential approach to modeling, whether you use *surface modeling* or *solid modeling*: **build only what you need.** In surface modeling, you create only the outside of an object, the portion that will be seen in the animation. Unless you plan on the camera zooming inside a model of a teapot, for example, there is no point to creating an inside surface with its own color characteristics. It would be a waste of time. Alternatively, if your animation calls for zooming into the teapot and shooting out of the spout, you will need to solid model the object, since the inside will be seen as well as the outside. You'll need to give thickness to its walls, and bore a tunnel inside the spout. Most often, solid modeling is critical for scientific applications only, but not necessarily so. The basic rule of thumb is, build the model to suit the animation. *Build only what you need.*

In Modeler, when you select the object to edit and then select a command button, the cursor changes to a new shape to indicate this new state. You can move the pointer to an edit window and modify the selected items using the mouse. With the pointer in place, you drag with the left mouse button (sometimes with the right, depending on the tool function) to manipulate the selected item. If you select the numeric button, a *numeric submenu* (available with some command buttons) enables you to modify the command button's parameters. Some command buttons call up an *automatic submenu.* These commands require specific information before they can operate. Once you enter the required information, click on OK to exit the submenu and perform the operation.



A numeric submenu and an operations submenu.

You carry out operations dynamically in the 3D space shown on screen. This allows you to see just what an object looks like as you make changes. Modeler maintains eight different work screens in which you may edit. These are called *layers*. The screens may be arranged so that any combination of them may be visible or invisible for reference purposes, and active or inactive so that multiple-object operations may be carried out in a single step. Objects may be manipulated in 3D space (*move*, *rotate*, etc.), modified to alter their shape (*bend*, *twist*, etc.), multiplied to create cross-sections (*extrude*, *lathe*, etc.), drilled (2D and 3D *drilling*), and combined to form new shapes (*Boolean operations*). A single-step *undo* function allows each tool to be tried and retried with new settings without having to rebuild entire objects. Modeler's inclusion of *Catmull-Rom splines* lends itself to incredibly easy free-form modeling and polygon meshing, making otherwise complex curves and smooth forms a snap. If you don't understand these concepts now, don't worry. They'll be explained and demonstrated further on.

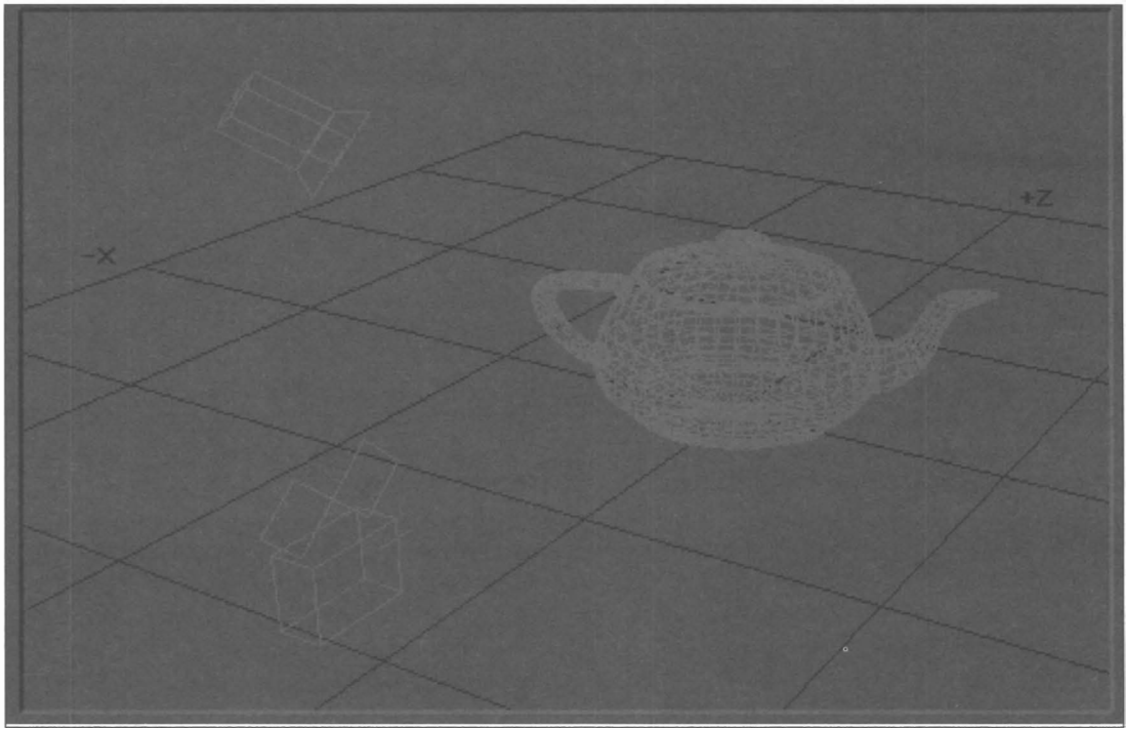


The result of a Boolean subtraction operation: a perfect tunnel (with an interior surface) cut into a sphere.

If modeling is beginning to sound difficult, take heart. Stop reading for a moment and look—really look—at the basic shapes that make up the objects around you. What shapes comprise the chair, the desk, the door? Now think about more complex shapes, such as a bicycle, or a cement truck, or a 747. You'd be surprised to find that most of man's creations are built upon triangles, squares and circles, pyramids cubes and spheres. What is a building but a tall cube? What is an airplane but a cylinder with rounded ends and flat angular wings? What is a bicycle but a collection of short cylinders, rounded wheels, thin spokes and flat-cube pedals? If you can successfully reduce the 3D world to its simplest shapes, you've taken a significant step toward mastering 3D graphics. For starters, *keep it simple*. When you get more skilled, you'll develop an eye for detail, and the knowledge of how recreate that detail without a great deal of tedious work. This comes with experience, and experience comes with time and practice.

Setting the Scene

Once you have developed the story and modeled the necessary objects, the final step before rendering is to position them on the set. You load the objects into the Layout world space. As in Modeler, you communicate your desires to LightWave by manipulating a *mouse*, which moves a cursor directly on the screen, choosing commands and directing graphic input by clicking either the *left mouse button* or the *right mouse button*. All objects are positioned on the planes of a *Cartesian*



The Layout screen showing camera, lights, and an object.

coordinate system, the same used in Modeler. Multiple *views* allow you to see the scene orthographically from *top*, *side*, and *rear*, labeled by their axes, as well as from third-person *perspective*, *camera*, or any *light* source. This enables you to place objects graphically, as you see them, via the mouse, with great precision and ease.

The elements you manipulate most commonly in Layout include the *camera*, *objects*, and *light sources*. You'll be able to do quite a lot with those alone! Layout considers these three items to be objects within the scene, just as if they were props on a movie set. Your job as the animator/director is to place them in their proper locations, aim and camera and lights appropriately, and direct them where to move during the course of the animation. More advanced animation tools include *bones*, which allow for *inverse kinematics*, movement that is both realistic and natural. Using both bones and *spline controls*, aspiring and professional animators will be able to recreate motion paths of delicacy and grace. Of course, you can animate raw power and brute strength too!

After placing an object in a specific position, you instruct LightWave to record a *key frame* for it at a particular frame number. You then move the object to a new position, instructing LightWave to record a new key frame at this location, with a different frame number. An object that is far away in frame 1, and close up in frame 30, will take 30 frames to move from far to near. This is a simple two key frame animation, lasting one second. (All NTSC video animations move at 30 frames per second, so a 30-frame animation will run for one second.) In this manner LightWave records the known position and orientation of all objects, from one frame to the next, throughout the animation, then creates the necessary frames in between. This is known as *in-betweening*, or just *tweening*, and in the early days of animation it was done entirely by hand.

LightWave automates this process so that you can concentrate on telling the story rather than redrawing images.

To see whether the motions you have designed are correct, LightWave generates a real-time *wireframe preview*. This may be created and watched from any of the different views noted previously. You may also do some *low resolution* test renderings to check the surface textures of each object. This is to ensure that everything looks exactly as it should. Surface menus allow you to set *color*, *diffuseness*, *luminosity*, *glossiness*, *reflection*, *transparency*, *bumpiness*, *texture maps*, and more for all objects. Use multiple light sources of varying types—*directional*, *spot* lights, or *point* light sources— each with adjustable brightness, color, and lens flare. Create sharp-edged shadows by activating the camera's *ray tracing* mode, or soft edged shadows by causing spot lights to cast *shadow maps*.

Test Rendering and Final Rendering

Rendering is similar to developing photograph.

Consider a professional photographer preparing a "product shot" for a magazine article. In the studio he positions the product on the set, places a few additional items beside the product, aims the light sources, checks exposure levels, and takes the photograph. Afterward, he develops the negatives. In the process of developing, images appear on the film. From these negatives, the photographer then creates positive prints. Fortunately, in computer animation, you never need to deal with chemicals, developing, or negatives. Instead, you *render* a scene, which has the same result—a fully developed image on the computer screen. This image may be used within a video production, included as one scene of a larger animation, or incorporated into print graphics.

After you have modeled the objects required by your animation, you load them into a special screen called *Layout*, the equivalent of the photographer's set. In Layout you move objects here and there, tilt them, turn them, and orient them until they look exactly right from one specific point of view. This point of view, the *camera*, is your equivalent of the photographer's camera. Like a genuine camera, your 3D camera can be positioned, aimed, and focused. LightWave's camera is the equivalent of a 35mm film camera, and it functions in the same manner as its real-life counterpart. When the scene is perfect, you tell LightWave to render the scene: i.e., take a photograph, develop the image, and display it on screen. LightWave calculates the appearance of the scene by taking into account the intensity of the lighting, the color of the objects, where and how shadows fall from objects, textures and highlights, special filters, the focal length of the lens, and more. No negatives, chemicals, or dark room necessary! Your result is the rendered image.

Your use of color will add depth and meaning to your animation. Volumes have been written about color theory, and since the concepts within such textbooks apply equally well to computer graphics as they do art, they will not be discussed here. Color is known to affect viewers, causing them to interpret what they see in a different manner. Watch the animation work of professionals, and consult color textbooks, for further information on using color effectively.

Making them move

First, let's establish the foundation for animation. Animation is similar to film and video in that it consists of a series of frozen images, each slightly different from the next, that create the illusion of movement. Have you ever seen a strip of film, say 8mm or 16mm? If you look carefully, you'll notice that each frame is sightly different from the frame before it. There's a natural progression of movement from one frame to the next.

A film of a bouncing ball is a simple example. In each frame, the ball changes position slightly. When this film is displayed through a projector, your eye cannot pick out the individual frames, and you see the movement of a smoothly bouncing ball. This is very similar to the manner in which television displays the individual frames of video, one frame at a time, at a speed that the human eye cannot keep up with. Hence, there is apparent smooth motion. In this respect, the manner in which film and video are displayed is similar.

To create a film animation, you draw a series of film cels with a slightly different amount of movement from one to the next. For ball to move from one side of the picture to the other, you would draw the ball a little further over from its last position in the previous frame. These cels are photographed onto a film strip. When you view the film through the projector, you see a ball rolling across the screen.

To duplicate this same animation on video, you create a series of video frames with a slight amount of movement from one to the next. In each frame, draw the ball a little further over from its last position in the previous frame. Now, record those frames one at a time onto video tape. When you place this video tape in a VCR and play it, you see a ball rolling across the screen.

Once you have choreographed the scene, the final step is to render it using *medium*, *high* or *print resolution*, depending on your preference or the requirements of your client. Of course, high-quality 3D animation of this type must ultimately be rendered to video tape, video disk, or film, for real-time playback. The process of displaying individual frames from the Toaster and recording them to video tape is called *single frame recording*. To perform single frame recording, you need a VCR capable of recording consecutive individual frames of video onto tape. While the Toaster displays the image, the VCR runs backward a bit, stops, then runs forward to reach a stable recording speed. This is called *preroll*. At precisely the right moment, the VCR switches to record-mode and records the video image for a duration of one frame (1/30th of a second). Obviously, a very high-quality VCR is required for this process, since it must hold up to high video quality standards and a heavy workload.

You also need a single frame controller, a device that allows LightWave to communicate with the VCR, instructing it just when to record the frame. To do this, the controller requires that the tape be formatted so that every individual frame on the tape can be accessed independently. This process, called striping the video tape, utilizes a standard code called SMPTE time code which places a coded number on every frame on the tape (either on audio channel 2 or in the vertical interval between frames). Once ready, you have the ability to record your animations in full 24-bit color to video tape. Many service bureaus and studios exist that accept Toaster files and will perform the rendering/recording process for a fee, if you do not have immediate access to such equipment yourself.

3D Animation Made Easy...

With the advent of the Video Toaster Flyer, the traditional method of single-frame recording can now be directed right to the Flyer! You can generate LightWave animations, save them to the Flyer, and play them back directly from hard disk in full broadcast quality.

See the addendum to LightWave for information on using the Flyer with LightWave.

How you command LightWave 3D

The physical tools with which you communicate with LightWave 3D include the mouse and keyboard. You should know about the conventions of these controls, how they are utilized by LightWave 3D, and how they are pointed out in the manual before you go any further.

The Mouse

LightWave 3D takes advantage of both buttons on the two-button mouse. If you have not used a two-button mouse in this platform before, you may wish to spend some time just getting familiar with its operation.

All commands and tools are chosen with the left mouse button. Once you have chosen a command, you may use the left button to manipulate it one way, and the right button to manipulate it another way. As you read the manual, make certain you know which mouse button you should press to engage a particular function.

To make mouse button usage clear, the LightWave 3D manual uses the following conventions when referring to mouse actions:

Mouse Directions

Click	means to press and release the mouse button once
shift+click	means to hold down the shift key and click the mouse button
Drag	means to hold down the mouse button and move the mouse
shift+drag	means to hold down the shift key and drag the mouse

The LightWave 3D manual will direct you to use the left or right mouse button with the following directions:

Left Mouse button directions

Click
Right-click
shift+click
shift+right-click

Right Mouse button directions

Drag
Right-drag
shift+drag
shift+right-drag

The majority of mouse usage involves the left mouse button. Therefore, instructions that direct you to *click* or *drag* mean for you to use the left mouse button. Alternately, whenever you see *right-* as part of an instruction, you'll know you need to use the right mouse button. As a general guideline, use the left mouse button unless the manual says otherwise. You will quickly catch on to right and left mouse button operations.

The Keyboard

LightWave 3D makes use of the keyboard for special command shortcuts. These are keys on the keyboard that function just like an on-screen button. Such shortcuts make modeling and animating simpler and faster by allowing access controls that may not be visible on screen at the moment.

For example, suppose you are working on a detailed silicon chip, as part of a printed circuit board model. Once the detail work is done, you want to zoom all the way out to see the entire board. Using the mouse, you would select the Display menu, them click several times on the Out zoom button. Finally, you might use the Pan button to drag the board around until it is centered on screen. This requires several steps, a number of mouse clicks, and some amount of moving about the screen. Using the keyboard you can reduce this to one step. Press a to auto-scale the entire object to fit the windows on screen. You can see the difference this makes in terms of ease of use, and efficiency. Keyboard equivalents make you more productive.

Keyboard shortcuts appear as keycap symbols in the LightWave 3D manual. When you see the instruction "Press x, or click on the Cut button," you have the option pressing the key with the letter x on the keyboard or clicking the button that says Cut on the screen. If you are required to use another key in conjunction with a command key, you will see shift+b. This means you should hold down the shift key, and while holding it press the b key. (Make sure you don't just press the shift key, then press the b key separately. When key symbols are grouped together in this manner, you should hold the first one while you press the second one.)

Note: Since it is sometimes difficult to determine the difference between lower case and upper case letters, the LightWave 3D Manual uses b for lowercase, and shift+b for uppercase, to avoid confusion.

Throughout the LightWave manual, commands for both keyboard shortcuts and on-screen buttons are provided. You can choose whichever method of control you prefer, alternating at will. We think you'll find the keyboard commands invaluable over time, so try them out as you go along. You'll quickly find that the most commonly used commands become second nature, and easy to remember. If at any time you can't remember a key command, press the h key for a pop-up display panel containing all LightWave's keyboard commands. LightWave will display a pop-up help screen that relates to the menu you are currently working on.

Executing Commands and Using the Menus in LightWave 3D

LightWave 3D contains several kinds of on screen controls that you manipulate with the mouse.

- **Menu buttons**. Located across the top of both the Layout and Modeler screens, these allow access to groups of related commands. The Layout commands appear in pop-up panels. The Modeler commands change the left-hand column of command buttons.

- **Command buttons**. The Layout commands appear in pop-up panels, while the Modeler commands appear on the upper left half of the Modeler screen. They are grouped by function, and perform a variety of actions.

- **Submenus**. These small pop-up panels appear in front of other panels on screen. They allow you to fine-tune the functions of various commands, or set certain parameters that regulate an operation, using the mouse and/or keyboard.

- **Pop-up menus**. Where a list of object names, surface names, or other items is displayed, click on the current name of any item and a pop-up menu will appear. Scroll the highlight to the name you want and it will be selected.

- **Sliders**. Various menus allow you to click and drag an indicator along a groove to set the value between 0-100 for an effect. These same pop-up panels may also allow for numeric entry via the keyboard. When this is available, you may enter values above 100, or below 0, for greater control over an effect.

Numeric Entry. A special feature of all pop-up menus and menus that involve numeric values is this: when you first call up one of these submenus, the text cursor appears in the first available box, in front of any previously set numeric value. Simply enter the new value. When you press Return (or click OK) it will be accepted. You do not need to clear the previous values, nor press Return to officially "enter" the new number.

In numeric menus and other submenus, the **return** key on the keyboard will enter the new number and advance the text entry cursor to the next number field, if any. If there is no other field below the current one, pressing **return** will enter the new number *and exit the submenu* at the same time.

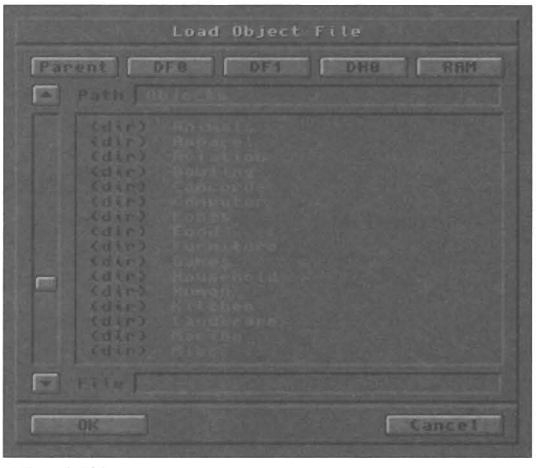
- **Keyboard commands**. These allow for text and numeric entry. Plus, keyboard commands allow for shortcuts (direct access to commands even when their command buttons are not displayed at the moment) while you work.

Here's a tip when entering text into a text field (such as when you are changing the name of an object or a surface). If there is already a name present and you wish to change it, hold down the right *A* key on the keyboard and press x. This automatically clears the entire field, allowing you to enter the new name. This tip also works in file requesters and numeric fields as well.

Loading and Saving Files in LightWave

Whenever you go to retrieve or save a scene, an object, or an image, LightWave displays a standard file access panel called a **file requester**. Essentially, its function is that of a file selector, or perhaps a file chooser. In the case of loading a file, it allows you to specify which hard drive you wish to look on, which folder (or folders) you wish to look inside, and ultimately which file you wish to access. In the case of saving a file, it allows you to specify which hard drive to use, which folder (or folders) to enter, and finally what new filename you wish to provide for the current item.

If you unfamiliar with using computers or computer systems, it may seem foreign to you at first to use this system. However, once you understand the workings of a file requester, you'll point-and-click with the best of them. They're simple devices, actually, and designed for ease of use.



A Load Object file requester.

LightWave's file requester looks like the one pictured. Whether you are loading or saving a scene or an object, the file requester looks the same. The only difference, and an important reminder, is that its title area will show you which function it will perform. This particular file requester will allow you to load a scene file. If you ever get interrupted in the middle of accessing a file, and forget what you were about to do when you return, the title area offers some assistance.

LightWave has built-in locations for all of the files that it deals with (Scenes, Objects, Images, Envelopes, Motion Paths). When you select an operation that involves a file requester, you have told LightWave that you want to access a file. LightWave displays the file requester for the appropriate folder right away. This means that you actually don't need to go hunting through the hard drive and its folders just to get to the files you want. When you select Save Scene, LightWave presents you with a file requester for

the *scenes* directory. You'll see the word *scenes* displayed in a text field near the top of the requester panel, and you'll see the list of scenes displayed in a larger area below it. LightWave **defaults** to these locations automatically, making file operations simple and straightforward.

On the other hand, sometimes you *want* to go elsewhere on the hard drive to locate a different sets of files, perhaps a set of images or objects purchased for a special project. In such cases, you need to use some of the controls on the file requester to access these other locations. Here's a quick rundown of the buttons on the file requester, and the function for each button.

Lightwave knows of the following folders. To get back to them after going elsewhere, simply click in the text field, and delete or backspace as necessary to clear out any existing names, then enter one of the following names (with no additional punctuation or characters):

- Scenes
- Objects
- Surfaces
- Images
- Envelopes
- Motions

Press r and LightWave will take you directly to that location.

The controls on a file requester are simple and straightforward. The top of the file requester is the title area, where the function of this particular requester shows. Just below it are five buttons: *Parent*, which we'll explain in a moment, and four *device* buttons, which are shortcuts to go directly to a specific drive. LightWave assumes you have two floppy drives, *DF0*: and *DF1*:, a hard drive, *DH0*:, and a ram disk, *RAM*:. (You can change these built-in assignments if you wish. See "Customizing LightWave.") Click one of these buttons to display the contents of one of these drives. The main display area will show you a list of the files and folders on that drive.

Files are often stored in folders, and there may be folders within folders. For example, you may have a set of texture images in a folder called *Marble*, with a group of sub-folders inside called *WhiteMarble*, *PinkMarble*, *RedMarble*, etc., so you can keep the images filed efficiently by color. LightWave shows folders with a prefix, **(dir)**, so the Marble folder would be shown in the listing as **(dir) Marble**.

If the file listing is lengthy, so much so that it extends longer than the file display area, you can use the pointer and drag the scroll box on the left side of the requester. This will scroll the display up and down so that you can see the entire contents of a folder.

To get inside a folder, you move the pointer over that listing and double-click the mouse. LightWave will "enter" that folder and update the file display with the name of the files inside that folder. Again, there may be files and folders listed in this location. And again, you double-click to go deeper into yet another folder. The text field above the file display box will show a list of the folders you have entered as you move among them. This is useful for letting you know where you are on the drive.

To go back to a previous folder, you click on the Parent button. This returns you, one level at a time, to the previous file listing. You can see how many folders you have entered by looking at the text field above the file display box, where LightWave maintains a list of the folders you have entered. If you entered a dozen different folders in the course of locating one file, it would take a dozen clicks of the Parent button to return to your starting point. Of course, if your starting point was DH0:, you could just click that button to return to the top level.

To load a file, simply locate its name and double-click it. LightWave will accept your command and load the file. The file requester will go away afterward. Alternately, you could single-click on the filename, then click the OK button at the bottom of the panel.

To save a file, use the file requester and its functions to go to the proper folder, then click in the text field at the bottom of the panel, and enter a name for this new item. Press Enter and LightWave will save this new file. LightWave will save the file and put away the file requester.

To save an item that you have modified, with the same name that it had originally, navigate to the proper location, and as a shortcut, double-click on the existing filename. LightWave will save the newly changed file over the old one stored on the drive. Be certain you want to do this, however, because if you double-click the wrong file, you will replace it with the current file. The old one will not be retrievable.

This information should give you an understanding of loading and saving files while you work within LightWave 3D. Of course, if you have any questions, contact Technical Support for clarification.

Sidebar

Important tip

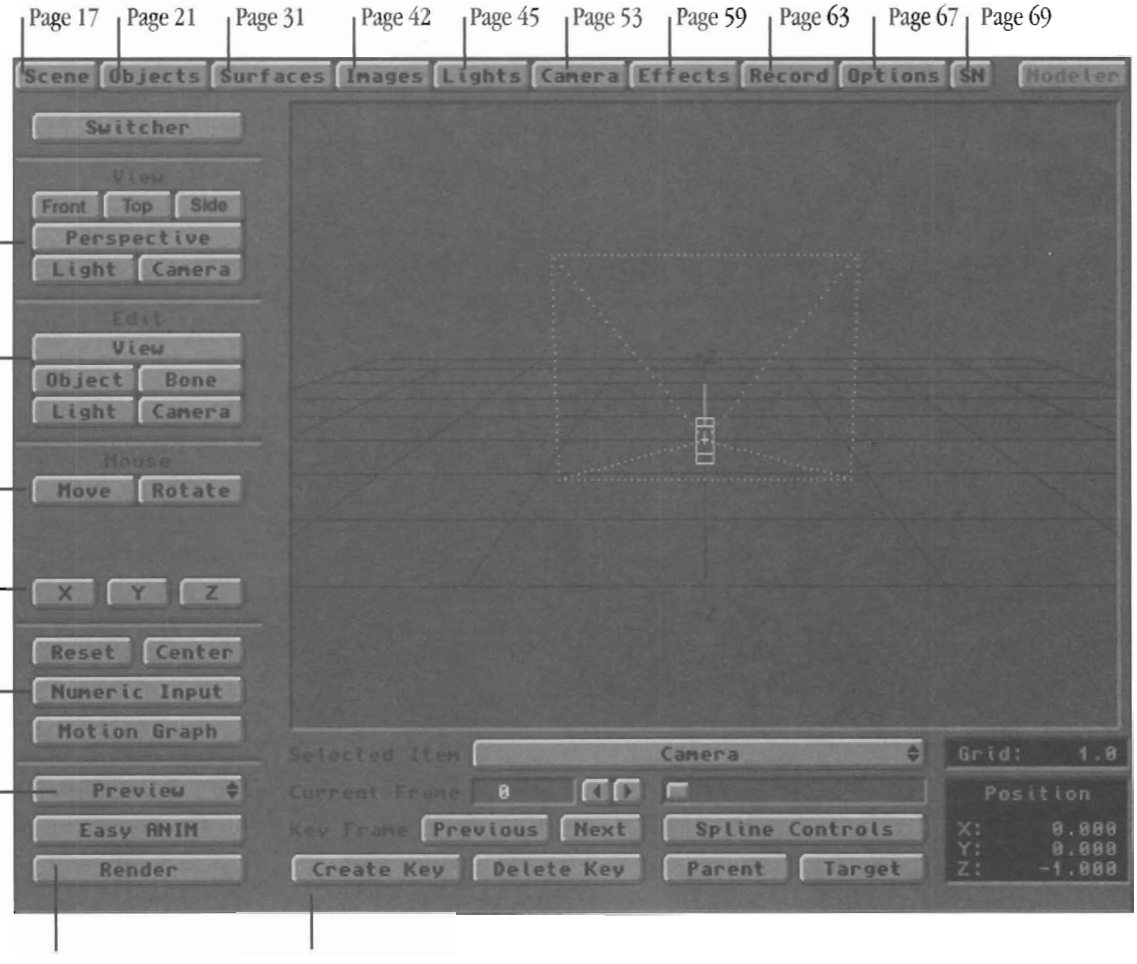
If you ever go astray while navigating in the file requester, here's a shortcut for getting back to the original directories that LightWave knows about. The name of the folders that LightWave defaults to are listed below. If you type one of these names into the text field near the top of the file requester, then press [Return], LightWave will instantly go to that folder and display its contents. This will get you back to the original files that LightWave works with, should you ever get lost within the filing system.

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LightWave Layout Rendering and Animation

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The Layout Screen

From the Layout screen you control all aspects of building a 3D animation: the movements of all objects, their color and texture properties, lighting, rendering resolutions, and which frames to render. On this main screen you can manipulate all of the items necessary to portray business graphics, animate flying logos, visualize scientific phenomena, or create entire galaxies.

If you are new to LightWave, or 3D animation in general, there are a number of important aspects of the Layout screen that you should be aware of. These are clarified below. Following them is a button-by-button tour of the controls you will find on the Layout Screen. LightWave's buttons are organized in small groups located around the main edit window. Therefore, each panel and its function is discussed first, followed by the buttons themselves.

- The different ways you can view the scene (see Viewing the Scene, below)
- How to move objects in the scene (see Selecting and Manipulating Objects, below)
- How to animate objects (see Creating Keyframes, below)
- Previewing animations in real time (see Previewing an Animation, below)
- How to create and save surfaces (see the Objects and/or Surfaces Panels)
- Working effectively with light sources (see the Lights Panel)
- Camera rendering modes (see Rendering the Scene, below, and the Camera menu)
- How to load and save scenes (see The Scene Panel)

Keyboard Shortcuts

1 Front (XY) view mode	V View edit mode
2 Top (XZ) view mode	O Object edit mode
3 Side (ZY) view mode	B Bone edit mode
4 Perspective view mode	L Light edit mode
5 Light view mode	C Camera edit mode
6 Camera view mode	
	Alt Temporary view edit mode
> Zoom in	
< Zoom out	
	Return Create key frame
] Increase grid size	Enter Create key frame
[Decrease grid size	Del Delete key frame
Space Cycle mouse functions	t Adjust tension
	c Adjust continuity
s Spline controls	b Adjust bias
l Adjust limited region	
r Set bone rest position	↑ Select previous item
n Numeric input	↓ Select next item
m Open motion graph	
p Open control panel	Shift ↑ Select first item
f Set current frame	Shift ↓ Select last item
Esc Abort preview render	← Go to previous frame
	→ Go to next frame
F8 Open ScreamerNet panel	
	Shift ← Go to previous key frame
F9 Render current frame	
F10 Render scene	Shift → Go to next key frame

Exiting LightWave 3D

Exiting to Switcher
Click the Switcher button to go to the Toaster Flyer's main startup screen (the Project/Switcher view).

Shutting down LightWave
Exit to the Switcher, hold the Shift key down, and select LightWave from the Programs pop-up menu again. This will remove the program from memory.

Exiting to Modeler
Select the button marked Modeler in the upper right corner of the screen. You will be taken into Modeler.

Shutting Down Modeler
To remove Modeler from memory and lose any data currently loaded into Modeler, hold down the Shift key and click on the Modeler button.

Viewing a Scene

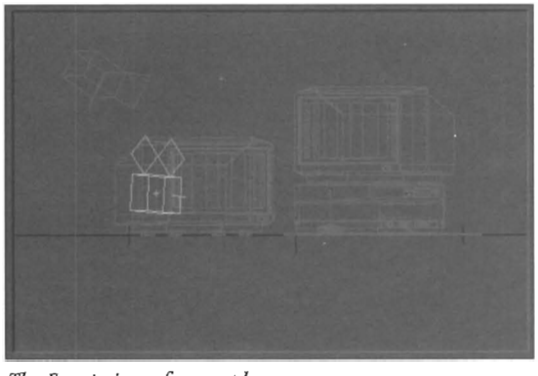
There are a number of ways you can view the current scene in progress. You should be familiar with these various points of view and how to move among them to increase your design efficiency. The small panel labeled "View" on the upper left side of the Layout screen contains six buttons, one for each of LightWave's view modes. This is the View section of the screen.

The View Section

The View mode controls the point of view shown in Layout's main window. Try each view out as you work. You will find yourself changing views frequently as you put together a scene. Note that some points of view limit the axes of movement, which is useful for lining up items in the scene.

All color images are rendered from the camera view. Before you render a scene or animation, make certain that you view the scene from the camera view mode to ensure that the camera is aimed properly. You'll use the camera view a great deal, so consider this a reminder. Finally, you can create a real-time wire frame preview from any of these points of view. LightWave's previews animate all aspects of the scene, including lights, spotlight cones, objects, and more. You'll learn a great deal about animating as you work with LightWave.



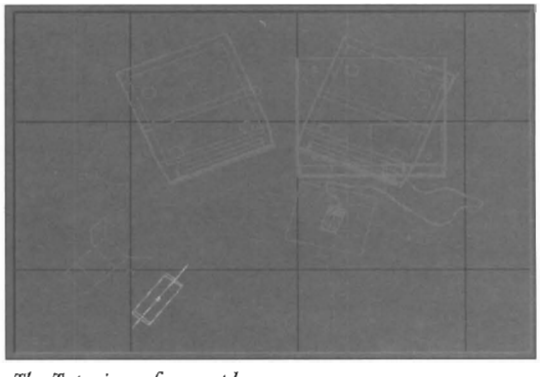


The Front view of a sample scene.

View section/Front button F1

Front is the front view of the scene (the same as the Face view in Modeler). While in this view, you may move objects on the X and Y axes only. You can also zoom in or out on the scene with the period (.) and comma (,) keys.



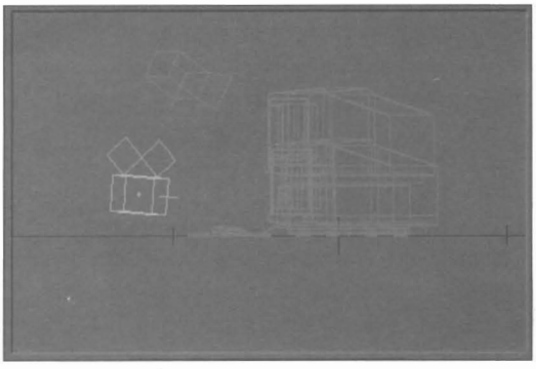


The Top view of a sample scene.

View section/Top button F2

Top is the top (or overhead) view of the scene. While in this view, you may move objects on the X and Z axes only. You can also zoom in or out on the scene with the period (.) and comma (,) keys.

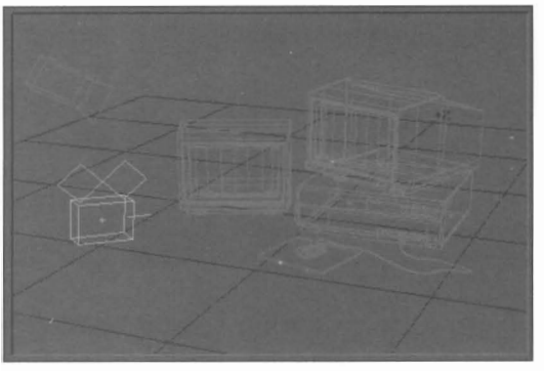
Side



The Side view of a sample scene.

View section/Side button F3
Side is the left view of the scene (looking to the left from the right side). While in this view, you may move objects on the Z and Y axes only. You can also zoom in or out on the scene with the period (.) and comma (,) keys.

Perspective

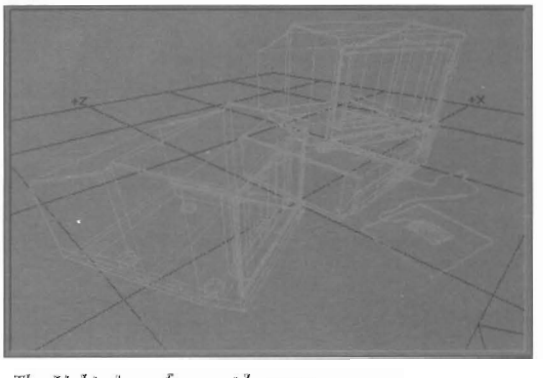


The Perspective view of a sample scene.

View section/Perspective button F4
The perspective view offers with a forced-perspective view of the scene. It's like the camera view (you view the scene in perspective) but it allows you to move about the set freely without affecting any items in the scene. In this mode, manipulation in all three dimensions is possible.

While in this view, you can manipulate objects freely on all axes. You can also zoom in or out on the scene with the period (.) and comma (,) keys.

Light



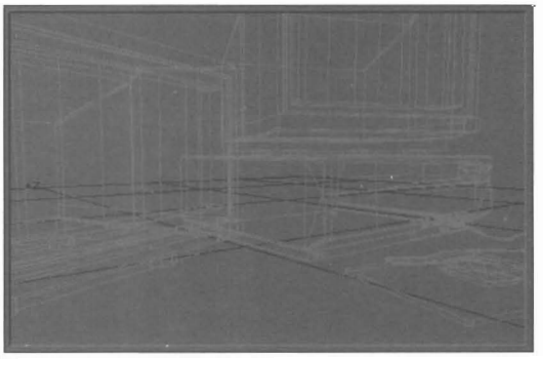
The Light view of a sample scene.

View section/Light button F5
Light View selects the point of view from the active light source. You can view a scene from any type of light source. This is extremely useful for setting the light's direction so that its illumination falls exactly where you desire.

While in this view, you can manipulate items in all three dimensions.

Note that if the selected light source is a spot light, its view will include a circle that shows the location and size of the spot of light being cast by this source.

Camera



The Camera view of a sample scene.

View section/Camera button F6
This button selects the Camera' s point of view, the point of view used for all rendered images. While in this view, you may manipulate items in all three dimensions.

You cannot zoom this view in or out unless you actually "change lenses" by adjusting the Zoom Factor control on the Camera menu. Remember that this will alter the zoom setting of the rendered image since the camera view is the same as the rendered view.

Selecting Items to Edit

Once you have entered Layout and loaded the objects you need in the scene, it's time to set the stage.

To edit in Layout, use the buttons in the Edit control panel to select the type of item you wish to work with: objects, bones, lights, the camera, or the view. Select an editing function from the Mouse control panel to position or angle the selected edit item. You may also use the axis control panel to activate or deactivate specific axes from the current operation. For example, this would enable you to move an item along the X axis without shifting it in Y or Z. When the object is placed correctly, create a keyframe for it.

Remember that once you have an item in its proper position and/or orientation, you must lock it in place by creating a keyframe (see Creating Keyframes, below). Otherwise, LightWave will return all objects to their original positions and render a mess at the center of the screen when you click the Render button. Forgetting to create a keyframe after positioning items is a common and frustrating mistake for newcomers to LightWave. **Note:** If you have Auto Key Adjust selected in the Options panel, any changes to an object at one of its keyframes will be automatically recorded.

Edit section/View button Shift+v
When you select View, you will be able to edit the view position, angle, or zoom factor. Choose one of these functions from the Mouse control panel to change it.

Edit section/Object button Shift+o
When you select Object, you will be able to edit any of the objects in the scene. After you select Object, use the Selected Item pop-up menu (located below the main Layout window) to choose which object you want to edit. You can also use the up-arrow and the down-arrow on the keyboard to run up or down through the list of objects.

Edit section/Bone button Shift+b
When you select Bone you will be able to edit any of the bones in the scene. After you select Bone, use the Selected Item pop-up menu (located below the main Layout window) to choose which bone you want to edit. You can also use the up-arrow and the down-arrow on the keyboard to run up or down through the list of bones.

Edit section/Light button Shift+l
When you select Light you will be able to edit any of the light sources in the scene. After you select Light, use the Selected Item pop-up menu (located below the main Layout window) to choose which light source you want to edit. You can also use the up-arrow and the down-arrow on the keyboard to run up or down through the list of lights.

Light sources may be moved and rotated, depending which function is chosen from the Mouse control panel. For greater control over specific light settings, such as color, intensity, or spotlight size, see the Lights Panel.
Until you select a light source to edit, no lights will appear up on the screen. This is intended primarily to keep the Layout workspace uncluttered. You can toggle the visibility of all lights in the Layout window so that they are visible at all times, if you prefer. Go to the Options Panel and select Show Lights. When you exit the panel, all lights will be visible on screen.

Edit section/Camera button Shift+c
When you select Camera you will be able to manipulate the LightWave camera. The camera may be moved and rotated, depending which function is chosen from the Mouse control panel. For greater control over specific camera settings, such as rendering mode, focal length, and motion blur, see to the Camera menu.

Manipulating Objects

Moving objects around in a three-dimensional world is easy in LightWave 3D.

Once you have selected the type of item from the Edit panel (and the specific item from the Selected Item pop-up), you can choose the kind of operation you need to perform. Select the operation from the Mouse control panel, move the mouse into the layout window, and drag with either the left or right mouse button held down. The functions on the Mouse panel allow you to change the location and/or orientation of any item on screen.

The left and right mouse buttons function differently, depending on which operation you select. Be sure to read about these differences below.

For editing ease, all editing is performed with respect to your current point of view. For example, with the Move command, when you drag to the left, the current Edit Item moves to the left. If you change to another view, or to another edit item, dragging to the left will still move that item to the left as you look at the screen. Movement on the Layout screen occurs in direct relation to the movement you produce on your desktop. Move the mouse left and the item moves left. This is natural, friendly approach takes little time to master.

Mouse Functions may differ for each item (view, object, bone, light, camera), since each of these items may be manipulated in a different manner. Use the Spacebar to toggle through each Mouse function.

Mouse section/Move button Spacebar
With Move you can modify the position of the selected item on the X, Y, or Z axes. Use the Axis buttons to activate or deactivate movement for that particular axis.

- To move on the X axis: drag the left mouse button left or right.
- To move on the Y axis: drag the right mouse button up or down.
- To move on the Z axis: drag the left mouse button up or down.

Mouse section/Rotate button Spacebar
With Rotate you can alter the facing orientation of the selected item on the H, P, or B axis. Use the Axis buttons to activate or deactivate movement for that particular axis.

- To rotate around the Heading axis: drag the left mouse button left or right.
- To rotate around the Pitch axis: drag the left mouse button up or down.
- To rotate around the Bank axis: drag the right mouse button left or right.

Mouse section/Zoom Factor button Spacebar
With Zoom Factor you can zoom the view in or out. Zoom Factor is available only for the View edit item. The X, Y and Z buttons in the Axis control panel do not affect the Zoom button.

- To zoom out (to move further away from the scene): drag either mouse button to the left.
- To zoom in (to move closer to the scene): drag either mouse button to the right.

Mouse section/Size button Spacebar
With Size you can scale objects larger or smaller. Size alters the size of the object equally in all three dimensions. Use Stretch to change an object's scale on one or two specific axes.

- To increase the size of the object: drag either mouse button to the right.
- To decrease the size of the object: drag either mouse button to the left.

Mouse section/Stretch button Spacebar
With Stretch you can stretch objects independently on any axis. Use the Axis buttons to activate or deactivate a specific axis for stretching.

- To stretch the object on the X axis: drag the left mouse button left or right.
- To stretch the object on the Y axis: drag the right mouse button up or down.
- To stretch the object on the Z axis: drag the left mouse button up or down.

Mouse section/Move Pivot Point button Spacebar
The pivot point appears whenever you select an object. It represents its center of rotation. With Move Pivot Point, you can change the center of rotation for the current object. This is useful when you wish to alter the manner in which an object rotates, how it follows a motion path, or how it moves in a hierarchy.

Move the point to the desired location (the Reset, Center, and Numeric controls function on the pivot point as well). If the object is resting in its originally-loaded location, the object will remain in place while you move the pivot point. It's best to move pivot points before repositioning the object. Otherwise, previous motions and positions will be affected.

You do not need to create a keyframe after moving a pivot point—the change is immediate, and remains for the duration of the scene. Pivot points may be changed at any time, but they cannot be changed during the course of a scene. They remain consistent for an object once set.

How is an object's pivot point determined? When an object is modeled and saved, the location of the origin (where X, Y, and Z coordinates are 0, 0, 0) at the time of saving becomes its pivot point, the point around which all object rotations take place.

In Layout, when an object is selected, you will see the tiny white keyframe symbol (it looks like a plus sign) and a tiny white pivot point symbol (it looks like a small x) near or inside the object. If these symbols overlap, they may look like a single asterisk symbol.

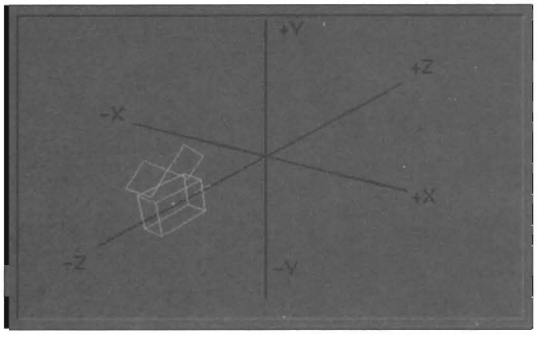
Mouse section/Rest Length button Spacebar
This button appears when you select a bone as the Edit item. Use Rest Length to change the size of bones without affecting the object they are attached to.

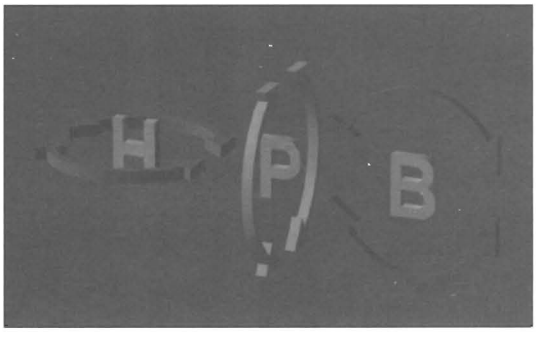
Since bones always load into Layout with a length of 1 meter, this is useful if you wish to resize a bone to better match the object it affects (which may be a great deal larger or smaller). Remember also that the size of a bone determines how much influence it has over the object it affects, so you may wish to size bones and objects appropriately. A larger bone exerts greater influence than a smaller bone.

Choosing Axes of Movement

This portion of the Function control panel governs which of the X, Y, Z (or H, P, B) axes is manipulated by the selected Mouse function. By default, all three axes are active when you first select an edit item and an edit function. Deactivate any axis by clicking on it. When a button is highlighted, the axis it represents is active.

X, Y, and Z axis movement is expressed in a base 10 unit of measure. The LightWave manual refers to axis movement in metric terms. A distance of 1.300 means 1 meter, 3 centimeters. Rotations around the H, P, and B axes are expressed in degrees, with 360° describing a full circle.







Mouse section/X button
When you are in the front view (XY), X movement occurs horizontally, to the left or right. Positive movement occurs to the right, negative to the left.

Mouse section/Y button
When you are in the front view (XY), Y movement occurs vertically, either up or down. Positive movement occurs up, negative occurs down.

Mouse section/Z button
When you are in the front view (XY), Z movement occurs horizontally, in a "coming at you" or "going away from you" fashion. Positive movement occurs as objects move further away, negative as they move toward you.
Note that in while you are in the XY view, you cannot move an item along the Z axis. This axis is always constrained in the XY orthographic views. The example given is intended to demonstrate the direction of movement along the Z axis only, not to give you the impression that this axis is active in the XY view.



Mouse section/H button (Heading)
This is a rotation around the Y axis. If you sat in a swivel chair and spun around, you would be rotating about the Y axis. A change in heading is a change in the direction you face.

Positive change is clockwise when looking straight down, along the positive Y axis toward the origin. Negative values produce a counter-clockwise movement.

Mouse section/P button (Pitch)
This is a rotation around the X axis. When you bend forward, as if looking over the edge of a balcony, you are rotating about the X axis. A change in pitch is a change of angle either forward or backward.

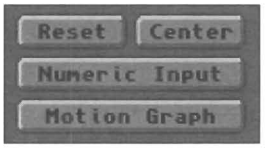
Positive values produce clockwise rotation around the positive X axis when looking toward the origin. Negative values travel counter-clockwise.

Mouse section/B button (Bank)
This is a rotation around the Z axis. When you tilt to the left or the right, as if reaching down to one side, you are rotating about the Z axis. A change in bank is a change of angle either left or right.

Positive values produce clockwise rotation around the positive Z axis when looking toward the origin. Negative values produce counter-clockwise movement.

Further Object Movement Controls

Additional controls that govern object movement appear on a slightly smaller panel to the left of the main layout screen. They allow you to reset items to their original position or orientation settings, center the currently selected item in the layout view, and enter specific X, Y, Z or H, P, B values via the keyboard for exact item placement.



Reset button

With Reset you can return an item to any one (or all three) of its original X, Y, Z locations or H, P, B orientations. This is useful if you've positioned and re-positioned an item in Layout so much that you've lost track of its orientation with the rest of the scene and you wish to reorient it to one or more of its original values. You can reset any combination of the current axes at a time. Whichever axes are active at the time you select Reset will be returned to their original settings. Any editable item may be Reset: the View, an Object, a Bone, a Light source, or the Camera.

To use Reset

Select the item you wish to reset, activate the appropriate axes, then click Reset. Reset does not reset any values for specific keyframes. Reset returns the selected (X, Y, Z) or (H, P, B) values to their original location or orientation when the object was loaded into Layout.

Center button

With Center you can center the currently selected item in the Layout window. This does not physically move the item within the scene, rather it shifts your point of view so that the object is in the center of the screen. This is useful in case you lose track of an object while editing a scene.

To use Center

Select an item, then click Center to shift the view to that object. The Center button works in the XY, XZ, ZY, and Perspective views.

Numeric button n

With the Numeric button you have the ability to position, orient , size, or scale an item by a specific amount. For minute changes or very exacting changes, this method is often easier to use than manipulating an item using the mouse.

To use numeric entry for any function

After selecting an item (such as the Camera) and an edit function (such as Rotate), select Numeric. In the menu that appears, enter the rotation values you wish, and press Return.

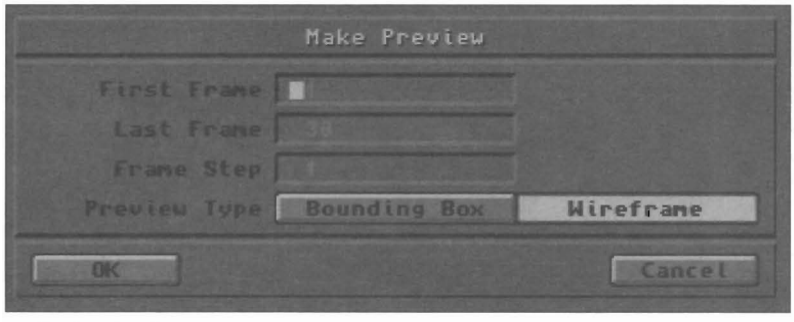
Motion Graph

To edit an item's motion path using motion graph controls, select Motion Graph (after selecting the item to be edited). The controls for Motion Graph are explained in the section titled "Fine-Tuning Motion Paths with the Motion Control Editor."

Previewing Animations

LightWave generates real-time wire frame previews in the Layout window for the purpose of previewing your animation work. These previews require far less time to generate than full color animations, and they always play at full speed—the NTSC video rate of 30 frames per second. Of course, you can adjust them for other playback rates.

The five preview options that appear on the Preview pop-up menu are discussed below.



Make Preview button

Use Preview/Make Preview to generate a wire frame preview of the current scene. The preview that LightWave creates is based on the following settings:

- The current point of view. LightWave creates previews from any of its six points of view. You may want to watch from a Perspective view, like a director on the set of a movie, or from one of the side views to make certain that objects travel the proper paths.
- The current visibility settings (as set up on the Options Panel).
- The frame numbers entered for First Frame (this defaults to frame 1), Last Frame (this defaults to frame 30), and the Frame Step (this defaults to 1). These can be changed here.
- The number of frames available for preview. This number is limited to chip RAM in your machine. If you need to create a longer preview, you can render every second (or every third) frame and play the preview back at 15 (or 10) frames per second. See Frame Step in the Scene Panel for further information.

To create a preview animation

When you select the Make Preview option, LightWave displays the following information: First Frame (the first frame to be rendered), Last Frame (the final frame to be rendered), Frame Step (the frame step to be used for rendering), Preview Type (either bounding box or wire frame, explained below). If these are incorrect, update them as you desire. When they are correct, click OK to generate the preview. LightWave will step through the animation, one frame at a time, as it builds the preview. When LightWave has completed creating a preview animation, it will display the Play Preview control panel (see Preview/Play Preview, below).

To interrupt the creation of the preview animation

Press Esc. The frames that have been processed up to that point remain available for preview, if you wish to view them anyway.

Note:

Changing the values for these controls does not change their values on the Scene Panel. The Scene Panel contains the values that are used for color image rendering. The Make Preview button only controls the frame values for the wire frame preview animation.

Bounding Box option

When Bounding Box is active, the preview that LightWave creates represents each object as a simple wire frame box. Each box fully encloses an object's dimensions. This is useful for animations that take too long to create in wire frame form and where seeing the exact wire frame is not critical.

Wireframe option

When Wire frame is active, the preview that LightWave creates represents each object as a fully-defined wire frame shape. This is useful when accuracy is important and you need to see exactly where objects are in relation to one another. Understandably, this preview takes longer to create than the Bounding Box preview.



Preview pop-up menu/Play Preview button

With Play Preview you can view a wire frame preview animation. This may be either a wire frame preview you just generated (see Preview/Make Preview, above), or one that you just loaded from hard disk (see Preview/Load Preview, below).

The Play Preview controls appear immediately after LightWave generates a wire frame preview. If you select this option but have not yet made a preview, LightWave will ask if you wish to generate one first.

Note:
When you view a preview animation you may think that the animation moves to quickly or too slowly. To slow it down, you may wish to increase the number of frames between keyframes. To speed it up, decrease the number of frames between keyframes. The simplest way to make these changes is to go to the Scene Panel and use the Scale All Keys button.

Play Preview panel/Reverse Once
Click this button to play the animation backward once.

Play Preview/Reverse Play
Click this button to play the animation backward in a repeating manner.

Play Preview/Reverse Step
Click this button to step backward through the animation one frame at a time.

Play Preview/Pause
Click this button to pause the animation.

Play Preview/Forward Step
Click this button to step forward through the animation one frame at a time.

Play Preview/Forward Once
Click this button to play the animation forward once.

Play Preview/Forward Play
Click this button to play the animation forward in a repeating manner.

Play Preview/Manual Speed Slider
The small slider below the playback buttons is a manual speed control button. Drag it left or right to move through the wire frame preview at your own pace. This is extremely useful for studying object motion.

Play Preview/End Playback
Select End Playback to exit Playback mode and return to the Layout screen. LightWave will not allow you to use any other controls until you select this option to exit the Play Preview control panel. All other controls will be dimmed.

Play Preview/3 fps (1/10th speed)
Click this button to play back the animation at 3 frames per second. See Frame Step in the Scene Panel for uses of this play back rate.

Play Preview/6 fps (1/5th speed)
Click this button to play back the animation at 6 frames per second. See Frame Step in the Scene Panel for uses of this play back rate.

Play Preview/10 fps (1/3rd speed)
Click this button to play back the animation at 10 frames per second. See Frame Step in the Scene Panel for uses of this play back rate.

Play Preview/15 fps (1/2 speed)
Click this button to play back the animation at 15 frames per second. See Frame Step in the Scene Panel for uses of this play back rate.

Play Preview/24 fps (motion picture film speed)
Click this button to play back the animation at 24 frames per second. This is the same rate at which motion picture film runs.

Play Preview/30 fps (full speed)
Click this button to play back the animation at 30 frames per second.

Preview pop-up menu/Free Preview
Free Preview will free, from memory, any previews that are currently loaded. If you render a frame or enter Modeler, any preview in memory will be automatically cleared.

Preview pop-up menu/Load Preview
Select Load Preview to load preview animation from disk. Layout presents you with a file requester, allowing you to select which preview animation you wish to load. Once the animation is loaded, you may use the playback controls to view the preview.

Note:
You do not need to load a preview animation that is related to the current scene in Layout, since the preview and the scene data are separate items in memory. Once you exit the playback you will be returned to the scene and elements that were present before you loaded the preview.

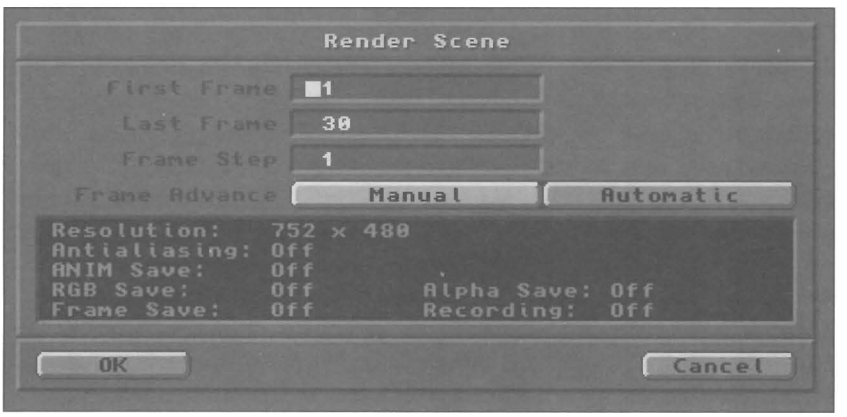
Preview pop-up menu/Save Preview
Once you have generated a wire frame preview in Layout, you may save it to disk for later playback. Layout presents you with a file requester, prompting you to provide a name for the preview animation. Previews saved to disk require large amounts of memory. If LightWave cannot save the preview (for example, because the disk is out of space) you may see the message "Can't save wire frame preview."

Rendering Scenes

When you are ready to see a fully developed image of the scene you have created, or when you are ready to record an animation to hard disk or tape, use the Render button. Based on the frame(s) you have chosen to render, and the settings you have selected for rendering, LightWave will generate a 24-bit full color image. Normally, this image is displayed by the Toaster as it is created. Depending on the equipment you use and your need for faster rendering, you may wish to turn this feature off (see the Render to DV1 button).

There are two keyboard shortcut commands for rendering: F9 (render current frame), and F10 (render defined frames). Render Current Frame will automatically render the current frame using the current render settings. Render Defined Frame displays the Render Scene status and control panel to provide you with an overall summary of important settings so that you can verify them before actual rendering.

Note:
When using F9 to render frames, frames will not be saved, even if you have selected record options from the Record panel.



Render button F9
Select Render to generate a rendered image to the Display Device selected in the Record panel..

The Render Scene panel displays the following information: First Frame (the first frame to be rendered), Last Frame (the final frame to be rendered), Frame Step (the frame step to be used for rendering), Frame Advance (select manual or automatic, see below), Resolution (the pixel resolution of the image), Antialiasing (whether off, low, medium, or high), Save RGB (whether on or off), Save Alpha (whether on or off), Save Frame (whether on or off), Display Device, Serial Recording (whether on or off), and Data Overlay (whether on or off).

Note:
About rendering and low memory. If you click Render and in response the screen flashes and no rendering occurs, LightWave does not have enough RAM available with which to generate the image. You will need to recover more memory. We suggest you make sure there are no unnecessary objects or images loaded into LightWave. If Modeler is active, but you are not using it, unload it from memory. You may need to reduce the number of colors or the resolution of your Amiga's Workbench display. Ultimately, you may need to add memory to your system.

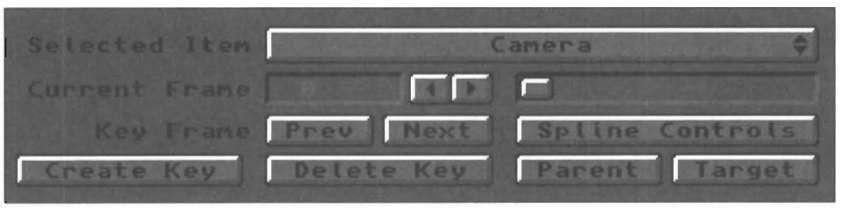
Render button/Render Scene panel/Manual button
Select manual to render a single frame (the frame whose number is shown in the First Frame field). The First Frame number can be set on the Scene Panel as well.

Render button/Render Scene panel/Automatic button
Select Automatic to instruct LightWave to render a sequence of images, such as when you are rendering an animation. This instructs LightWave to render all of the frames defined by the First Frame and Last Frame fields, one after another.

Note:
About Automatic Rendering. If you are rendering images to a single frame controller (to video tape or recordable laser disc), you must have Serial Recording turned on.

Creating Keyframes

Every time you change an object's position or rotation in LightWave, and you decide you want to keep that change, you need to record it so that LightWave keeps this information stored in memory. This is known as creating a keyframe. A keyframe is a specially marked frame within an animation that contains recorded information about an object's position and orientation at a specific moment in time. There can be any number of keyframes in an animation. The succession of keyframes allows LightWave to create the illusion of movement known as animation. As an object moves from keyframe to keyframe, LightWave generates the in-between images necessary for smooth movement.



Selected Item the up-arrow and the down-arrow
This pop-up menu button displays the current item being edited whether it is an object, a bone, or a light source (based on the type of item selected on the Edit panel). If more than one of these of items is present in the scene, drag the pointer over the Selected Item pop-up button to choose which item you wish to manipulate. You can also use the the up-arrow and the down-arrow keys on the keyboard to shift through the list one item at a time.

Here's how to select an item:
1. From the Edit panel on the Layout screen, select the type of item you wish to edit (View, Object, Bone, Light, Camera). The selected item pop-up button now displays the name of the first item of that type.
2. Drag the pointer over the Selected Item button to display a list of all the items of this type that have been loaded into Layout. Highlight the item you desire and let go of the mouse button to select it.

Grid and Status Windows
The Grid window and the Status window, both in the lower right corner of the main Layout screen, display information about the size of the LightWave reference grid and the stats of the current operation.

For example, as you rotate an object the amount of rotation H, P, and B angles shown in the status window. The information displayed is based on the Function selected.
Move displays the position for objects, bones, lights, and the camera, or aimpoint for the view.
Rotate displays the direction for the view, objects, bones, lights, and the camera.
Size and **Stretch** display the scale for objects and bones.
Move Pivot Point displays the pivot point for pivot points.
Rest Length displays the rest length for bones.
Zoom Factor displays the zoom factor for the view.

Current Frame f (place cursor in Current Frame field)
The Current Frame field displays the frame number of the current frame shown in Layout. To advance to a particular frame, click to the left of the current number in this field, enter a new frame number and press Return.

Note:
To advance or fall back a single frame at a time, press the left-arrow or the right-arrow, or click the left- or right-facing arrows beside the current frame number.

Create Key Return or Enter
Select Create Key to create a keyframe for the currently selected item item at its current position and orientation.

This is how to create a keyframe:
1. With an item selected, click on Create Key. The Create Key dialog box appears.
2. LightWave displays the current frame automatically in the Frame field. If this number is incorrect, enter the frame number that you want.
3. Select which item a keyframe should be created for:
Selected Item creates a keyframe for the current item only.
All Items creates a keyframe for all items in Layout.
Selected Item and Descendants creates a keyframe for the current item plus all of its descendant items.
4. Click Ok to create the keyframe and exit the dialog box, or click Cancel to cancel the operation.

Note:
The Return key is a shortcut for this dialog box. If you press Return after entering (or confirming) the frame number, you will both exit the dialog box and confirm the creation of a keyframe in one step. Make sure the Create Key For option is correct before doing so, or you may create a keyframe for the wrong items.

Delete Key Return or Enter
Select Delete Key to delete a keyframe for the currently selected item item at its current position and orientation.

This is how to delete a keyframe:
1. With an item selected, click on Delete Key. The Delete Key dialog box appears.
2. LightWave displays the current frame automatically in the FramE field. If this number is incorrect, enter the frame number that you want.
3. Select which item a keyframe should be deleted for:
Selected Item deletes a keyframe for the current item only.
All Items deletes a keyframe for all items in Layout.
Selected Item and Descendants deletes a keyframe for the

current item plus all of its descendant items.
4. Click Ok to delete the keyframe and exit the dialog box, or click Cancel to cancel the operation.

Note:
The Return key is a shortcut for this dialog box. If you press Return after entering (or confirming) the frame number, you will both exit the dialog box and confirm the deletion of a keyframe in one step. Make sure the Delete Key For option is correct before doing so, or you may delete a keyframe for the wrong items.

Current Frame f (place cursor in Current Frame field)
The Current Frame field displays the frame number of the current frame shown in Layout. To advance to a particular frame, click to the left of the current number in this field, enter a new frame number and press r.

Note:
To advance or fall back a single frame at a time, press the left-arrow or the right-arrow, or click the left- or right-facing arrows beside the current frame number.

Prev Key **Shift+left arrow**
The Prev Key button jumps you from the current frame to the previous keyframe. Click Prev Key to go to the previous keyframe.

Note:
There is another keyboard shortcut for changing frames. If you just want to go to the previous frame, just press left-arrow on the keyboard.

Next Key **Shift+Right arrow**
The Next Key button jumps you from the current frame to the next keyframe. Click Next Key to go to the previous keyframe.

Note:
There is another keyboard shortcut for changing frames. If you just want to go to the next frame, just press right-arrow on the keyboard.

Spline Controls
Spline Controls are used to fine-tune motion paths for the camera, light sources, objects, or bones. While bones can make inanimate objects move with useful squash-and-stretch effects, spline controls affect more subtle aspects of movement.

For example, if you animated a comic cartoon character preparing to punch a punching bag gently, you might cock his arm back and swing it with perhaps just a few keyframes. However, using spline control, you could manipulate his arm with greater finesse. You character might pull his arm back, slowing to a stop as it reached the cocked position, then he might shoot forward swiftly, bringing it to a sudden, gentle stop as it touched the punching bag. These are the kind of subtle-yet-powerful touches that spline control can add to your animation. Without them, the cocking and swinging motions would be less exaggerated and more constant. They would appear less visually interesting.

For further background and details about spline control, see Fine-Tuning Motion Paths with the Motion Control Editor.

Parent
With Parent you can attach the current item to any other item in the scene (including a bone, the camera or any light source). This attachment is unique: if the parent object moves through the scene, the attached child object will mimic its movements. In addition, the child object can be rotated and moved independently while remaining consistent to its parent object's movements and rotations.

An example of this feature might be having a squadron of jet fighter planes peel off to one side. You might parent each of the jets following the lead jet so that when the lead jet veers left each of the child jets will veer left as well.

Here's how to parent one object to another:
1. Load some number of objects into Layout.
2. Select an object that will be a child object (an object that you intend to attach to another object).
3. Click Parent. Drag through the pop-up selector to select the name of the parent object. Click OK.
4. Now position the child object in relation to the parent object. When it is in position, create a keyframe at this frame.
From this point, you can manipulate the parent object as you wish, and the child object will mimic each of the operations that the parent undergoes. At the same time, you can cause the child object to undergo its own changes while mimicking those of the parent.

An example of this might be a moon object rotating on its own axis as it circles its parent planet object.

Note:
If the parent object has been repositioned in Layout before the Set Parent button is used on a child object, the child object may jump to a new position relative to the parent object in the Layout window. If so, use Layout movement and rotation controls to place the child object where it should be in relation to the parent object. Then create its starting keyframe.

Note:
The offspring object will mimic the parent's movement exactly. Any mouse functions that have been (or will be) performed on the parent object (move, rotate, size, stretch) will affect the child object as well as its parent.

Target

With Target you can instruct the camera (or any number of light sources) to point to another object at all times during a scene. This is useful when you want the rendered point of view to follow a certain object through an elaborate scene, or when you want a spot light to to remain fixed on a moving object so that it is always illuminated, especially when the target object moves along a complex motion path.

Tip:

A useful trick in 3D animation is to use a null object as the target object. A null object can move through the scene freely without danger of being seen, since single points do not render (unless they are designed to be seen using certain settings). For a spot light to track back and forth across a scene, a null object target is highly beneficial.

Here's how to use Target:

1. Load some number of objects into Layout.
2. Select Camera from the main panel, under Edit.
3. Select Target.
4. Drag the pointer through the pop-up menu to locate the target item.
5. Click OK.

Note:

No matter which frame you are on when you use Target, the selected item will look at the target item for the duration of the entire scene. You cannot set a target for an item in the middle of a scene unless you were to break the scene up into two separate scenes, one with Target active and one without.

Using Goals

Whenever you have an object or a bone selected in the Edit section, the Target button reads "Goal."

By selecting a goal object in this pop-up menu, you can tell an object (or a bone) to always "reach" for the goal. Any objects/bones that are parented in a chain will react as the last item in the chain reaches for its goal. In other words, you could pull on a robot's finger and the arm would follow (as far as it can, of course).

Here's how a goal works.

1. In Modeler, create a rectangular box that has the approximate dimensions of an arm and make sure that the center of rotation, or origin is located at the end of the arm. Import this into Layout as "arm".
2. Clone this object 3 times so you have a total of four copies.
3. Parent arm (2) to arm (1), arm (3) to arm (2), and arm (4) to arm (3).
4. Select arm (1) and then Create Key. Create a key for Selected Item and Descendants.
5. Add a Null object (+)and select Save Object to give it a new name of "GoalNull".
6. Select arm (4) and then select GoalNull as the Goal.
7. Select the GoalNull object and move it around the screen to see how the others follow.
8. This may not give us exactly what we want as the pivot point of arm (4) is actually what is trying to catch the GoalNull. In order to get the "end" of arm (4) to reach for the goal, you will need to add another null object and parent it to the end of arm (4). Remove the Goal from arm (4) and instead, make it the Goal of the null object that is parented to the end of arm (4).

Tip:

Turn off unwanted movement and rotation axes for individual objects to make the chain of objects easier to work with.

In order to use goals with bones, you must create a similar set up where a chain of bones are parented and the end bone has a Goal object selected. Using the Add Child Bone button in the Bones panel quickly creates a bone that is parented to, and "slid down from" the previous bone.

The Scene Panel

From the Scene panel you perform the basic operations for scene files: clear the scene from the screen, load a scene from disk, or save a scene to disk. You can determine the length of the scene and the frame step to be used for wire frame previews and full color image rendering. You can also scale or shift the animation in time. Finally, you can get an overview of the items in the scene and their keyframes.

What is a scene? All of the information that goes into the creation of a LightWave image or animation is stored in a file that LightWave calls a *scene*. A scene is the name for the type of file LightWave uses to store all of the information that goes into the creation of a LightWave image or animation—including the objects, textures, lights, camera, motions, and images.

Note:
The surface descriptions for objects are an important item not stored within the scene file. They are part of the object file itself. This is why you should always save your objects after modifying their surfaces in Layout. Only the newly written object file knows what the object's surface texture looks like; not the scene file.

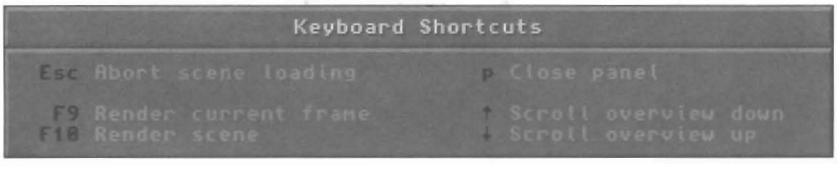
You should know that scene files keep track of the original location (device and drawer name) from where the objects and images were loaded. If any of this information changes after you have saved the scene file (for example, if you had changed an object's name, or moved it to another location on the hard drive), LightWave may be unable to locate an element that it needs. If LightWave cannot find something, it will ask if you wish to select an alternate item (OK), or if you wish to skip this item and continue loading the remainder of the scene (Cancel). If you select OK, LightWave will present you with a file requester so that you may direct it to the proper file. If you select cancel, the remaining contents of the scene will be loaded.

For tips on rendering scenes quickly, such as when test-rendering, see the introductory text for the Camera menu.



◆ Addendum ◆
Frames Per Second

◆ Addendum ◆
Show pop-up menu
Hide pop-up menu



About LightWave 3D
Click About LightWave 3D to learn which version of the LightWave software you have.

Free Memory status window
This window shows the amount of memory available on your computer. This amount is read in *megabytes*.

Clear Scene
With Clear Scene you can reset the Layout screen to its original state (a solitary camera and light source, and nothing else in the scene). Clear Scene clears everything from the Layout screen (objects, surfaces, textures, additional light sources, images, motions, and envelopes) then returns the program to its default settings. A requester will ask you to confirm that you wish to clear the scene.

Note:
Clear Scene will not affect any of the files on your hard drive. It does not delete them from disk. Rather, it removes them from the screen.

Load Scene
Use Load Scene to (a) clear the current scene, and (b) load a new scene file into Layout. The previous scene will be cleared, and all the elements of the selected scene will be loaded (objects with their surfaces, images, keyframes, envelopes, light sources, etc.). Be sure you have saved the current scene before selecting Load Scene.

Note:
If you would like to load the contents of one scene file into another scene file without replacing the original scene, use the Load from Scene button on the Objects Panel.

Save Scene
Use Save Scene to save the current scene. This includes all information necessary to recreate the scene (objects, images, keyframe data, etc.) when you load it at a later date.

To protect you, the status of the Recording buttons themselves will not be saved when they are active.

Note:
Save Scene does not save the actual objects used in the scene, it only saves the knowledge of which objects were involved and where they came from. To save an object with its current surface settings, use the Save Object button on the Object menu. (To save all the objects in the scene with their current surface settings, use the Save All Objects button on the Object menu.) To save an object's surface settings as a separate file from an object, use the Save Surface button on the Surface menu.

Note:
When saving scenes with the Data Overlay option (from the Record Panel) turned on, LightWave will ask if you want the Data Overlay Label filled in with the current scene name. Since the Data Overlay Label is included in the resulting animation frames, this is useful should you wish to identify the resulting animation with the same name as the scene file used to generate it.

Current Scene status window
The display beside this button shows the name of the current scene, and information about items and elements within the scene.

First Frame, Last Frame
The First Frame and Last Frame buttons are place markers. Use them to instruct LightWave which frames to use when rendering images, animations and wire frame previews; or when you want to display a series of previously rendered framestores.

Here are the situations where the First Frame and Last Frame buttons are important.

- The Render button. When you render a single image, the number entered under First Frame is the frame that will be rendered. In such cases, the Frame Advance setting is on Manual and the Last Frame number is ignored.
- The Render button. When you render an animation, the numbers entered for First Frame and Last Frame determine which frames will be rendered.
- The Make Preview pop-up menu. When you render a wire frame preview animation, the numbers entered for First Frame and Last Frame determine which frames will be used to generate the preview. (You may change these numbers on the pop-up menu that appears when you select Make Preview, but this change affects *only* the frame numbers used to generate the preview. They will not change the values on the Scene Panel itself.)
- The Play Framestores button. When you select Play Framestores, the numbers entered for First Frame and Last Frame are used to determine which frames will be displayed in sequence. (This option assumes that you have previously rendered a sequence of framestore images which you would like to display or record to tape and that you are running LightWave from the Video Toaster Switcher.)

Note:
If you wish to reverse the animation (in fact, it is easier sometimes to set up the scene backwards, so that all items begin offscreen at a higher frame number then come to a resting point at frame 1), enter a frame number for Last Frame that is lower than the frame number for First Frame. Set a Frame Step value that is negative. When you generate wire

frame previews, or the rendered animation, it will be created in reverse.

Frame Step

Frame Step allows you to skip frames when you render an animation or preview. This is most useful when you need to make a lengthy preview or test-render an animation, and you don't wish to take as much time waiting to see the results.

Another benefit of Frame Step is that LightWave can only allocate so many frames to the preview function, meaning that although you can set up an animation of any length in Layout you may not have enough memory to generate a wire frame preview of the same length.

For example, say LightWave is able to allocate only 150 frames for preview (it will notify you whenever you have exceed your system's preview limit) but you have created a 300-frame animation, you can still preview the animation in its entirety. Set First Frame to 1, Last Frame to 300, and Frame Step to 2. Make the preview. When the preview is ready to play back, use the 15 FPS rate to approximate a true 30 frame-per-second playback.

In this way Frame Step allows you to generate the entire preview length, skipping every other frame in the process, while fitting within the memory limits of your system. Similarly, a Frame Step of 3 works in conjunction with the 10 FPS speed to approximate a 30 frames-per-second playback rate.

Note:
LightWave renders frames based on the number entered here. 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.

Note:
The Frame Step may be changed by a pop-up menu that appears when you select Make Preview, but such a change affects only the Frame Step used to generate the preview. It will not change the value shown on the Scene Panel.

Shift All Keys

With Shift All Keys you can shift keyframes within the scene forward or backward in time. You can specify this shift either for all keyframes in the scene or for a specified range of keyframes. This allows you to fine-tune the animation without having to make individual changes for each item in the scene, a potentially tedious task.

Note:
Time-related elements of the scene other than motions and envelopes will not change. Therefore, image sequence loop lengths and texture velocities will not be affected by Shift All Keys.

Note:
Some operations can affect frames outside the specified range. For example, shifting a range of frames in the middle of a motion path will cause keyframes after the range to be shifted so they are not overlapped by the newly shifted keyframes.

Scale All Keys

With Scale All Keys you can extend or shorten either the duration of the entire scene or the duration of a portion of the scene that falls within the range of two user-specified keyframes. This results in the entire scene, or events within the scene, occurring either more slowly or more quickly, as they have been scaled to take place over a longer or shorter period of time. Scale All Keys enables you to fine-tune the animation, allowing certain events or the entire animation to take place within a specified time frame so that you do not need to alter specific keyframes manually. Either all keyframes or a specified range of keyframes may be scaled.

Here's how to use Scale All Keys.

1. After you have set up a scene and generated a preview, you decide that the entire animation is too fast. Select Scale All Keys.
2. Suppose that you wish to double the length of the animation so that it takes twice as long for all objects to move into position. Enter the number 2 in the Scale Frames By: field. Click OK.
3. LightWave will effectively stretch the animation by a factor of 2. Notice that the number in the Last Frame field on the Scene Panel has been doubled. Your animation has been scaled by 2.

Note:
Time-related elements of the scene other than motions and envelopes will not change. Therefore, image sequence loop lengths and texture velocities will not be affected by Scale All Keys.

Frame End Beep

Frame End Beep causes LightWave to beep after each frame has been rendered, whether Frame Advance is set to Automatic or Manual. The beep is output via the audio output jacks of the computer.

Scene Overview

This portion of the Scene Panel displays information about the objects and elements used by the current scene. Use the slider at the left to scroll through the list of items in the scene, and the solids at the upper right to scroll through time (the keyframes that have been assigned for each item).

(scene overview, cont.)

All items within the scene are denoted by a single icon in the first column. For example, objects are denoted by a sphere, light sources by a light, the camera by a camera, and bones by a small bone. Any items that are parented appear indented just below their parent item.

The second column tells the visibility state of an item when not selected. Lights, bones and the camera can either be visible or not. A checkmark denotes visibility. An object can be invisible, or represented by a bounding box, points only, every other polygon, or fully visible.

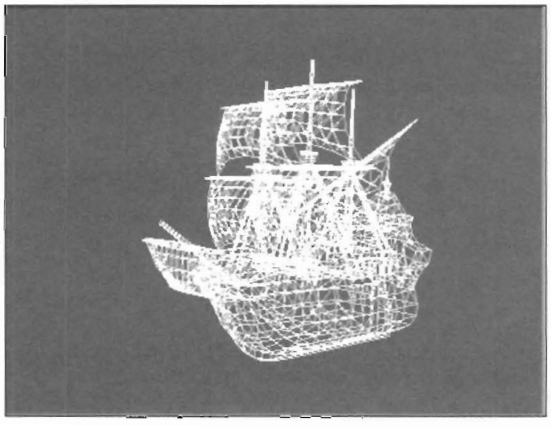
You can also click on an item's symbol or name to highlight it and make it the currently selected item in Layout.



A close-up of the Scene panel. This scene contains five objects, two bones, one light, and the camera. The first column indicates the type of item (object, bone, light, or camera). The second column shows visibility settings (wireframe, invisible, bounding box, points-only, and alternate polygons for objects; on or off for bones, lights, and camera).

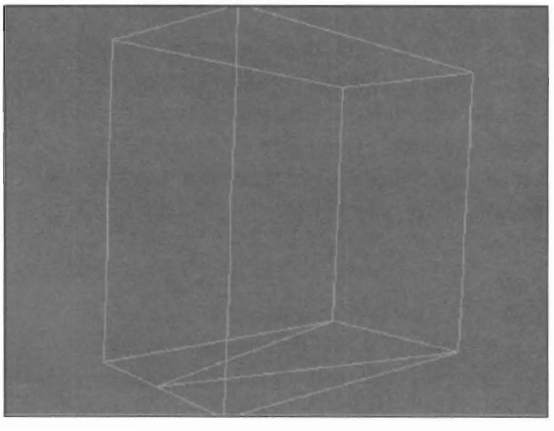


The visibility setting for normal wireframe view.



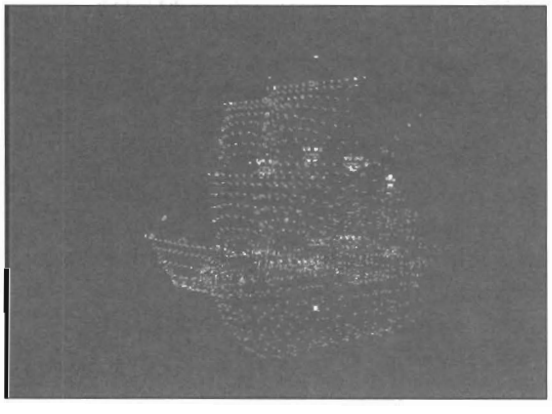


The visibility setting for bounding box view.



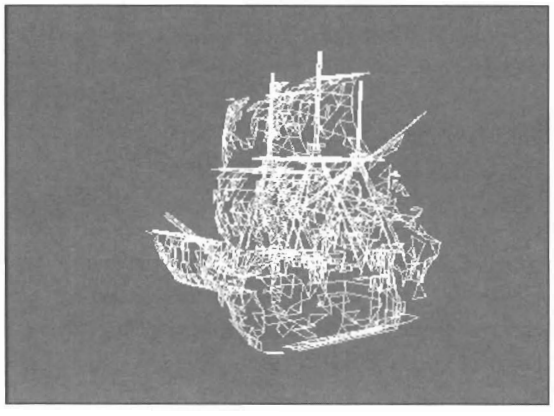


The visibility setting for points-only view.





The visibility setting for every-other-polygon view.



The Objects Panel

With the Objects panel you perform the basic operations for Object files: clear an object, load an object, save an object. These buttons have extended versions as well, such as Clear All Objects or Save All Objects, which allow for more complete control. Through the use of Displacement Mapping and Bones, you can also edit some physical characteristics of objects.

What is an object? An object is a file that contains both the physical information (points, their location, polygons, etc.) and surface information (color, texture maps, specularity, etc.) that defines an object's shape and appearance.

- Physical characteristics refer to an object's physical form, or shape. These may be modified by the influence of Bones, or by special object maps such as Clip or Displacement Maps. An additional feature of such physical transformations is that an object may be deformed freely and saved in this transformed state, thus defining a new object.

While the physical characteristics of an object are created in LightWave Modeler, they can be modified with Displacement Mapping or Bones.

- Surface characteristics refer to an object's visual appearance, consisting of both color and texture. These may be modified by color, reflective qualities, environment maps, bump maps, and more. Of course, these surface settings may be saved, thus completing the process of modeling and defining a 3D object.

Surface names are created and assigned in Modeler, but the appearance of each of these surfaces is defined via the Layout Surfaces panel.



◆ Addendum ◆

Unaffected By Fog
Unseen By Rays

Buttons on the Objects Panel
Following is a button-by-button description of the controls on the Objects panel.

Clear All Objects
Clear All Objects removes all objects from the current scene in memory. It does not remove images, or alter the camera or light sources. A requester will ask for confirmation. Note: Clear All Objects will not delete any object files from your hard drive.

Load Object
Select Load Object to load an object into the Layout screen. A file requester will appear. By default, it displays the contents of the Objects directory on your hard drive. Locate the filename and double-click on it to load it.To direct LightWave to list the objects from another location, click a device button at the top of the file requester, and move through the directories until you locate the object file. When you find it, double-click on it to load it.

Objects and images take up memory as they are loaded into LightWave. The more objects and images you plan to use, the more memory you take up. If you have loaded many complex objects, and/or perhaps many images, you may have to be selective about the next item you load. (One trick for getting around this is to load those objects that may be part of the background and render an image. Then, clear the scene, load the remaining objects, and load the rendered picture to be used as a background image.) Currently, LightWave loads the object file formats listed here. Others may have been added after this manual went to press. LightWave will load these files. However, if it cannot identify a file with certainty, it will display a panel where you may select the type of file you are loading. LightWave will then load the object. See the Appendix on TIO for further information about this and file conversion.

Videoscape 3D
Sculpt 3D/4D
AutoCAD DXF
3D Studio .3Ds
Swivel 3D Pro
Wavefront .obj

Note:
When you load one object several times, or perhaps several different objects that share the same surface names, the surface settings from the last-loaded object will override all previously loaded surfaces of the same name. To avoid this, use the Rename Surface button (on the Surfaces panel) to rename surfaces that should remain distinct after loading each object.

The maximum number of objects you may have in a scene is 1000.

Load From Scene
Select Load From Scene to load objects and their associated data (motion paths, surface description saved in object files, object hierarchies, etc.) from a previously saved scene file into the current scene. These items will load to their normal coordinates as specified by their original scene file.

The Load from Scene option has its own default directory, making it easier for users to separate regular scenes from scene files created specifically to store hierarchical objects. The name of this default directory is saved in LightWave's configuration file, lw-config.

After you select Load From Scene, LightWave will present you with the list of previously saved scenes on the hard drive. Select the proper scene either by double-clicking on its name, or by clicking on it once and then selecting OK. All objects within the scene will be loaded into the current scene.

LightWave will then ask "Load lights from scene as well as objects?" Select Yes or No according to your preference. As an example of this feature, if you have a police car object that had parented red and blue rotating lights in its original scene, use Load From Scene with the add lights option to load the car plus its attached light sources.

Note:
If the scene you select had its own light sources, and you select OK to loading lights as well as objects, you will end up with multiple light sources in the scene. Make sure they do not exist at the same coordinate location, or you may not know there are several lights present.

Save All Objects
Select Save All Objects to perform an automatic save of all objects in the current scene (with their current surface names and settings). If you confirm this operation, the objects will be saved in the same location (and with the same name) as the originally loaded objects.

Note:
If multiple copies of the same object appear in a scene, and they have the same name, only one is saved when you use Save All Objects, since each will be overwritten by the next. If you want to save them as separate objects, use Save Object first to save each one individually. Later, you can use Save All Objects, since then they will have distinct names. This is also true if these objects share the same surface names. If you want their surfaces to remain separate, be sure to use Rename Surface to create distinct surface names before you save them.

Add Null Object

Selecting this option will create a special object called a "null" in your scene. Nulls are used for many things, such as targets, goals and parents of other objects. Sometimes they are just used as a marker to visually locate a space (like an "x" on the floor).

Object Information Display

The Object Information Display provides collected information on all objects loaded into the scene.

Current Object

The Current Object is the object whose name is displayed on the panel, the one that is affected by the other controls on the Objects panel. Use the pop-up list beside Current Object to choose an object for editing (you can also use the up and down arrow keys on the keyboard to cycle through current object names). As you load objects into a scene, their names will be added to this pop-up list.

For example, to assign a clip map to an object drag the pointer over the pop-up list beside Current Object to select an object. Then select the Clip Map button, choose the type of clip map, and enter the proper settings. Exit by selecting Use Texture. The clip map will be assigned to the Current Object.

Clear Object

Select Clear Object to remove the object listed in the Current Object pop-up panel. The object is removed from the scene only. It is not deleted from the hard drive.

When clearing an object that has other objects or lights parented to it, LightWave will ask if you want the offspring items to be cleared also.

If you select yes, the current object and its descendant items will be cleared.

If you select no, then the current object is removed and replaced with a null object (to maintain the object's place in the hierarchy).

Replace Object

Replace Object allows you to replace the Current Object with any other object. This is useful when you have a complex object that requires a great deal of time to redraw on screen. Rather than wait for the screen to redraw the complex object, create a simpler version of the object in Modeler and design the scene with that. Replace it with the actual object prior to rendering.

Save Object

Select Save Object to save the current object with its surface settings. (Surface settings for individual objects are not saved when you use the Save Scene button. Surface settings belong to the object, and are saved with the object.)

Null objects do not have to be called just "NullObject." Null objects can be renamed (using the Save Object button) which allows you to provide a new name for the null when you save it from Layout. After adding a null object, if you wish to name it, select it, then go to the Objects panel and click on Save Object. LightWave will instead ask you to provide a new name for the null object. The null object will be renamed. Note that null objects generated by the Add Null Object button are saved automatically when you save the scene. You do cannot save them separately (since you do not need to).

Note:
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.

Note:
Save Object does not save changes made in Layout when these changes were made with either the Size or Stretch buttons. The Size and Stretch commands in Layout do not permanently change an object, they are just part of the scene description of "what happens to this object during this animation or scene," of which sizing or stretching may be a part. To permanently alter an object's size, load it into Modeler, resize it, then save it and return to Layout.

Save Transformed

Use Save Transformed to save an object with any changes of location, rotation, scale, morph, skeletal deformation, or displacement map created in Layout. Save Transformed will save the current object from the current frame in Layout.

For example, if you load an object, rotate it, move it off to one side, displacement map it into a new shape, then add a few bones and pose it into a new shape, you can save the object exactly as it appears as if you had modeled it that way, using Save Transformed. This allows LightWave to be used as a kind of free-form modeler - for example, a flat mesh of triangles could be loaded, displacement mapped with an image into a mountain range, and then saved with the displacement "frozen" in place, thus creating a mountain object. Bones could be used as modeling tools with this option also.

Note:
You should be aware that Save Transformed saves the new object relative to the origin, just as Modeler saves objects. So, if you move the object 100 units away from (0, 0, 0), use Save Transformed, then load it into Modeler, it will load exactly 100 units away from Modeler's origin as well.

(continued from Note on previous page)

Note:
An object that is being displacement mapped with a projected image (planar, cylindrical, or spherical) as well as surface color mapped with a projected image has a unique quality. With the displacement map altering the object's shape, the color map is also "bent" to follow the contours of the transformed object.

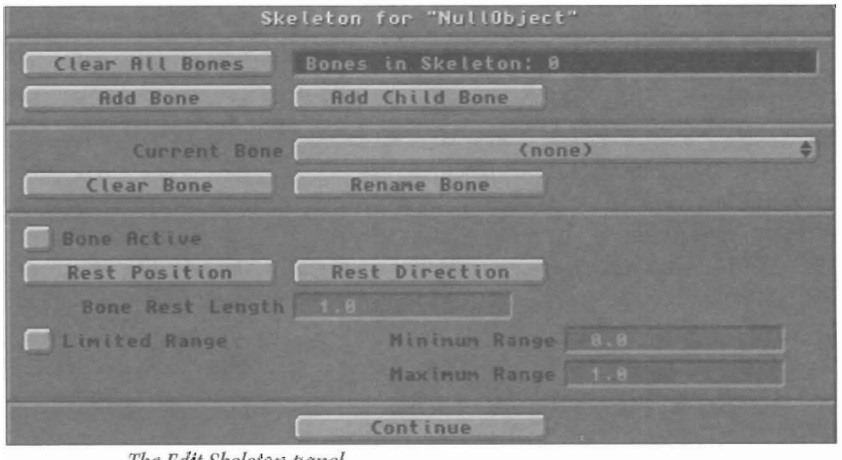
However, if you save this object with Save Transformed, it will now be permanently reshaped. Projecting a color image map onto this new object may cause irregularities to appear on some faces, similar to the results you see when you planar map a cube: the front looks normal, while the sides appear odd.

Clone Object
Select Clone Object to make copies of an object. A panel will ask you for the number of clones you would like to create. Enter a value, and press Return or click OK. All settings for the current object are also copied, including motions, parent and target info, morphing settings, shadow options, etc.

Current Object Information Display
The Current Object Information Display provides information about the current object.
There is no limit to the number of vertices a polygon may have. However, we recommend that single polygons be limited to no more than 16,000 vertices.

◆ Addendum ◆

Minimum Range
Maximum Range



The Edit Skeleton panel.

Edit Skeleton...
With the Edit Skeleton control panel you perform basic operations for the parts of an object that LightWave calls bones. Bones are unique to LightWave 3D, allowing you to animate objects with incredible ease. If you are skilled with other animation packages, bones are an advanced form of free-form deformation that allow the animator to create realistic character animation. From this panel, you can add bones, clear bones, and set their rest attributes. You can also edit bone motion paths.

The general procedure for using bones follows:
- Load the object which requires character animation. Select it as the Edit item.
- Press p to display the Objects panel for the selected object, or select the Objects panel.
- Select Add Bones once for each bone you wish to add to the object.
- Close the Objects panel.
- In Layout, select Bone as the Edit Item.
- One at a time, place each bone in relation to the object, rotating or sizing it if necessary, then press r. Pressing r does two things: it tells LightWave that the bone is now in its rest position (the position in which the object appears normal), and that it is now active, exerting influence on the object.
- Create a keyframe for each bone individually. If you forget to do this, the first time you go to another frame the bones will jump back to their as-loaded position, stretching the object out as they do so.
- At this point you can manipulate the bones as you wish, creating keyframes as necessary, and they will cause the object to deform appropriately.

What is a bone?
A bone is a small object pointer that you can use to exert influence over the shape of an object. Think of bones as puppet strings affecting the movement of the puppet (object). When you move the bone so that it rotates, the object will twist around and rotate as well. Just as an experienced puppeteer can imitate smooth, natural flowing motion, so can you. Using bones, objects turn and twist in natural curves.

Bones have an unlimited influence on their related object, unless you limit that influence with the Limited Range setting on the bones panel. For example, if you load one bone (with a default unlimited influence) onto an object, place it at its rest position, then move it, the entire object will move with it since it is being affected wholly. If you move the bone, or turn it around, the object will also move or turn around in full. However, if you limit the influence of

this bone to a distance that is one-half of the object's height, then moving the bone will affect a smaller portion of the object.

Another method for doing this would be to place another all-influencing bone elsewhere within the object so that the two bones "play off of" one another. This causes twisting, squashing or stretching, and with spline interpolation it appears naturally smooth. The object doesn't just stretch in a straight line, it bends.

Two factors dictate how much influence a bone has over an object: its rest length and, if used, a Limited Range (of influence). A bone with a longer rest length exerts more influence than bone with a smaller length right beside it. The influence of a bone extends outward from it in all directions in the form of an aspirin caplet or cold capsule. Also, although the appearance of the bone seems to indicate that it has a front end and a back end, or perhaps more influence on one end than the other, this is not the case. Its shape is designed to give you better feedback on its orientation, i.e., which way it faces. This does not affect its influence. This is a visual aid to help you work with bones.

Bones are saved within scene files. They are not saved as part of the object file. When you use bones in an animation, be sure to save the scene before you exit LightWave.

Clear All Bones
Select Clear All Bones when you want to remove all bones that have been assigned to the current object. There is no undo function, so you should be certain that this is what you wish to do.

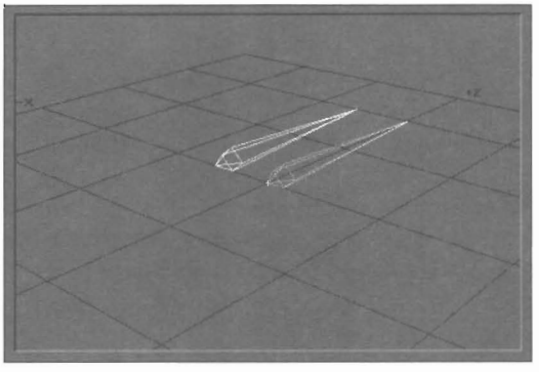
Add Bone
Select Add Bone to add a bone to the current object. Bones are automatically placed at the origin (0, 0, 0) as it was located when the object was saved from Modeler. (Therefore, if you move an object, then add bones to it, the bones will appear on screen in relation to the object's origin as it was in Modeler.) You will need to return to Layout to place the bones in relation to the object.

Add Child Bone
Selecting this button will add a bone that is equal in rest length, parented to, and placed at the end of the currently selected bone.

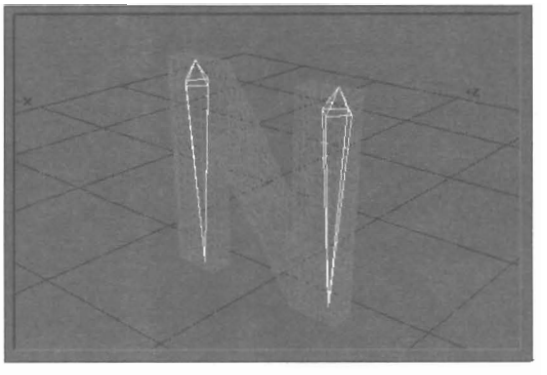
Bones Information Display
This display window shows the number of bones present for the current object.

Current Bone
Use the Current Bone pop-up panel to select a bone for editing.

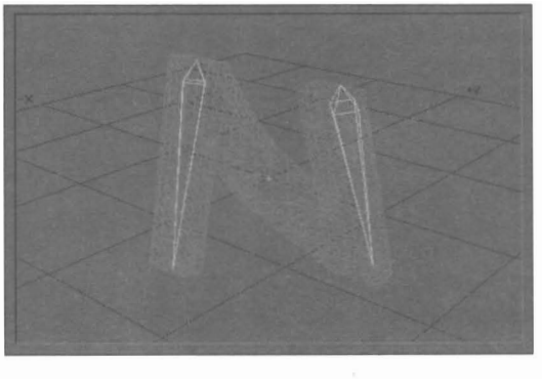
(Below.)
Three images showing how bones can be used to influence objects in an organic manner.



Two bones have been loaded into Layout.



The bones have been rotated and positioned inside the letter N. Once in position, the Rest Position (r on the keyboard) was activated. Now, any change to the bones will affect the object.



The bones have been rotated, one forward and one back. This movement exerts influence over the legs of the N, which bend to form a natural curve.

Sidebar:
About the "Rest" Commands
The three "Rest" commands are important in that they determine the position, orientation, and size of a bone when the bone is at rest, exerting no influence of change upon an object.

When you first add bones to an object, they are all inactive. Once you position a bone, press r to enter its rest values and activate its influence upon the object. From this moment onward, moving that bone will have an effect on the object's shape.

If you place a bone in its rest position, and later decide that you need to shift its rest position, go ahead and move the bone, then press **r** again. This will reset its rest position with the new data.

Clear Bone

Select Clear Bone when you want to remove the current bone from the current object. There is no undo function, so you should be certain this is what you wish to do.

Rename Bone

Select Rename Bone when you wish to give a bone a new name. LightWave numbers bones automatically as bone (1), bone (2), bone (3), etc. We suggest you rename them so that it will be easier to remember each bone's function.

Bone Active

When you add bones to Layout, they are inactive, meaning they have no influence on the object to which they have been added. To indicate this, newly added bones are drawn by LightWave with dotted lines.

If you wish to make a bone active, select Bone Active. When this button appears unpressed, the current bone is not active.

Rest Position, Rest Direction, Rest Length r

When a bone is at rest, it does not deform the object. These three elements, position (coordinate location), direction (orientation), and length (size), are "at rest" when the bone and the object are both in their unchanged state. In this case, the object's shape appears unaffected by its bones. All three elements are set to their rest position when you press r on the keyboard.

Rest Position refers to the coordinate location of the bone when it is exerting no effect on the object. Any changes to the X, Y, or Z coordinate of this bone will affect the object similarly.

Rest Direction refers to the orientation of the bone when it is exerting no effect on the object. Any changes in the heading, pitch or angle of this bone will affect the object similarly.

Rest Length refers to the size of the bone when it is exerting no effect on the object. Any changes in the size of this bone, whether larger or smaller, will affect the object similarly.

Limited Range

A bone's range, by default, is infinite, affecting the entire object to which it is assigned. Limit this region of influence by activating Limited Range and entering a value for the surrounding area which the bone affects. The value you enter is calculated in meters, extending outward in all directions from the bone. Note that the range of a bone will "fall off" gradually until it is equal to 0 at the end of the Influence Range.

General Information:About Using Bones

Some animators have requested assistance with a situation that can occur in 3D graphics programs like LightWave. It's called gimbal lock, since it resembles a situation that occurs in the gimbal mechanism that supports a gyroscope. The phenomenon of gimbal lock happens when an object has been rotated in such a manner that its pitch approaches 90° and it loses the freedom of rotation along another axis. The heading and bank rotations become one and the same. Most animators have noticed it when working with bones, which load in Layout in a specific orientation, although it can occur with other objects as well.

Rotations are applied to an object in a precise order. Subsequent rotations can have the effect of rotating the axes themselves about which preceding rotations have been applied. Suddenly two rotational axes share the same orientation and have the same effect. This is the nature of the mathematics behind object rotation, and it is common to many 3D systems.

To better understand this, consider the order in which heading, pitch, and bank rotations are applied when an object is oriented. Imagine an airplane centered on the origin in standard orientation (nose pointing in +Z direction). Its heading rotation is applied first, around the object's Y axis (this is sometimes called yaw). Pitch rotation around the plane's X axis (wingtip to wingtip) is next, followed by Bank, which is a rotation around the object's Z axis (down the length of the fuselage). You'll find that as the pitch angle approaches +90° or -90°, the heading and bank rotation axes become the same, and you lose a degree of freedom.

There are two ways to work around this situation. First, design objects in Modeler with the order of rotations in mind. For example, the main rotor blades for a helicopter spin around an shaft that leans forward by six degrees (to give choppers more forward thrust). When modeling the rotor blades, make them in the XY plane (upright, like a propeller). Load the blades into Layout, pitch the assembly down by 96 degrees, and use bank to spin the blades. If instead you had modeled the blades "as they should be in the first place" in the XZ plane, then you would have pitched them down by 6 degrees to orient them properly. But if you had tried to rotate them using a heading rotation, they would have wobbled like crazy, because of the order of rotations.

Another solution is to use a null objects as a parent to separate out the rotations and change their order of application. For example, you could have achieved the correct results with the XZ-modeled helicopter blades by setting up the spinning motion using their heading angle first, then parenting the assembly to a null object that was pitched down by 6 degrees. This effectively swaps the heading-pitch order that caused the wobbling mentioned above.

Metamorph Level
Metamorph causes a 3D metamorphosis from one object into the shape of another object. (This is a different process from 2D metamorphosis, a transformation between two specified images.)

When you enter a Metamorph Level, the object will be transformed by that percentage into the Metamorph Target object.

If you select Envelope (the E button), you will be able to animate the change over a series of frames. At 0%, there is no metamorphosis whatsoever, and the original object appears normal. At 100%, the original object is fully morphed into the target object's shape. See "Animating with Envelopes" for further information.

Note:
If you enter the Envelope Editor, this value entered for Metamorph Level will have no effect on the result. All Metamorph Level values are taken from the envelope itself.

To metamorph object shape only
Use the Metamorph button. The Metamorph envelope controls can be used to animate the change in object shape. See below for details.

To metamorph both object shape and surface color
Use the Metamorph button, and select the Morph Surfaces button as well. The Metamorph envelope controls can be used to animate both object shape and object surface at the same time. See below for details.

To morph surface color only
Use the Metamorph button to set up an object metamorphosis between two copies of the same object (so there is no apparent change in object shape), and select the Morph Surfaces button as well. The Metamorph envelope controls can be used to animate the change in surface colors. The surface color and texture settings will change while the object shape will not. See below for details, see also the Morph Surfaces button.

About Metamorphosing
Metamorph requires a minimum of 2 objects—a beginning object and a target object. There may be up to 16 target objects for any one beginning object, and any number of objects may be morphing within a scene. For best results, every target object should have been created out of the original object, so that the number of points in each object is equal. You cannot morph successfully between objects that are totally different, or have a different number of points.

To set up a morph
First load the objects involved. Locate the beginning object's name in the Current Object pop-up panel, then locate the target object's name in the Metamorph Target pop-up panel. This sets up the relationship between the two objects. It will remain if you save the scene at this point. Select the E button beside Metamorph Level to access the standard envelope editor where you may set the attributes for the 3D metamorphosis. When you are finished and return to Layout, you should move all target objects out of the camera's point of view (or make them 100% dissolved) so that only the beginning object is visible during the animation.

To remove a morph relationship
First locate the beginning object's name in the Current Object pop-up panel, then locate the word (none) in the Metamorph Target pop-up panel. Objects default to having (none) as their target. This is the normal setting for non-morphing objects.

To render a single image (rather than an animation) with an object partially-morphed
Load the beginning and target objects. Select one to be the Current Object, and the other to be the Metamorph Target. Select Metamorph Level, and enter the desired level. Render the image. As an example, a value of 50% would be half a transformation between the two objects.

E (Envelope)
Select E beside Metamorph Level to use an Envelope to control the metamorphosing of an object during an animation. For details on using envelopes, see "Animating Effects with the Envelope Editor."

Morph Surfaces
With Morph Surfaces you can cause the surface attributes (color, texture, etc.) of one object to convert to the surface attributes of another object. Using the controls for the Metamorph button, you can animate this change with an envelope.

See the Morph button, above, for details on how to morph objects and surfaces.

Metamorph Target
The Metamorph Target is the destination object for the Metamorph button. Use this scrollbox to select the target object (that object which the Current Object will morph into). See the Metamorph button for details on its use in morphing objects and surfaces. There may be up to 40 morph targets for any morphing objects.

Displacement Map
Select Displacement Map to use either an image map or a procedural pattern map to alter the physical shape of the current object. This altered object may be saved in its transformed state with the Save Transformed button on the Objects panel.

Anew feature of these object mapping subpanels is a "thumbnail"display window showing the currently selected image. Image resolution information is also displayed. When you select Displacement Map you will go directly to the texture mapping panel choices available for displacement maps. There are two types of texture maps available via the Displacement Map button:

- **Projection Maps**
  Planar, Cylindrical, and Spherical are projected image texture maps. For a Displacement Map the image provides brightness information that affects the shape of the object.

- **Bump Maps**
  Ripples and Fractal Bumps are bump maps. A Displacement Mapped bump map can cause an entire object to ripple, or appear truly bumpy (both on the surface and in profile). Displacement bump maps are extremely useful in this manner.

After assigning a displacement map to an object, return to the Layout screen to see the effects of the map on the wire frame object.

Note:
For Displacement Mapping to succeed, the object being mapped must consist of a great many polygons. You may wish to load such an object into Modeler, then use Triple (to convert all polygons into triangles) followed by several iterations of Subdivide (to further subdivide the object into smaller triangles). Otherwise, too few polygons will cause the displacement effect to appear broken up.

Start out using low values for amplitude. If you go too high the object will begin to break up, with polygons bent out of shape. Amplitude will vary, depending on the size of the object itself, so the same setting may not work on a ping pong ball as it will for a blimp. Try values like .1 or .2 to begin with if the default value is too high.

Uses for displacement mapping

- Use a displacement map on a flat plain of triangles to create a mountainscape or other landscape forms.
- Use a displacement map with ripples to create blowing curtains, or waving flags.
- Use a displacement map with ripples to create waves on an ocean or lake. The ripples will actually appear wavy against boat hulls, piers, or dams that contact the water's surface.
- Use a displacement map of someone's face to have their face morph out from walls and floors.

Object Dissolve
Object Dissolve determines the percentage of visibility (or solidity) of an object. This is similar to transparency for a surface, yet it works on an entire object. In a still frame, this would cause an object to appear partially transparent. In an animation, this could be animated to cause an object to fade in and/or out of the scene.

Note:
Objects with a Dissolve setting of 100% will not be seen in Layout, and their bounding boxes will be drawn with dashed lines.

To use Object Dissolve on an object in a single frame
Enter a dissolve value and render the image. Dissolve values may be positive or negative.

To dissolve an object within an animation
See the E button (below) for Object Dissolve.

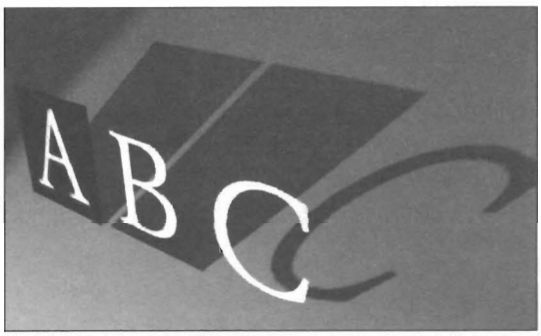
Note:
If you enter the Envelope Editor, the value entered for Object Dissolve will have no effect on the result. All Object Dissolve values are taken from the envelope itself.

E (Envelope)
Select E beside Object Dissolve to use an Envelope to control an object's transparency during an animation. For details on using envelopes, see "Animating Effects with the Envelope Editor."

To dissolve an object within an animation
Use an Envelope. Choose the E button beside Object Dissolve to access the Envelope Editor where you may set the attributes for the dissolve. At 0%, there is no dissolve whatsoever, and the object appears normal. At 100%, the object is fully dissolved and invisible.

Clip Map
Select Clip Map to use either an image map or procedural texture map to remove portions of the current object that correspond to certain brightness levels of the mapped image or mapped texture. This is useful for removing unwanted polygons (and portions of polygons) from being seen, such as when using shadow mapped light sources. Shadow mapping "sees" polygons, even if they are given 100% transparency. A clip map that corresponds to the transparent portions of the mapped surface will remove those polygons from the shadow map's "sight" rendering them truly invisible.

If you are familiar with the television production term clip level, which refers to the cutoff point for a keyed video signal where some portion of the video signal is seen and some portion is unseen, you will better understand a clip map. Using a clip map, you can use an image or texture to cut away part of an object that should not be seen.



An example of clip mapping. The accompanying figure shows one use for clip mapping. In this example, the light source is using a shadow map. Shadow mapped light sources render shadows faster than ray tracing, and with more realistic, soft edges.

- *The first polygon is image mapped with an image of the letter A. You can see the entire polygon shape: the white letter, the blackness surrounding it. The shadow is that of the entire polygon.*
- *The second polygon is both image mapped and transparency mapped with the same image, the letter B. Unfortunately, transparency mapping is not 100% successful when using a shadow-mapped light source such as the one in this scene. Shadow mapping "sees" the whole polygon when computing the shadow. You should be aware of this when using transparency maps in scenes with shadow mapped light sources.*
- *The third polygon is image mapped and clip mapped with the same image, the letter C. The first map applies color while the second map removes the outer black portion from the polygon. The result is that shadow mapping can successfully cast an accurate shadow.*

- **Projection Maps**
  Planar, Cylindrical, Spherical, Cubic, and Front Projection are projected image texture maps. This means that an image is projected directly onto the chosen object. For a clip map the image provides the cutoff level that affects how much of the object you will see.

- **Procedural Maps**
  Checkerboard, Grid, Dots, Marble, Wood, and Underwater are procedural maps. These kinds of maps have varying attributes that determine their appearance. You control each of these attributes by changing the settings to your liking. Clip mapped textures need only a texture value to create their patterns. This is chosen with a texture value slider found in the procedural texture's control panel.

When you select Clip Map you will go directly to the texture mapping panel choices available for clip maps. There are two types of texture maps available via the Clip Map button:

Distance Dissolve
This specialized version of Object Dissolve controls an object's dissolve rate based on its distance from the camera. As an object moves nearer the camera, it will automatically grow more solid. As it moves further away, it will grow more transparent. An object that is anywhere between the camera and the Maximum Distance will be partially visible, based on that distance. You can set the point at which the object is 100% transparent with the Maximum Distance setting, below.

This feature is primarily useful for simulating underwater particles, as solid objects may look strange when partially faded.

Maximum Distance
With Maximum Distance and Distance Dissolve you can set the point at which the selected object is 100% transparent. For example, if you choose 10 meters as the maximum distance, then animate a ball rolling toward the camera from 20 meters away, the ball will be unseen until it crosses the 10-meter mark. As it rolls from 10 meters up to the camera itself (0 meters), it will grow less transparent until it is finally 100% solid.

Polygon Size
This button determines the size of the polygons in the object. Polygon size affects the rendered image only. You will not see Polygon Size affect the wire frame appearance or preview animations on the Layout screen. Animated, 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 shrink toward their centers.

To use Polygon Size on an object in a single frame
Enter a size value and render the image. Size values may be positive or negative.

To change the size of an object's polygons within an animation
Use an Envelope. Choose the E button beside Polygon Size to access the Envelope Editor where you may set the attributes for the size of the polygons.

Note:
If you enter the Envelope Editor, the value entered for Polygon Size will have no effect on the result. All Polygon Size values are taken from the envelope itself.

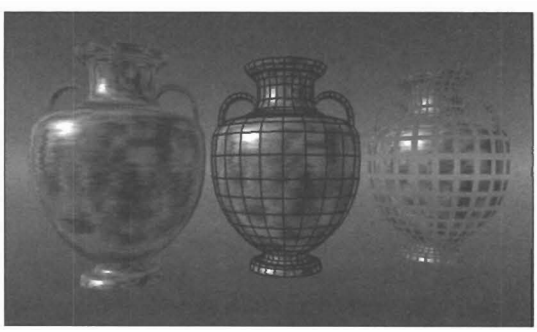
E (Envelope)
Select E beside Polygon Size to use an Envelope to control the change in size of an object's polygons during an animation. At 0%, polygons are at their smallest size. For details on using envelopes, see "Animating Effects with the Envelope Editor."

Unaffected by Fog
Selecting this option for an object will cause it to be unaffected by any fog effects. This is useful when using Front Projection mapped objects that you do not want to fade in the fog.

Particle/Line Size
This pop-up panel allows you to select different sizes for particles (single point/polygon objects) and lines (two-point polygons). Automatic will calculate particle size of 1 pixel for Super Low and Low Res output; a 3x3 pixel array for Medium Res output and a 5x5 pixel array for High and Print Res output. Likewise, line sizes will be one, three or five pixels thick (no matter how far away from the camera).

You can also choose Small, Medium or Large which will always use the sizes listed above no matter what Basic Resolution is selected for the output images.

Polygon Edges
Polygon Edges causes all polygons in the scene to be outlined with the Edge Color (set below). The polygons themselves will still be rendered with all surface characteristics, only outlines will be added. Use this to give a hidden line appearance to objects in the scene. (To see the full outline, use the Outline Only button on the Surfaces panel.) Objects created of triangles only may appear overly busy with this option.



Three Urns showing several different effects. The urn on the left displays a simple texture map. The urn in the center is the same, except that it had Polygon Edges turned on and set to the color black. The urn on the right is also the same, except that its Polygon size has been set to 50%.

Edge Color
Use Edge Color to set the color of polygon edges.

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 in a scene. Some objects, because of the nature of their shape, need not have this option active. A sphere, for example.

Cast Shadow
Click this option to allow an object to cast a shadow onto other objects in the scene. If an object is in the background of a scene or animation, and its shadow would not be important, turn this option off to save rendering time.

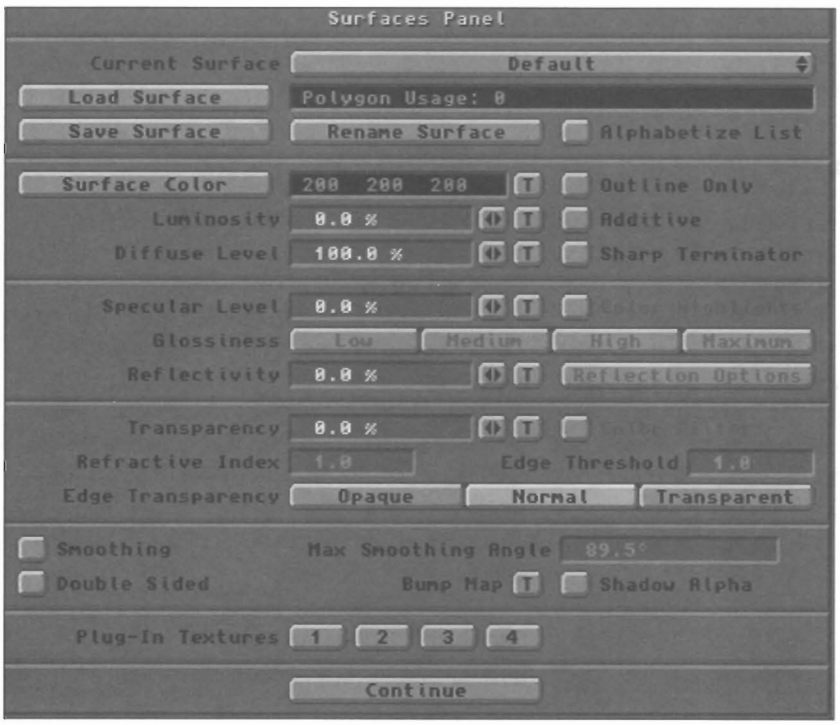
Receive Shadow
Click this option to allow an object to receive a shadow being cast upon it by another object. This is useful for objects such as floors that receive shadows from objects in the room.

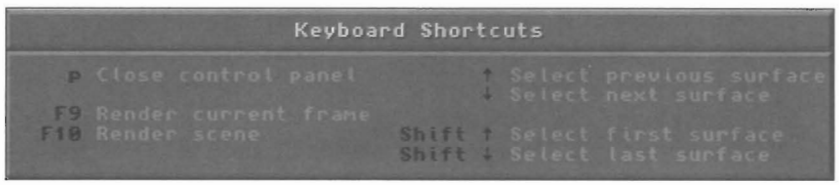
The Surfaces Panel

With the Surfaces Panel you can assign objects different material properties that determine their appearance when rendered. In essence, you are creating a collection of surfaces that reflect light differently. Surface characteristics consist of both color and texture, which may be modified by diffuseness, reflectivity, environment mapping, bump mapping, and more. Some of the properties that LightWave uses to define a surface include those listed below. There are many more attributes available to the 3D artist that are covered further on.

What is a surface? A surface can be from one to many polygons that share similar qualities—called attributes—of color and texture. All of these surface settings may be saved within the object file, thus completing the process of modeling and defining a 3D object. Furthermore, they may be saved separately, so that they can be applied to any object quickly and easily.

Below you'll find a description of some of the major surface attributes an object may have.





◆ **Addendum** ◆
Reflection Options

◆ **Addendum** ◆
Shadow Alpha
Plug-In Textures

Surface color
All objects absorb light and reflect light, and some even transmit light. Surface color is determined by a combination of these qualities. It is the color we see when we look at an object.

Diffuse
The amount of light that is scattered by a surface, based on the amount of light it receives. A ball may be a bright red color, but its surface may or may not reflect this intense red color very well. Two such balls, side by side, may appear to be different shades of red due to differing amounts of diffuse reflection. In the real world, this reflected light is a combination of some amount of both diffuse and specular reflection.

Luminosity
Luminosity refers to how much a surface appears to glow of its own light. This does not turn an object or surface into a light-projecting source. Rather, it serves to make the object or surface glow of its own accord.

Specular
A kind of reflection or highlight that occurs on the surface of smooth or shiny objects. It may be hard and bright or broad and dull. How this highlight is reflected tells us if the surface is dull, smooth, shiny, or metallic, for example. Its location on a surface indicates the direction of the light source that illuminates it.

Reflectivity
An object's surface may be such that it reflects some amount of its surroundings on its own surface. It may reflect a little or a lot. The surface of a car shows some amount of reflection, while its rearview mirror is an example of a perfect reflector: it reflects its surroundings 100%.

Transparency
Of the light that strikes an object, some is reflected, some is absorbed, and some may be transmitted. Transparency indicates the amount of light that passes through an object's surface, how much we see of that surface and how much we see of that which is behind that surface.

Bumpiness
Up close, many surfaces have a texture or bumpiness. Consider an orange peel, for example. Such bumps are apparent due to the way lights fall across the surface of an object. Which portion is lit? Which is in shadow? Changes in the surface color indicate this bumpiness to us.

Buttons on the Surfaces Panel
Following is a button-by-button description of the controls on the Surfaces Panel.

Current Surface
When you load an object into Layout, all surfaces associated with that object are loaded to a list here, grouped by object in the order objects were loaded. The Current Surface button maintains this list of all surfaces in the scene. To view or edit surface settings, drag the mouse over it. A scrollbox will pop up. Drag the highlight to any surface name, then let go of the mouse button. The surfaces control panel will update itself to display the settings for the surface name you selected. You can also use the up-arrow and down-arrow keys on the keyboard to cycle through surface names.

Load Surface
Surface settings may be saved in a surfaces file. Use Load Surface to load a previously saved surface definition onto the Current Surface. See Save Surface for a tip about using Load Surface as well.

Save Surface
Surface settings may be saved in a surfaces file. Use Save Surface to save the current surface settings. A file requester will pop up, asking you to provide a name for the surface file.

Notes and tips for Load Surface and Save Surface
Load Surface and Save Surface are especially useful when you have several different surface names that need the same settings. Define the settings for one of these surfaces. Then save them as a surface file. Now select the remaining surface names, one at a time, and use Load Surface to load the settings to them as well. Be sure to save the object(s) afterward so that the surface settings remain intact.

Rename Surface
Use Rename Surface to change the name of the current surface. For example, you might rename a surface from "chair legs" to "light mahogany legs" as a better reminder of their appearance.

Notes and tips for Rename Surface:
If you load multiple copies of the same object with the idea of coloring them differently, you'll find that the objects' names remain distinct, as "couch (1)," "couch (2)," etc., but that their surface names become shared, so that the surface called "cushions" describes the cushions of both couches. To avoid this, load the first couch, use Rename Surface to rename the pertinent surfaces, then load the second couch. You'll be able to define their surfaces separately.

Remember to save the objects if you want the new surface names to remain permanent. Also, from the example above, be sure to save the two couch objects under different names if you intend to keep them distinct. See the Save All Objects button for further information.

Alphabetize List
The Surfaces pop-up list can grow quite large. Toggle this button on to alphabetize the list of names whenever you display it.

Polygon Usage Display
This window displays the number of polygons used by the current surface name.

Surface Color
Select Surface Color to assign color values to the Current Surface. You can adjust color values in two ways: through the color sliders on the right, or through the numeric entry fields on the left.

The color indicator at the bottom of the screen shows the current color as you adjust the sliders. The color sliders adjust the amounts of red, green, and blue of the surface color. Each slider varies from 0-255. To adjust a color, drag its corresponding slider left or right. To the right raises a color value, to the left lowers it. Only 4096 color variations can be displayed on the RGB monitor, although LightWave will calculate a true 16.8 million color image based on the actual color values that you set.

If you prefer, you can type in the new color values directly. Enter any new values directly in front of the old ones. They will be accepted, although the color indicator will not change until you press r. Press Return to go to the next color value, or click OK if you are done.

Consult the RGB color values chart at the end of the LightWave reference for assistance in choosing RGB colors.

T (Texture Map)
Select T beside Surface Color to access the texture mapping control panel to apply color to the current surface using either an image map or a procedural map. Any object that is texture mapped via an image will take on the colors of the image map itself. An image of woodgrain, for example, mapped onto a table, will make the table appear genuinely wooden. Any object that is texture mapped via a procedural texture will take on the colors of the texture that you set up. With the Checkerboard pattern, for example, you can assign black and red to the check colors.

For details on texture map controls and options, see "Achieving Realism with Texture Mapping."

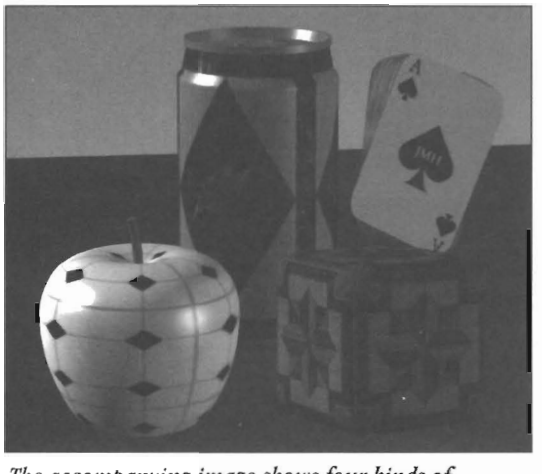
More about Surface Color Texture Mapping
When you select Texture Map beside the Surface Color button, you have a choice applying one of five projected image maps or seven procedural maps: Image maps apply the selected image to the surface so that the entire surface takes on the colors of the image itself; Procedural maps use two color values— the first color taken from the RGB sliders that appeared when you selected Surface Color, and the second color from the RGB slider that appear when you select Texture Color on that map's control panel.

With an image map, the colors within the image will completely replace any color values entered beside Surface Color.

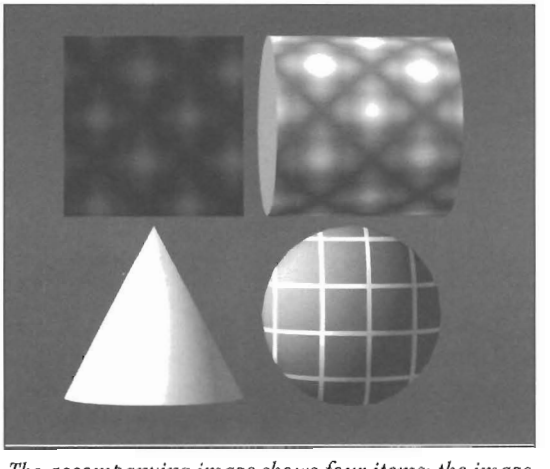
When you use a procedural texture as a map, the procedural texture consists of two sets of RGB color values: those you enter in the numeric field beside Surface Color, and those you enter via the Texture Color button on the texture map's control panel.

Luminosity
Enter a luminosity value to affect a specific percentage of glow to an object or surface. Luminosity refers to how much an object or surface appears to glow of its own accord. This glow affects the item itself, and will not cast shadows or light upon other objects nearby. Think of this effect as the glow of a clock radio dial or an old TV channel selector. Luminosity may be set at any level from 0-100%, or it may be texture mapped onto object surfaces.)

The value entered here is also valid when you use a procedural texture map, but ignored when you apply an image as a texture map. See "More About Luminosity Mapping" for further details.



The accompanying image shows four kinds of projected image mapping: a cylindrical map applied to the pop can, a planar image applied to the ace card, a cubic map applied to the wooden block, and a spherical map applied to the apple.



The accompanying image shows four items: the image map used for texture mapping, the image applied as a cylindrical luminosity map to a short cylinder (brighter areas appear to glow more), a cone that has been made 50% luminous so that it appears to glow, and the grid pattern mapped via the luminosity texture button.

More About Luminosity Mapping

A Luminosity map affects how much portions of an object surface will appear to glow of their own accord based upon the luminance variations in the projected image map or procedural map you select. Luminance, or the range of brightness, is used to map variations in the intensity of the surface color of an object. Color information is ignored. Luminosity image maps are often used to map lighted windows on buildings or space ships, glowing cracks of hot lava, and more.

T (Texture Map)

Select T beside Luminosity to access the texture mapping control panel and apply luminosity to the current surface using either an image map or procedural map. Luminosity refers to how much a surface appears to glow of its own accord. Therefore, a Luminosity map affects how much the portions of the surface will appear to glow on their own based upon the luminance variations in the projected image map or the texture values for the procedural map you select.

For details on texture map controls and options, see "Achieving Realism with Texture Mapping."

When you use an image as a Luminosity Texture Map, the range of brightness within the image will be used as a basis for determining the amount of "glow" added to the mapped object or surface. Any value entered for Luminosity alone will be ignored.

When you use a procedural texture as a Luminosity Texture Map, you determine the high and low "glow" values using two fields: the percentage showing beside Luminosity, and the percentage showing beside the Texture Value button (in the procedural texture's control panel).

You can use either of two types of texture maps for Luminosity:

Projection Maps

Planar, Cylindrical, Spherical, Cubic, and Front Projection Image Map are projected image texture maps. This means that an image is projected directly onto the chosen surface. For luminosity image mapping, the image provides a glow or intensity value that alters the object's surface color brightness.

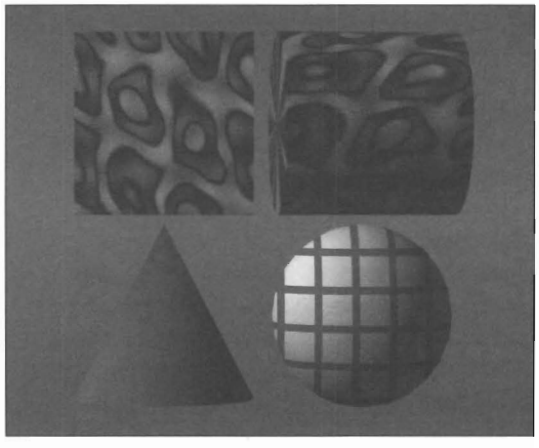
Procedural Maps

Checkerboard, Grid, Dots, Marble, Wood, Underwater, and Fractal Noise are procedural texture maps. These kinds of maps have varying attributes that determine their appearance. You control each of these attributes by changing the settings to your liking. Luminosity procedural textures provide two luminosity values to create their patterns: the first value is entered beside the Luminosity button, and the second value is chosen with a texture value slider found in the procedural texture's control panel.

Diffuse Level

Diffuse refers to the ability of a surface to scatter received light and reflect color. A blue object with low diffusion will appear shiny yet dim, an almost unlit dark blue. A blue object with high diffusion will appear dull and fully lit, an almost bright blue. To achieve more realistic appearances, especially with reflective surfaces, do not set Diffuse high.

The value entered here is also valid when you use a procedural texture map, but ignored when you apply an image as a texture map. See "About Diffuse Mapping" for further details.



The accompanying image shows four items: the image map used for texture mapping, the image applied as a cylindrical diffuse map to a short cylinder (the object retains its original color, but it is brighter or darker according to the map), a cone that has been made 50% diffuse so that it appears dim or dark, and the grid pattern mapped via the diffuse texture button.

More about Diffuse Mapping

A Diffuse map affects the shading of the surface to which it is applied. A image of white and black streaks, for example, diffuse mapped onto a brown tube, would result in the brown tube appearing weather-beaten, with lighter and darker brown streaks on its surface.

Diffuse image maps are often used to map streak marks, burn marks, or atmospheric wear and tear on aged surfaces, since they serve to darken the existing colors of the surface.

T (Texture Map)

Select T beside Diffuse Level to access the texture mapping control panel and apply surface color variations to the current surface using either an image map or procedural map. Diffuse Level affects how the selected surface scatters the light that it receives. Therefore, a Diffuse texture map affects the apparent brightness of the surface, varying the diffuse reflection of light from that surface based upon the luminance variations in the projected image map or the texture values for the procedural map you select.

For details on texture map controls and options, see "Achieving Realism with Texture Mapping."

When you use an image as a Diffuse Texture Map, the range of brightness within the image will be used as a basis for determining the amount of "shading" added to the mapped object or surface. Any value entered for Diffuse alone will be ignored.

When you use a procedural texture as a Diffuse Texture Map, you determine the high and low "variation" values using two fields: the percentage showing beside Diffuse, and the percentage showing beside the Texture Value button (in the procedural texture's control panel).

There are two types of texture maps available via the Diffuse button:

Projection Maps
Planar, Cylindrical, Spherical, Cubic, and Front Projection Image Map are projected image texture maps. This means that an image is projected directly onto the chosen surface. For diffuse image mapping, the image provides brightness information that alters the object's surface color.

Procedural Maps
Checkerboard, Grid, Dots, Marble, Wood, Underwater, and Fractal Noise are procedural texture maps. These kinds of maps have varying attributes that determine their appearance. You control each of these attributes by changing the settings to your liking. Diffused procedural textures provide two luminance values to create their patterns: the first value is entered beside the Diffuse button, and the second value is chosen with a texture value slider found in the procedural texture's control panel.

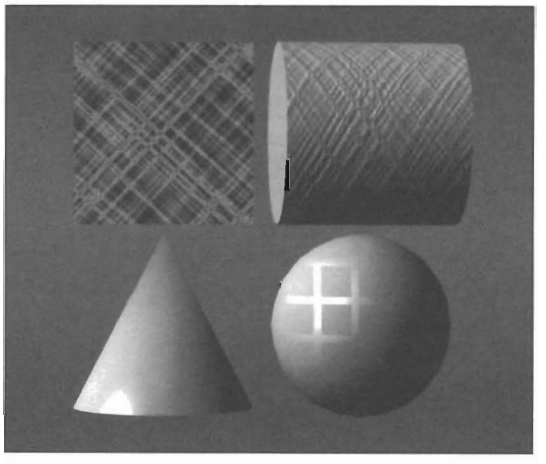
Outline Only
Outline Only renders the outlines of polygons rather than their surfaces. The outlines will render in the surface color, and if the surface is image or texture mapped the outlines will show portions of this mapping.

Additive
With Additive, the color of an object is added to the colors of the objects visible behind it. The result is that this area will be brighter in color and intensity as if it were overexposed. The brighter color will tend toward white, ultimately, as this is the brightest it can become. This control is best used to enhance the glow of rocket flames, jet exhausts, and the like.

Sharp Terminator
Sharp Terminator is used to cause a more severe shadow edge on objects rather than a gradual falloff of light. Sharp Terminator is usually used for planet objects specifically.

Specular Level
Enter a Specular value to set the amount of specular highlighting for a surface. A bright, small highlight indicates a hard or plastic surface. A broad, dull highlight indicates a flat, matte or metal surface (metallic surfaces generally have low specularity and low glossiness). The highlight will be the color of the light source illuminating it, unless Color Highlights is turned on.

The value entered here is also valid when you use a procedural texture map, but ignored when you apply an image as a texture map. See "More About Specularity Mapping" for further details.



The accompanying image shows four items: the image map used for texture mapping, the image applied as a cylindrical specular map to a short cylinder (the object shows specular highlights in the pattern of the map), a cone that has been made 50% specular so that it has a small hotspot, and the grid pattern mapped via the specular texture button (the grid appears where the specular hotspot would be).

More About Specular Mapping
When you use a procedural texture as a Specular Texture Map, you determine the high and low "shiny" values using two numeric fields: the percentage showing beside Specular (on the surfaces control panel), and the percentage showing beside the Texture Value button (in the procedural texture's control panel).

T (Texture Map)
Select T beside Specular Level to access the texture mapping control panel and apply specularity to the current surface using either an image map or procedural map. Specularity, or rather, specular reflections, occur all around you. These highlights on smooth or shiny surfaces indicate just how smooth or shiny that surface actually is, or how dull. A specular map causes highlights to appear on a surface based upon the luminance variations in the projected image map or the texture values for the procedural map you select.

For details on texture map controls and options, see "Achieving Realism with Texture Mapping."

There are two types of texture maps available via the Specular button:

Projection Maps
Planar, Cylindrical, Spherical, Cubic, and Front Projection Image Map are projected image texture maps. This means that an image is projected directly onto the chosen surface. For specular image mapping, the image provides brightness information that affects the highlights on a surface.

Procedural Maps
Checkerboard, Grid, Dots, Marble, Wood, Underwater, and Fractal Noise are procedural texture maps. These kinds of maps have varying attributes that determine their appearance. You control each of these attributes by changing the settings to your liking. Specular procedural textures provide two luminance values to create their patterns: the first value is entered by the Specular button, and the second value is chosen with a texture value slider found in the procedural texture's control panel.

Color Highlights
Color Highlights cause 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. White light causes a white highlight. A color highlight blends the objects color with the light source's color, causing a more metallic appearance. When a reflection map is being used, reflection maps are also tinted by the surface color.

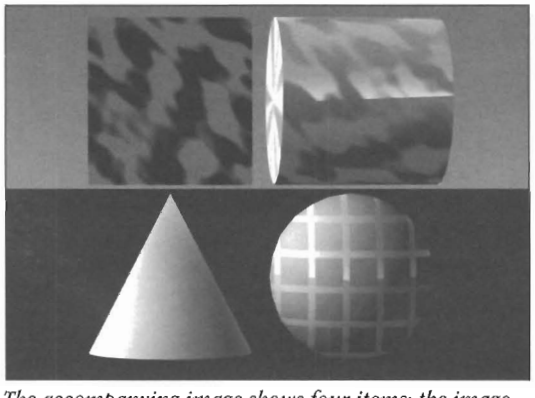
Glossiness
Glossiness affects how spread out the highlight is on a surface (the specular reflection). Glossiness may be set Low, which creates a broad soft hotspot, Medium, which creates a medium hotspot, High, which creates a bright and intense hotspot, or Maximum, which creates a very bright, very intense hotspot.

Reflectivity
Reflectivity determines the amount of reflection on an object's surface. The controls for Reflectivity and Reflected Image, found here, in conjunction with the Trace Reflections button on the Camera menu, also determine what is reflected by the selected surface. There are a number of ways to make reflective surfaces. They are listed below. In addition, a Reflectivity map may be used as another form of texture mapping. A reflection level of 100% will cause the object's surface to be completely reflective (none of its own color will be visible), unless you turn on color highlights or select some percentage of diffuse or specularity.

Image Seam Angle
Image Seam Angle determines where the seam of the reflected image will be placed. The 3D universe is considered to be a mathematical sphere, with all rendering occurring inside this sphere, and the Reflected Image is used to wallpaper its inside surface. In this manner, the Reflected Image can be reflected off the different surfaces on the objects within the scene, no matter which angle they face.

Unless the image has matching edges, there will be a seam where its edges meet. You may or may not see this seam, depending on the setup of the scene. In case it is visible, you can adjust where the seam falls in LightWave by changing the Image Seam Angle. Image Seam Angle corresponds with heading in Layout. If you were standing at the center of the Layout grid (0, 0, 0), and looking straight ahead into the +Z axis (the camera's default position)...use these settings to give you an idea of how you can shift the seam.

0° places the seam straight ahead of you, at the end of the +Z axis. 90° rotates it to your right, at the end of the +X axis. 180° rotates it behind you, so that it is at the end of the -Z axis. 270° rotates it to your left, at the end of the -X axis.



The accompanying image shows four items: the image map used for reflection mapping, the image applied as a cylindrical reflection map to a short cylinder (lighter areas appear reflective), a cone that has been made 50% reflective (this would be enhanced by seeing something reflected off of it), and the grid pattern mapped via the reflection texture button.

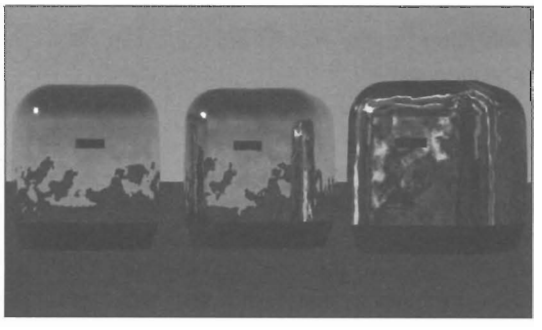
More about Reflection Mapping
When you use an image as a reflectivity Texture Map, the range of brightness within the image will be used as a basis for determining the amount of reflection added to the mapped object or surface. Any value entered for Reflection Map will be ignored.

When you use a procedural texture as a reflectivity Texture Map, you determine the high and low "reflection" values using two fields: the percentage showing beside Reflectivity, and the percentage showing beside the Texture Value button (in the procedural texture's control panel).

To reflect only the colors of the sky and ground (colors which are chosen on the Effects Panel)
Enter a value for the amount of reflection you desire. When you render the scene, the color gradations of the background will reflect off this surface.

To reflect the true environment surrounding the current object (including surrounding objects)
Enter a value for the amount of reflection you desire. Go to the Camera menu and select Trace Reflections. When you render the scene, the items around this object will be reflected in its surface.

To reflect a specific image (often as an effect for metallic highlights)
Enter a value for the amount of reflection you desire. Load the desired image from the Images Panel, and use the pop-up button to select its name as the Reflected Image. Depending on the reflected image, the angle of reflection, and how it reflects off the object's surfaces, you can create very realistic reflections.



The Toaster on the left reflects the background colors only (it has 90% reflectivity and was rendered with Trace Reflections turned off). The toaster in the middle reflects everything around itself, both the background and objects (it has 90% reflectivity and was rendered with Trace Reflections turned on). The toaster on the right is reflecting an image map of black and white marble at 90% reflectivity and was rendered without any rendering options turned on.

T (Texture Map)
Select T beside Reflectivity to access the texture mapping control panel and apply luminosity to the current surface using either an image map or procedural map. Most surfaces reflect some amount of light. Mirrors, metals, and glass surfaces reflect a great deal, while paper and cloth reflect very little. A reflection map applies varying amounts of this reflectivity to a surface based upon the luminance variations in the projected image map or the texture values for the procedural map you select.

For details on texture map controls and options, see "Achieving Realism with Texture Mapping."
There are two types of texture maps available via the Reflectivity button:

Projection Maps
Planar, Cylindrical, Spherical, Cubic, and Front Projection Image Map are projected image texture maps. This means that an image is projected directly onto the chosen surface. For reflection image mapping, the image provides brightness information that affects the reflectivity of a surface.

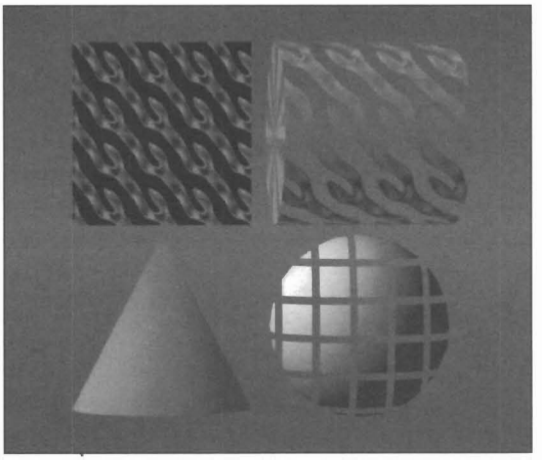
Procedural Maps
Checkerboard, Grid, Dots, Marble, Wood, Underwater, and Fractal Noise are procedural texture maps. These kinds of maps have varying attributes that determine their appearance. You control each of these attributes by changing the settings to your liking. Reflection procedural textures provide two reflection values to create their patterns: the first value is entered beside the Reflectivity button, and the second value is chosen with a texture value slider found in the procedural texture's control panel.

Reflected Image
Reflected Image allows you to reflect an image off the surface of the currently selected object. Reflected images are reversed on the surface, as if they were truly reflected. To select an image, drag the pointer over the pop-up list. (Note that, in order to be available on this pop-up button, images must be loaded via the Images Panel.)

If you select an image file to be used as a Reflected Image, the Reflection Map slider will set the amount of reflection for that image on the selected surface. The higher the Reflection Map percentage, the more that reflected image will be calculated for the surface as opposed to the original surface color.

Transparency
Transparency determines the amount of light passing through the surface. Enter a transparency value to set the amount of transparency for the current object or surface.

At 0% the object is opaque. A high percentage of Transparency, combined with a Refractive Index, will produce a glass-like appearance.



The image above shows four items: the image map used for texture mapping, the image applied as a cylindrical transparency map to a short cylinder (darker areas appear see-through), a cone that has been made 50% transparent so that it appears to disappear somewhat (this would be enhanced by seeing something behind it), and the grid pattern mapped via the transparency texture button.

T (Texture Map)

Select T beside Transparency to access the texture mapping control panel and apply transparency to the current surface using either an image map or procedural map. Some surfaces transmit, or pass, varying amounts of light. Glass transmits a lot of light, plastic a bit less, and wood not at all. A transparency map applies varying amounts of transparency to a surface based upon the luminance variations in the projected image map or the texture values for the procedural map you select.

For details on texture map controls and options, see "Achieving Realism with Texture Mapping."

When you use an image as a Transparency Texture Map, the range of brightness within the image will be used as a basis for determining the amount of "transparency" added to the mapped object or surface. Any value entered for Transparency will be ignored.

When you use a procedural texture as a Transparency Texture Map, you determine the high and low "transparency" values using two fields: the percentage showing beside Luminosity, and the percentage showing beside the Texture Value button (in the procedural texture's control panel).

There are two types of texture maps available via the Transparency button:

Projection Maps

Planar, Cylindrical, Spherical, Cubic, and Front Projection Image Map are projected image texture maps. This means that an image is projected directly onto the chosen surface. For transparency image mapping, the image provides brightness information that affects the transparency of a surface.

Procedural Maps

Checkerboard, Grid, Dots, Marble, Wood, Underwater, and Fractal Noise are procedural texture maps. These kinds of maps have varying attributes that determine their appearance. You control each of these attributes by changing the settings to your liking. Transparency procedural textures provide two luminance values to create their patterns: the first value is entered beside the Transparency button, and the second value is chosen with a texture value slider found in the procedural texture's control panel.

More about Transparency Mapping

Transparency texture maps, whether image maps or procedural maps, do not use color information. Instead, they use luminance, or changes in brightness, to map variations in the surface color of an object. Brighter areas will map more transparently, and darker areas are more solidly.

Color Filter (available only with some % of Transparency)

Selecting color filter allows the surface color of an object to tint all objects seen through it. A good example would be a stained glass window. Light shining through the colored glass tiles would cast colored shadows on the objects below.

Refractive Index (available only with some % of Transparency)

Refraction simulates the bending of light as it passes through glass or glass-like objects (obviously, objects with a fairly high amount of transparency). Most useful values here range from 1.0 (which bends light not at all) to 2.4 (heavy crystal such as diamond, which refracts light a great deal).

To render refraction

On the Surfaces Panel, set Transparency to a value above 0%, and enter a Refraction value above 1.0. On the Camera Menu, make certain you are rendering in the Realistic mode, and that Trace Refraction is selected.

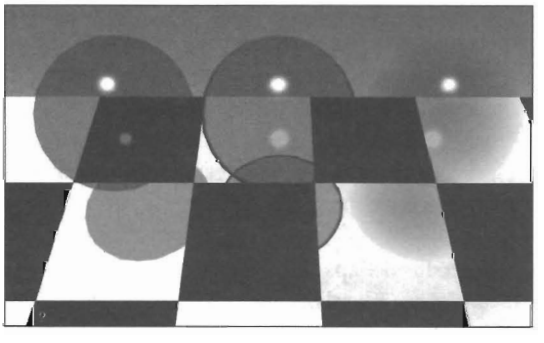
Consult the refraction index at the top of the next page for accurate refraction values.

Index of Refraction Chart

Air (no refraction)	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

Edge Transparency

Edge Transparency affects the degree of clarity and definition for the polygon edges belonging to an object. Opaque Edge creates an adjustable edge. Normal Edge creates a solid edge. Transparent Edge causes the edges of the object to blend into its surroundings.



The sphere at left was rendered with opaque edges (edge threshold 0.55). The sphere in the middle was rendered with normal edges (no value). The sphere at center was rendered with transparent edges (edge threshold 0.55). All three spheres shared the same diffuse level (50%), specular level (90%), glossiness (high), transparency setting (100%), and color filter (on).

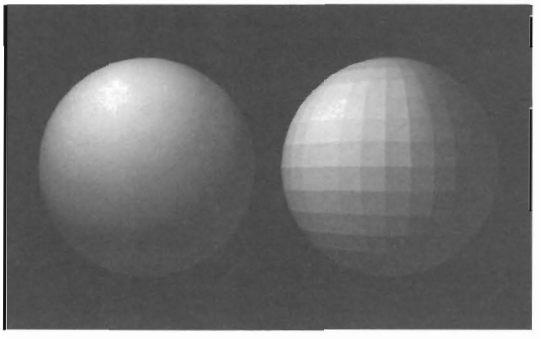
Edge Threshold (available for Opaque or Transparent Edge Transparency only)

Edge Threshold determines the amount of blending between the surface color and the transparent edge 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 at 1.0. Use lower values for a sharper transition. Use higher values for a softer transition.

Note

When fine-tuning Edge Transparency and Edge Threshold for glass-like objects, we recommend you use Limited Region and render a small portion of the image at Medium Resolution. When rendering at lower resolutions, these controls can appear to create jaggy edges that actually disappear at higher resolutions. This is the nature of glass-like materials.



Two identical spheres. The sphere at left has smoothing turned on, while the sphere at right is shown without smoothing.

Smoothing

Smoothing causes objects to appear to have smoothly rounded surfaces even though the object is composed of flat-faced polygons. To do this, LightWave utilizes a technique known as "Phong Shading." If two smooth-shaded polygons share a side and have some vertices (points) in common, they will appear as one continuous, curved surface. The shared edge between them will no longer be visible.

Normally, LightWave will not smooth across two polygons if the angle between them is 90 degrees or sharper, unless you adjust the Max Smooth Angle (below). Also, if two polygons appear to share a common edge, but do not share points in common along that edge, LightWave will not be able to smooth the edge between them. Smoothing requires common vertices and a common edge to function properly.

Max Smoothing Angle

The Maximum Smoothing Angle adjusts the range of the Smoothing function. It determines the angle beyond which LightWave cannot smooth over the seam between adjoining polygons. Sometimes, due to the manner in which an object is modeled, there may be unexplained rendering errors. Try adjusting the Max Smooth Angle to correct for these. We recommend using lower values first, although for extreme Displacement Mapped objects you may try fairly high values if rendering produces a mixture of jagged and smoothed results.

Normally, two or more polygons that share vertices along a common edge can be shaded in such a manner that the seam between them is not seen. However, if the polygons lie at an angle to one another, beyond 89.5 degrees, the Phong shading technique has no effect. Select Max Smooth Angle and enter a greater degree to allow LightWave greater latitude in shading such edges.

Double Sided
If you are importing objects from other 3D modeling programs, either directly or through a conversion utility, some polygons may face the wrong direction, causing the object to render improperly. Click Double Sided to cause LightWave to treat all polygons on the selected surface as two sided, thus correcting for any rendering errors.

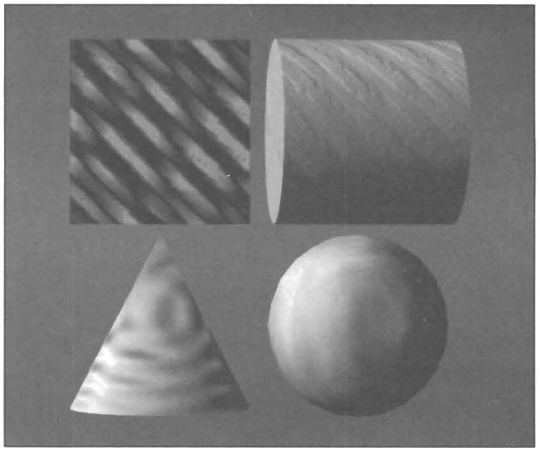
Note that this will increase rendering time, as there are more polygons to calculate. Note also that if you select Double Sided, then save the object, the Double Sided setting will remain intact as a part of the surface description for this surface, although when loaded into Modeler the polygons will show as true (single-sided) polygons.

Bump Map
Click the T button beside Bump Map to access the texture mapping control panel and apply the appearance of "bumpiness" to the current surface using either an image map or procedural map.

An orange peel and a golf ball have a bumpy, pitted surface. Many elements of the world around us have some amount of bumps, ridges, or other irregularities. You can create the appearance of raised and lowered portions to any surface in the form of image maps, ripples, and bumps. A bump map applies varying amounts of this bumpiness to a surface based upon the luminance variations in the projected image map or the texture values for the bump map you select.

For details on texture map controls and options, see "Achieving Realism with Texture Mapping."

If the T button beside Bump Map appears highlighted when you display the Surfaces Panel, then a bump map has been applied to this surface and is in effect.



An example of bump mapping. The accompanying image shows four items: the image map used for bump mapping, the image applied as a cylindrical bump map to a short cylinder (brighter areas appear indented), a cone that has a ripple map applied to it, and a sphere mapped with fractal bumps.

Bump Mapping is a visual trick. Notice the cone in the image. While it appears to be rippled where it faces you, notice that its profile edges are not equally rippled. They are straight. This is the nature of bump mapping, which affects the appearance of a surface but not its physical shape. You would use a Displacement Ripple Map to physically alter this cone.

There are two types of texture maps available via the Bump Map button:

Projection Maps
Planar, Cylindrical, Spherical, Cubic, and Front Projection Image Map are projected image texture maps. This means that an image is projected directly onto the chosen surface. For Bump Map image mapping, the image provides brightness information that affects the apparent bumpiness on a surface.

Procedural Maps
Ripples and Fractal Bumps are procedural bump maps. These kinds of maps have varying attributes that determine their appearance. You control each of these attributes by changing the settings to your liking. Bump Mapped textures need only an amplitude value to create their patterns—the amount of bumpiness. This is chosen with an amplitude slider found in the procedural texture's control panel.

More about Bump Maps
Bump Mapped texture maps, whether image maps or procedural maps, do not use color information. Instead, they use luminance, or changes in brightness, to map surface variations onto the surface of an object. When you select the T button beside Bump Map you will go directly to the texture mapping submenu for bump mapping.

Shadow Alpha
See addendum.

Plug-In Textures
See addendum.

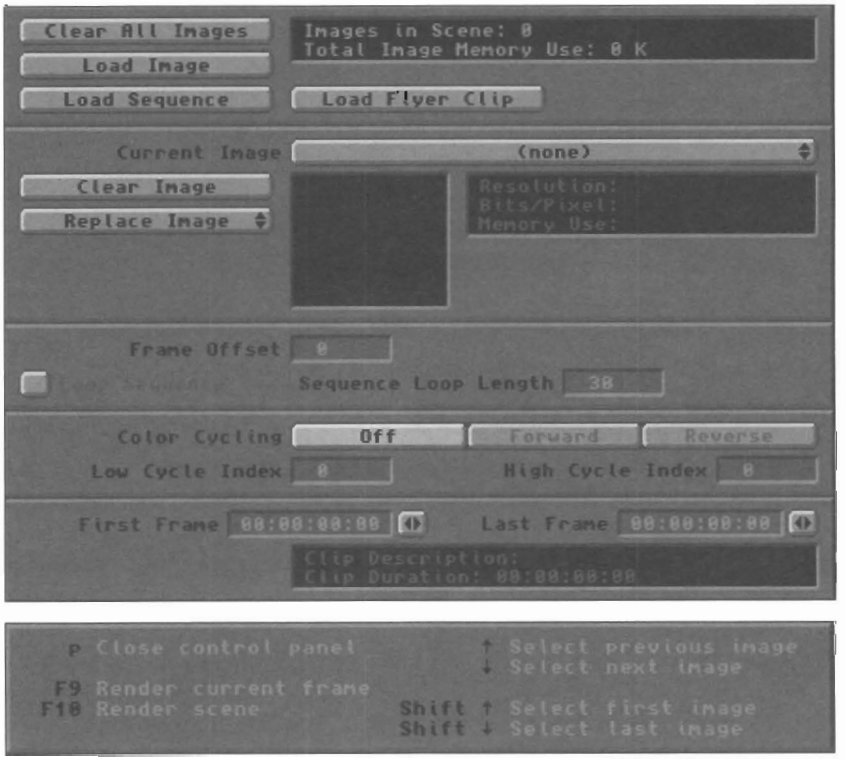
The Images Panel

With the Images Panel you load single images and sequences of images to be used for backgrounds, foregrounds, alpha images, or LightWave's vast offering of texture maps. From this menu you can perform all image file management within LightWave, including loading, removing, and replacing images within a scene. LightWave will support up to 1000 images in any scene, assuming you have enough RAM to contain them.

What is an image or an image sequence? An image may be a brush or a full-sized picture saved from a paint program. An image sequence is a series of brushes or full screen pictures that are consecutively named and numbered.

◆ Addendum ◆

Load Flyer Clip



◆ Addendum ◆

First Frame

Last Frame

Buttons on the Images Panel

Following is a button-by-button description of the controls on the Images Panel.

Clear All Images

Clear All Images will remove all images and image sequences from the current scene. This includes any images that you may have loaded manually, as well as images that were loaded automatically with the objects to which they belonged.

Note:

Clear All Images will not delete any image files from your hard drive.

Load Image

Use Load Image to load images into the scene. See the description of the Images Panel at the beginning of this section for information on acceptable file formats.

To be used in LightWave, images must be loaded and then assigned. For example, to load an image for use as a background: first, use Load Image to load the image. Next, go to the Effects Panel and select the name of this image using the Background Image pop-up menu.

LightWave 4.0 accepts

- Framestore files saved by the System 2.0 and System 3.0 Toaster applications (including Switcher, ToasterPaint, LightWave).
- Framestore files saved by the System 4.0Toaster applications (including Switcher, ChromaFX, ToasterPaint, ToasterCG, LightWave).
- RGB files and brushes saved by ToasterPaint (all releases).
- ToasterLink-translated Macintosh PICT files that have been converted to Framestores or RGB files.
- IFF format images and brushes of any size or depth, from 2-24 bitplanes.
- 6-bit Amiga HAM images (also called HAM or HAM 6)
- 8-bit Amiga HAM images (HAM8)
- 24-bit Targa images

Note:

LightWave will not accept any Toaster Version 1.0 Framestores. Use either the current Switcher or current ToasterPaint program to load and resave them as System 2.0 Framestores.)

Note:
LightWave will only support Framestores loading and saving if you run LightWave from the Video Toaster. The stand-alone version of LightWave does not support the Framestore format.

Load Sequence
With Load Sequence you can insert the individual frames of animations or externally captured video segments into the current animation. Image sequences are also useful for animating image, bump, displacement, or clip maps.

To load a sequence, select Load Sequence. The Load IFF Sequence Prefix requester will pop up. Locate and select any image from the image sequence you wish to utilize in the scene. When selected, its name will appear in the File box at the bottom of the popup requester. Click the pointer in this box and delete the three-digit number from the file name. This is important, because LightWave only needs to know the base name of the image sequence (you will use other buttons to specify starting and repeating frames)—not the name plus its sequence number. After deleting the three-digit suffix, press r or click OK to accept it. If you are using Framestore images as your sequence, make sure to delete the three-digit number as well as the ".FS." in the name.

The images must exist as individual files. See Load Image (above) for valid file formats. Each separate file must have the same name, followed by a three-digit number. The three-digit number sequence may be staggered, but the name must be consistent. See the examples that follow.

For example, this is a valid image sequence:
FlyBy001
FlyBy002
FlyBy003
FlyBy004
FlyBy005

This is not a valid image sequence, since none of the prefix names are the same:
FlyBy001
Fly002
ZoomIn003
FlyOver004
FlyIn005

If there are breaks in the numbering sequence, then LightWave will continue to use the last valid image number in the new animation until the next valid image number is reached. This can be useful if you want an image sequence to pause, or if you want a series of images to be displayed for several seconds each.

As an example, consider the following valid image sequence:
FlyBy001
FlyBy005
FlyBy006
FlyBy009
FlyBy010

In the resulting newly rendered animation:
Image 001 will be used in frame 1, 2, 3, and 4.
Image 005 will be used in frame 5.
Image 006 will be used in frame 6, 7 and 8.
Image 009 will be used in frame 9.
Image 010 will be used in frame 10.

General:How incomplete Image Sequences work (Images Panel)
When you specify an image sequence, LightWave uses those images, one at a time, for each frame that it renders.

If the image for a particular frame can't be found, LightWave will then search backward in the sequence until an image is found, and use that image until the correct number in the sequence is encountered. The result is that the sequence will appear to stop for a period of time until it can continue.

If, in searching backward, zero is reached and no images have been found, black will be used in place of the image. Thus sequences with numbering gaps will work even when randomly accessing frames (as networked rendering systems do).

Image Information Display
This window displays the total number of images in the scene and the amount of memory (in megabytes) they use.

Current Image the up-arrow and the down-arrow
Use the Current Image pop-up menu to select an image or image sequence (you can also use the the up-arrow and the down-arrow keys on the keyboard to cycle through image names). Select an image so that you may clear it, replace it, or enter color cycling information for it. Select an image sequence to clear it, enter looping information for it, or enter color cycling information for it.

Image sequences are listed in the pop-up menu with the suffix (sequence) to indicate that they are sequences.

Clear Image:
This removes the image or image sequence listed in the Current Image pop-up menu from memory.

Note:
Clear Image will not delete any image files from your hard drive.

Replace (pop-up menu)
(Replace with Image, Replace with Sequence)
To replace an image or an image sequence with another image or image sequence, drag the mouse over this pop-up button and select the appropriate option. Any surface assignments (image maps, bump maps, backdrops, etc.) that use the original image will be reassigned with the new image name automatically.

Current Image Information Display
The Current Image Information Display displays information about the current image.

Frame Offset
This determines which frame in an image sequence is the starting frame for the animation. The number entered in First Frame and the number entered here, when added together, equal the suffix number of the first image to be used.

For example, a ten-frame image sequence called ZoomOut (with frames 001 through 010) is being image mapped into a ten-frame animation:

- Set First Frame to 1 and Frame Offset to 0, and image ZoomOut001 will appear in the first rendered frame.
- Set First Frame to 1 and Frame Offset to 5, and image ZoomOut006 will appear in the first rendered frame.
- Set First Frame to 1 and Frame Offset to -99 and image ZoomOut001 will appear at frame 100 of the rendered animation.

Loop Sequence
Click this button to toggle looping. The image sequence will repeat itself upon reaching the frame number entered in Sequence Loop Length (below).

Sequence Loop Length
Use Sequence Loop Length to enter the number of frames after which LightWave should repeat an image sequence.

For example, consider the following scenario:

- A 300-frame animation.
- A 30-frame image sequence.
- Loop Length is set to 10.

The result is that images 001-010 of the sequence will repeat continuously throughout the animation. Images 011-030 of the sequence will be ignored, since the repeat point instructs LightWave to go back to image 001 after reaching image 010.

Color Cycling
With Color Cycling you can create color and motion effects within still images or image sequences. Color cycling is the progressive shifting of each color to the next color position in the image palette. LightWave allows you to cycle any range of colors within the total palette, including the entire palette itself.

Images intended for color cycling must contain 256 colors or fewer, and must be saved in the IFF format. The paint or image processing program that created the image must save the image's color information in a color table within the image file, and the colors you want to cycle must be contiguous within the palette (i.e., if you cycle colors that are jumbled in the palette, then the resulting cycle will appear garbled). Also, while in the program that created the image, you should note the location of the colors you intend to cycle, as you will need to enter these for Low and High Cycle Index values.

Here are some examples of color ranges for IFF image palettes. This list is not exhaustive, it is only an example.

16 colors	low 0	high 15
32 colors	low 0	high 31
128 colors	low 0	high 127
256 colors	low 0	high 255

Color Cycling may cycle forward from the low color to the high color, or in reverse from the high color to the low color.

Off
Select Off to turn off color cycling.

Forward
Select Forward to activate color cycling in a forward progression, from the lower values to the higher values.

Reverse
Select Reverse to activate color cycling in a backward progression, from the higher values to the lower values.

Low Cycle Index
This is the low color position within the palette color table that belongs to the current image.

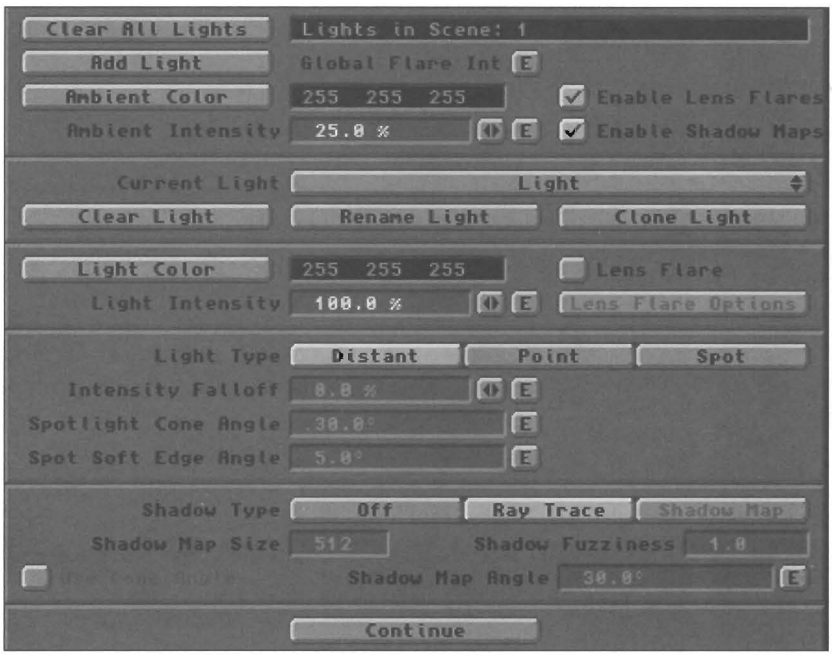
High Cycle Index
This is the high color position within the palette color table that belongs to the current image.

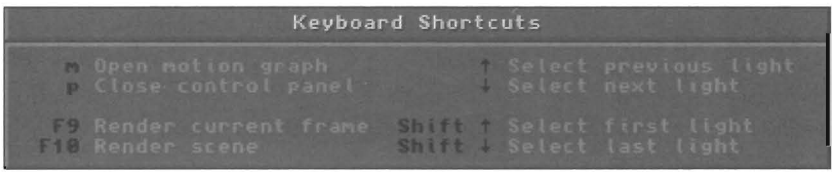
The Lights Panel

With the Lights panel you can control all aspects of the lighting model that LightWave uses to render a scene. Computer artists have much greater control over lighting than film and television gaffers. In LightWave, your lights can be adjusted to cast light only or light and shadows. The type of shadow-casting light you choose may cast hard-edged shadows or soft-edged shadows. Furthermore, the objects in the scene may be adjusted so that they cast no shadows as well! You have as much control as you like.

LightWave sports three methods for projecting light in a scene: directional light, like that cast by the sun; omnidirectional light, like that cast by a bare bulb; and focused light, like that cast by a spotlight. These cast direct light, over which you exert specific control. A fourth light source is ambient light, a more indirect form of lighting, which you can also control.

Direct lighting illuminates objects harshly, with strong contrasts of bright colors and dark shadows, while ambient light contributes a low level of general illumination to the scene (bringing out detail even in shadowed areas). For softly-lit scenes, use low-level light sources. You may even wish to use a low-level shadow-mapped light source with a very broad beam, for soft-edged diffuse shadows. Soft light, such as that from a flood light, enhances mood and tends to reveal character. Hard light, such as that from a bright lamp, heightens drama, and provides hard-edged, dark shadows. The type of lighting you use will add such qualities to the scene.





◆ **Addendum** ◆

Global Flare Instensity

Some Tips for Effective Lighting

Try these simple tips and you'll be able to "rig the lights" for your scenes with ease.

- Whether you use a single source of light or several, in general, one source should dominate the scene. Typically, this source is placed above the scene, at a 45° angle, much like the sun. However, for other effects (or times of day) you may wish to place it elsewhere.
- Use one or two shadow-mapped spot lights as the primary sources of light in a scene. In fact, one may be all you need. Shadow-mapped lights generate soft edged shadows, which look more realistic, and they render much more quickly than ray traced shadows.
- Experiment with lens flares for additional touches of realism. Lens Flares can be used to emulate or enhance glows, flames, or reflections off of the lens elements of the camera. They are simple and very effective.

Buttons on the Lights Panel

Following is a button-by-button description of the controls on the Lights panel.

Clear All Lights

Select Clear All Lights to reset the default light source to its original type, location, and intensity, and to remove all additional light sources from the scene.

Add Light

Select Add Light to add an additional light source to the scene. Each added light source, by default, is a Distant type light source, at 50% intensity, of the color white. LightWave allows as many as 1000 light sources per scene. Note that the more lights in the scene, the longer the rendering time for the image.

Ambient Color

Select Ambient Color to modify the R, G, and B color values for the ambient light source.

Ambient Color Sliders

You can adjust ambient color values in two ways, through the color sliders on the right, or through the numeric entry fields on the left. The color indicator at the bottom of the screen shows the current color as you adjust the sliders. Only 4096 color variations can be displayed on the RGB monitor, although LightWave will calculate a true 16.8 million color image based on the actual color values that you set.

The color sliders adjust the amounts of red, green, and blue of the ambient light color. Each slider varies from 0-255. To adjust a color, type in new color values directly, or drag its corresponding slider left or right. To the right raises a color value, to the left lowers it.

Consult the RGB color values chart at the end of the LightWave reference for assistance in choosing RGB colors.

Ambient Intensity

Ambient light shines equally in all directions and on all surfaces, adding a small amount of light to the overall scene. The default setting (25%) approximates natural lighting. Without ambient light, unlit or shadowed surfaces are devoid of detail, completely black rather than a darker shade of the object's color. Use settings lower than 25% to create these darker, more dramatic shadows. With too much ambient light, the scene may be washed out and devoid of shadow. An intensity value much greater than 25% (the default amount) may tend to wash out images. Use such settings carefully, or for special effects.

Enable Lens Flare

With Enable Lens Flare you can quickly toggle the lens flare effect on or off for all light sources in the scene that use it. This toggle does not turn off the light source itself, it only activates or deactivates any lens flare settings.

Enable Shadow Maps

With Enable Shadow Maps you can quickly toggle shadow mapping on or off for all light sources in the scene that use it. This toggle does not turn off the light source itself, it only activates or deactivates the use of shadow mapping.

Global Flare Intensity Envelope

This envelope allows you to globally increase or decrease all of the flares in a given scene. The default value of 100% will leave all flares as they are. Enveloping it to 50% will halve the intensity of all flares. making it 200% will, likewise, double the intensity. This envelope acts as a "multiplier" to any values in the Flare Intensity field (or envelope)

Tip:
If you have any lights with flares that also have light intensity, the intensity of the lights will ramp up or down accordingly.

Current Light

LightWave keeps track of all light sources. When you add a light source to the scene, the Current Light updates its list of all lights in the scene. To view or edit settings for a specific light source, drag the mouse over this button. A list will pop up. Highlight any light source, then let go of the mouse button (you can also use the † and √ keys on the keyboard to cycle through lights). The lights control panel will update itself to display the settings for the light source you selected.

Clear Light

Select Clear Light to remove the current light source from the scene.

Rename Light

Select Rename Light to provide a new name for the current light source. It's useful to be able to name a light by the type of light it casts (Blue Spot, for example), or the purpose it serves in a scene (Yellow Profile Light, for example).

Clone Light

Select Clone Light to make copies of a light source. A menu will ask you for the number of clones you would like to create. Enter a value, and press r or click OK. All settings for the current light are also copied, including motions, parent and target info, lens flare options, all envelopes, shadow options, etc.

Light Color

Select Light Color to modify the R, G, and B color values for the current light source.

Light Color Sliders

You can adjust light color values in two ways: through the color sliders on the right, or through the numeric entry fields on the left. The color indicator at the bottom of the screen shows the current color as you adjust the sliders. Only 4096 color variations can be displayed on the RGB monitor, although LightWave will calculate a true 16.8 million color image based on the actual color values that you set.

The color sliders adjust the amounts of red, green, and blue of the light color. Each slider varies from 0-255. To adjust a color, drag its corresponding slider left or right. To the right raises a color value, to the left lowers it.

If you prefer, you can type in the new color values directly. Enter any new values directly in front of the old ones. They will be accepted, although the color indicator will not change until you press r. Press r to go to the next color value, or click OK if you are done.

Consult the RGB color values chart at the end of the LightWave reference for assistance in choosing RGB colors.

Note:
Light Color will also affect the central color of any light source that has Lens Flare options. The central glow of a lens flare light source is white, while the glow around it is tinted by the light's color.

Light Intensity

Light Intensity allows you to set the brightness for the Current Light. You do not need to erase existing values in order to enter new ones in the numeric field—just start typing. When the cursor appears in front of the current value, enter a new value directly and press. The new value will be accepted.

E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate the intensity of the light level changing over a series of frames. Think of this as a dimmer control. At 0%, there is no Light Intensity. At 100%, Light Intensity is fully on.

Lens Flare

With Lens Flare you can add the effect of lens reflections to the scene, as if the camera were actually shooting through a lens assembly. Toggle Lens Flare to activate or deactivate the lens flare effect for the current light source.

A light source that has Lens Flare activated continues to cast light in the direction that it faces. When this light source is within the camera's field of view, it will also cast a lens flare within the scene.

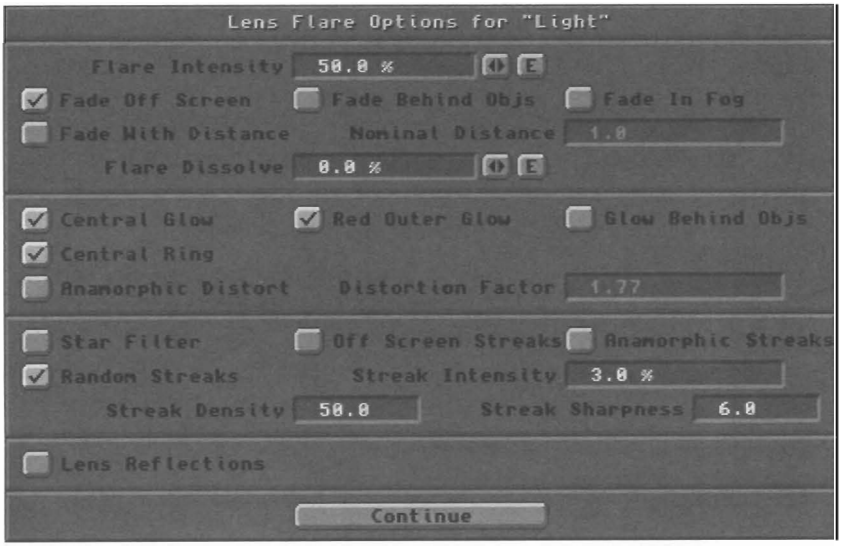
Note:
LightWave's easy-to-use lens flare effects are a powerful feature found in few 3D packages, but that doesn't necessarily mean you should use them in all of your animations. Professional lighting artists and filmmakers spend hours carefully trying to avoid unwanted lens flares in their work. If you watch film and television closely, you'll see lens flares typically appear when it was otherwise impossible to avoid them. Use these effects sparingly to add little touches of realism to your work.

Flare Options...

Select Flare Options... to access the settings menu for lens flare light sources. One option may be animated using an envelope, while other options are toggles which may be turned on or off.

Flare Intensity

Enter a value for Flare Intensity to adjust the brightness of lens flare for the current light source. You do not need to erase existing values in order to



◆ **Addendum** ◆

Anamorphic Distort
Distortion Factor
Streak Intensity
Streak Density
Streak Sharpness

enter new ones in the numeric field—just click in the space in front of the existing value and start typing.

E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate the intensity of the lens flare changing over a series of frames. At 0%, Lens Flare Intensity is not visible. At 100%, Lens Flare Intensity is fully on. You can go higher than 100% if you desire more intensity.

Fade Off Screen

Select Fade Off Screen when you want a Lens Flare light source to reduce its flare intensity automatically as the light source enters or exits at the edge of the screen. This is to simulate the properties of actual lens flare within a film camera. If this option is not selected, the lens flare will remain constant as it moves off screen.

Note:
Fade Off Screen must be active if you wish to use Off Screen Streaks.

Fade Behind Objects

Select Fade Behind Objects when you want a Lens Flare light source to reduce its flare intensity automatically as the light source moves behind other objects in the scene. This is to simulate the properties of actual lens flare within a film camera.

Flares even change color when passing behind stained glass windows with the Fade Behind Objects option, which uses ray tracing to determine when lights are obscured by objects.

If this option is not selected, flares will appear through objects.

Fade In Fog

Activate Fade In Fog when you want a Lens Flare light source to automatically reduce its flare intensity as it is affected by the minimum and maximum distances set for Fog. The further into the fog the lens flare is, the less bright it will be. Once past the maximum fog distance, the lens flare will be completely dissolved by the fog.

If Fade in Fog is not selected, the lens flare will remain bright no matter how far away it is.

Fade With Distance
Selecting Fade With Distance will automatically fade a lens flare as its distance from the camera increases. If you bring a flare closer to the camera, it will grown brighter.

Nominal Distance
This field, only active with Fade With Distance selected, is the distance from the camera where the flare is at its input intensity. For instance, if your Flare Intensity is 50%, and your Nominal Distance 10, a flare 5 units from the camera would appear with 100% Intensity. Whereas a flare 20 units from the camera would appear as 25% or 1/2 the Intensity.

Flare Dissolve

Enter a Flare Dissolve value to adjust the transparency of the lens flare effect.

Flare Dissolve is handy when you wish to see large streaks of light coming from the lens flare but do not want a bright hot spot at the center of the flare. The higher the Flare Intensity, the larger the streaks (if selected), and the brighter the flare.

Flare Dissolve Envelope
There is now an envelope for Lens Flare Dissolve, allowing you to dissolve a lens flare light source in and out of the scene. The controls are the same as those found in other envelope menus in LightWave.

Central Glow

Toggle Central Glow to turn on a glow of light at the center of the light source flare. This will be the color of the light source.

Red Outer Glow

Toggle Red Outer Glow to turn on a luminous, soft-edged red glow around the light source. Red Outer Glow is only available when Central Glow is active. This is an option, because red flares would not always appear with every light source—deep undersea, for example, the color red is not visible.

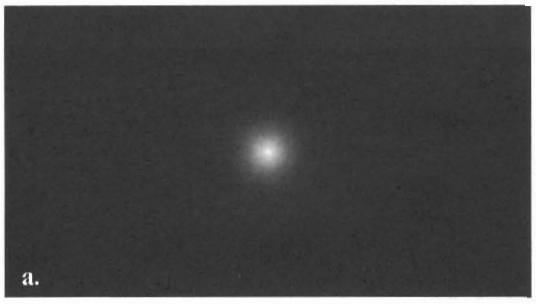
Glow Behind Objects

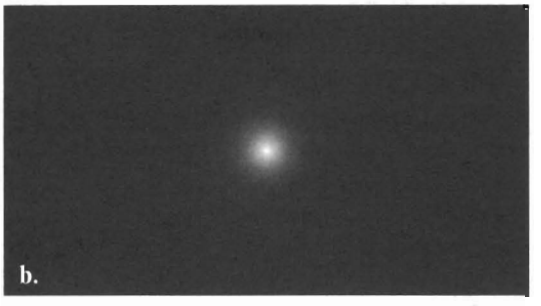
Glow Behind Objects simulates a glow that surrounds a light source. This effect is different from that of a true lens flare, and should not be confused with that effect.

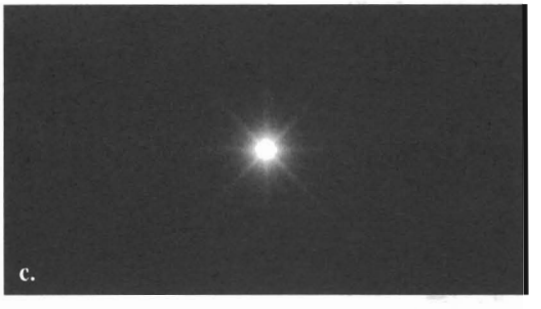
See also the notes and tips about Glow Behind Objects (below) for more information.

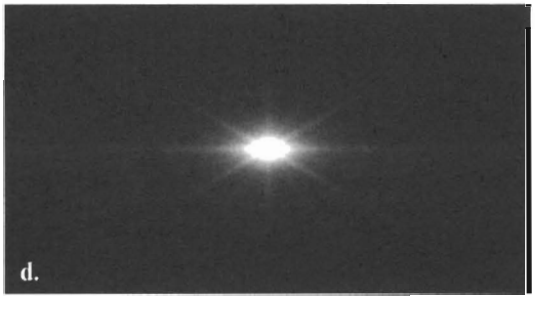
About Glow Behind Objects

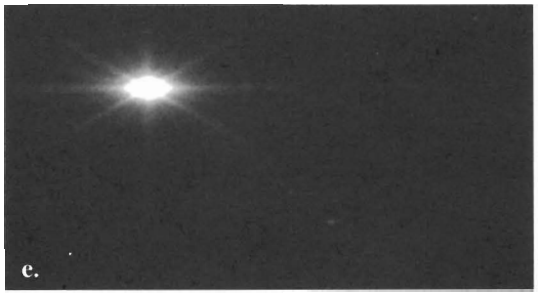
Lens flare is a phenomenon that occurs within the camera lens, thus it appears to be in front of all objects in a scene. When the light source that is causing the flare is obscured by objects between it and the camera lens, the flare will fade or disappear depending on whether the light is partially or completely obscured (an effect that is handled by the Fade Behind Objects option).











A few of the various "looks" of Lens Flare, and their settings. (In the final image, the light source was placed in the upper left of the scene to better display lens reflections.) ***a****. central glow only* ***b****. central glow, red outer glow, central ring* ***c****. central glow, red outer glow, central ring, star filter, random streaks* ***d****. central glow, red outer glow, central ring, star filter, random streaks, anamorphic squeeze, anamorphic streaks* ***e****. central glow, red outer glow, central ring, star filter, random streaks, anamorphic squeeze, anamorphic streaks, lens reflections*

Glow Behind Objects is designed to simulate glows physically located at the light source rather than within the lens. These glows are caused by the illumination of a medium surrounding the light, such as murky water or foggy atmosphere, as opposed to true lens flares which are caused by diffraction and reflections among the glass elements inside a lens assembly. Unlike lens flares, glows at a distance can be partially visible even if the light source itself is obscured.

For example, on a foggy night you can see the glow from the headlights of an oncoming car even if the car itself is still hidden behind a rise in the road. Also, even if the headlights themselves are directly visible, parts of the glow can be hidden by objects between the lights and the camera, which will appear silhouetted against the glow. Glow Behind Objects approximates these effects.

Tips for Using Glow Behind Objects

When using Glow Behind Objects, you should use only Central Glow (and possibly Fade in Fog is some cases). All other options apply only to true lens flares, and should not be used at the same time.

Conversely, for true lens flares, the Fade Off Screen, Fade Behind Objects, and Fade in Fog options should usually be on, along with any combination of the remaining effects, except for Glow Behind Objects. For true lens flares Glow Behind Objects should always be off.

Finally, note that a full simulation of both phenomena requires a pair of co-located light sources—one for the glow at a distance and one for the true lens flare.

Central Ring

Toggle Central Ring to turn on a small ring of light, like a halo, surrounding the light source.

Star Filter

Toggle Star Filter to turn on streaks of light that appear to form an eight-pointed star.

Random Streaks

Toggle Random Streaks to turn on dozens of tiny random streaks of light emanating from the light source.

Off Screen Streaks

Toggle Off Screen Streaks to allow lens flare light sources that move off the visible screen area to continue to cast occasional streaks across the LightWave camera and into the scene.

Note:
Fade Off Screen must be active if you wish to activate Off Screen Streaks.

Anamorphic Distort
Anamorphic Distort causes lens flare to be elongated horizontally. This simulates the effect of the wider lens flares you see in motion pictures filmed in Panavision.

Anamorphic Streaks
Anamorphic Streaks toggles the appearance of an elliptical horizontal blue streak emanating from the lens flare light source. This simulates the effect of similar streaks seen in motion pictures filmed in Panavision.

Lens Reflections
Toggle Lens Reflections to turn on reflections of light in the LightWave camera as if it were shooting the scene through a standard 35mm lens assembly. This effect emulates the multiple lens elements that make up a typical 35mm lens. Such flares commonly occur whenever you aim a camera at an intense light source, and they always occur over the contents of the scene.

If either the light source or the camera is moving, then the Lens Reflections will move across the screen also.

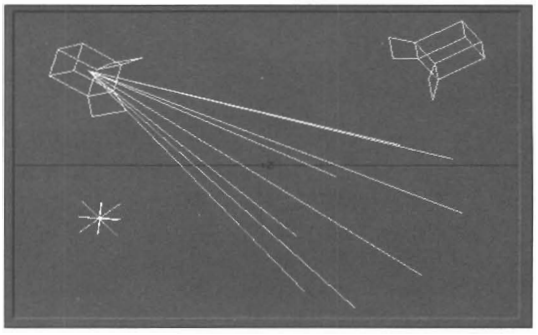
Note:
To get the most lens reflections, place the light source in one corner of the camera's view.

Light Types
There are three different types of light sources in LightWave: Distant, Point, and Spot lights (shown above).

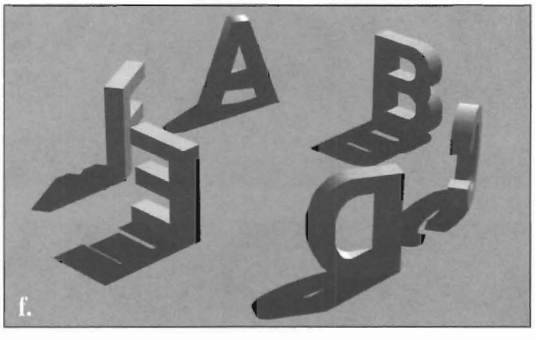
Distant (sometimes called Directional or Infinite)
This type of light shines in the same direction equally across the scene. The actual location of the light source icon and its nearness to any objects in Layout has no effect; only the direction that it faces matters. Sunlight is usually modeled this way. On the Layout screen, the directional light symbol looks like a classic movie light with barn doors.

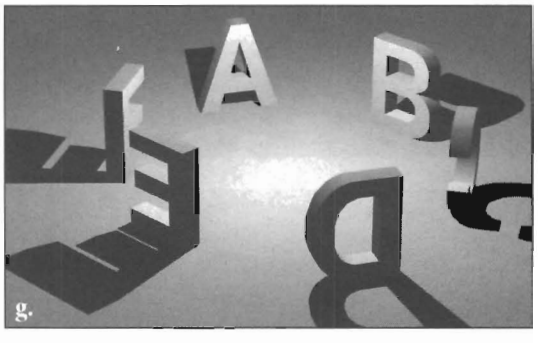
Point (sometimes called Omnidirectional)
This type of light radiates in all directions from a single point, such as the light of a campfire, a bare light bulb, or a candle flame. You can adjust Falloff for a point light so that its light fades with distance. On the Layout screen, the point light symbol looks like a small star. It does not face a particular direction, and therefore it does not matter which way it faces.

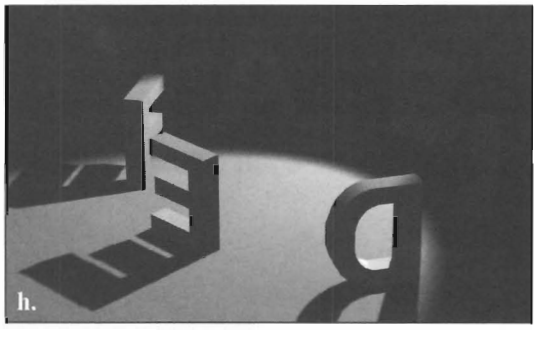
Spot
This type of source sends a cone of light in one direction, similar to a car headlight. You can adjust Falloff, Cone Angle, or Edge Angle for spot lights. Cone Angle and Edge Angle can also be animated using an Envelope. On the



Three types of light sources. Distant, Point, and Spot.







The same scene rendered with each type of light source: f. distant, g. point, h. spot. The light source was in the center of the scene in all instances.

Layout screen, the spot light symbol looks like classic movie light with barn doors, with light beams that indicate its direction and cone angle. The cone angle of these light beams will change if you change the angle value with the Cone Angle value.

Intensity Falloff (0-100%, and higher)
With Intensity Falloff you can control how the intensity of

Point or Spot light sources fades with distance. The falloff value is considered to be a percentage of 100, rather than a percentage of the light source's own intensity.

If the light source is at 100, with a 10% falloff, then it will be gone after 10 units (meters, whatever) have passed. It will lose 10% intensity with every unit of distance.

If the light source is at 40, with a 10% falloff, then it will be gone after 4 units of distance have passed. It will lose 10% intensity with every unit of distance. This same light source, with a 20% falloff, will lose 20% intensity with every unit of distance, and be gone in 2 units of distance.

Note:
In the XY, XZ, and ZY Layout views, any light source with an Intensity Falloff setting will display a circle that indicates the extent of the falloff value.

Spotlight Cone Angle (0-180°)
With Spotlight Cone Angle you can control the spread of light from a Spot light source.

The Spotlight Cone Angle is the angle between the center point of the light's direction and the edge of the cone of illumination. In Layout, when this light source is active (or light visibility is on), the Spotlight Cone Angle will be shown by beams in all view modes. From the light's point of view, the Spotlight Cone Angle will appear as a circle that indicates the coverage of the cone of light.

The angle of the beams can be seen, animated, in the wire frame preview mode for greater feedback.

E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate a change in the angle (width) of the light cone over a series of frames.

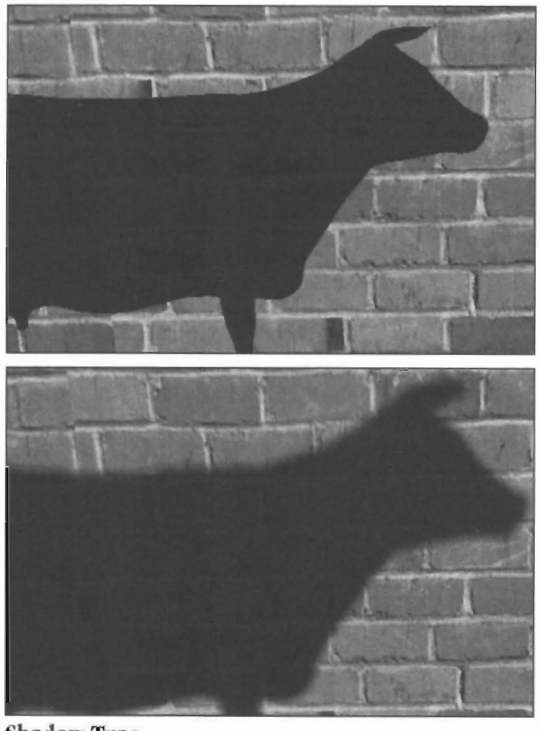
Spot Soft Edge Angle (0-180°)
With Spot Soft Edge Angle you can control the size of the soft edge around the Spot light's circle of visible light. The soft edge is determined from the outer cone of the light source inward, toward the center of the lit area. The Spot Soft Edge Angle value represents the angle between the beginning and end of the soft edge around the circle of light.

A value of 0% results in a hard edge, while 10% results in a thin soft edge, 30% results in a medium soft edge, and anything over 50% results in wide spreads of soft light.

Although the Envelope Editor allows the Spot Soft Edge Angle to go beyond the 0-180° limits, Spot Soft Edge Angle is only useful between these two values.

E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate a change in the width of the soft edge of the light cone over a series of frames.

Two shadow types: ray-traced and soft-edged.



Shadow Type
With Shadow Type, you can control the kind of shadows (if any) cast by the Current Light. You can have many types of light sources casting many types of shadows within a scene. There are three shadow settings.

Off
Off allows the light source to cast light but no shadow. Objects illuminated by this light source will cast no shadows.

Ray Trace
Ray Trace allows the light source to cast both light and shadows. Shadows will be calculated by ray tracing, which produces hard-edged shadows. Remember to select Trace Shadows on the Camera menu in order to ray trace shadows.

Shadow Map (only available for Spot Light sources)
The Shadow Map option allows a spot light to cast light with soft-edged shadows falling off of objects in the scene, as opposed to the hard-edges caused by ray-traced shadows.

A shadow map is a special kind of map used to compute shadows. The benefit of shadow mapping is that it results in much faster rendering of shadows than those calculated by ray tracing. The drawback is that shadow maps require large amounts of memory,

and you may be able to utilize only a few shadow mapped light sources per scene. See the shadow map buttons below for further information.

Shadow Map Size

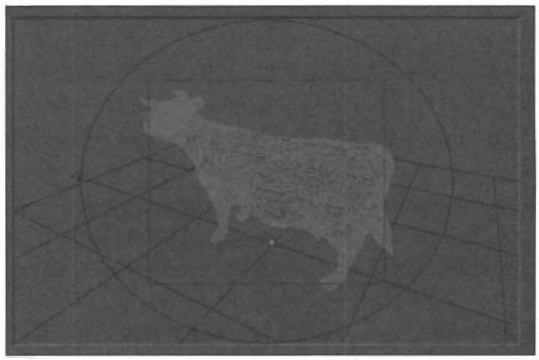
With Shadow Map Size you can set the amount of memory LightWave uses to compute a shadow map. This is important if you find that the default value (512) is not sufficient to render smooth-edged shadows. Higher values generate smoother shadows, at the expense of requiring more memory. Lower values use less memory, yet may cause unwanted aliasing. You will need to experiment to find the proper settings.

We recommend you begin using the default value, and adjust accordingly based on the rendered image. You will probably find the most useful shadow map size values fall between 512 and 1024.

Use Cone Angle

With Use Cone Angle selected LightWave will use the value of the Cone Angle of the spot light (in degrees) as the value for the spread of the shadow mapped spot light source.

Shadow Map Angle (0-180°)
With Shadow Map Angle you can limit the application of shadow mapping to an area that is smaller than the area of light cast by the spot light itself. To do so, you must turn off Use Cone Angle, and then enter a value for the Shadow Map Angle. The Shadow Map Angle is the angle between the center point of the light's direction and the edge of the application of shadow mapping.



A spot light's view when casting a shadow map with a limited shadow map angle. The black circle denotes the area illuminated by the beam of the spot light. The dotted lines of the inner black square denote the area of the scene which will be shadow mapped.

This feature is extremely useful when you wish to illuminate a large area with light, yet do not have the RAM memory available to shadow map the entire scene.

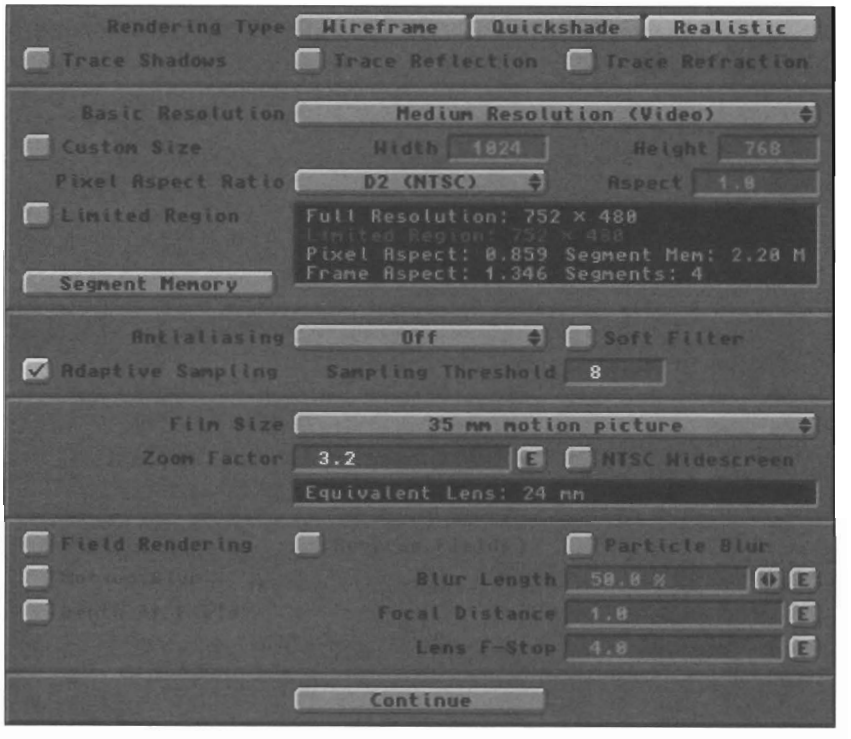
E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate a change in the angle (width) of the shadow mapped light cone over a series of frames.

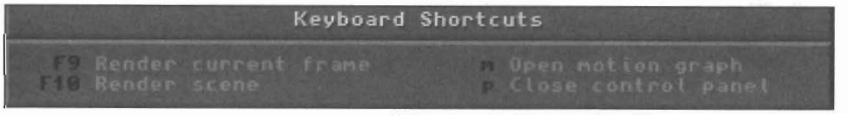
Shadow Fuzziness

With Shadow Fuzziness you can control the edge softness of shadows cast by objects that are illuminated by a shadow mapped light source. A value of 0 creates a very sharp shadow edge, and may show pixelization (i.e., jagged edges) unless you have a large Shadow Map Size. The default value of 1 creates a standard edge with the default. Values above 1 will create progressively fuzzier edges.

The Camera Panel

From the Camera menu you determine the final quality of the developed image or animation. The five main sections on the Camera menu allow you to select rendering options and resolutions, adjust camera zoom, antialiasing levels, film stocks and special camera effects.





◆ Addendum ◆
Aspect

◆ Addendum ◆
NTSC Widescreen

Tips for Rendering Scenes
You should experiment with each of the different rendering modes in LightWave. Depending on what you need to see when preview-rendering, certain modes and settings can render quicker results. See the guidelines below, arranged from fastest to slowest, for settings on the Camera menu.

To check lighting, object placement, and solid surface colors quickly
Use Low Res and QuickShade for a rough check of these items.

To check surface settings and texture maps quickly
Use Low Res and Realistic for a good look at these items.

To check surface settings and texture maps accurately
Use Medium Res and Realistic for fully accurate textures and surfaces.

Options that will decrease rendering times for most all resolutions and modes:

- On the Camera menu, use Limited Region to render only the portion of the screen you need to see. This renders a small portion only, and not the entire screen. This will decrease rendering by limiting the area of the scene to be rendered.
- If you select Trace Shadows, in the Objects Panel, turn off all shadow options for every object that does not need to cast or receive shadows.
- On the Camera menu, turn off AntiAliasing and Adaptive Sampling. This disables LightWave's image filtering techniques.

Which rendering settings create the best images?
Depending on your final output (video, film, or print), this question has a different answer. Here are some general guidelines as a starting point. You may find that one setting higher or lower may be more to your preference.

Output to video
Medium Resolution, Realistic rendering, AntiAliasing Low, Adaptive Sampling 8. Raise the AntiAliasing level if desired.

Output to film
High Resolution, Realistic rendering, AntiAliasing Medium, Adaptive Sampling 8. Save images as RGB files for later output to film.

Output to print
Print Resolution, Realistic rendering, AntiAliasing High, Adaptive Sampling 8. Save images as RGB files for later output to print.

Buttons on the Camera Menu
Following is a button-by-button description of the controls on the Camera menu.

Rendering Type
LightWave can render an image in one of three selectable modes: wire frame, quickshade, and realistic.

Wire frame
Select Wire frame to render a wire frame representation of the scene.

Quickshade
Select Quickshade to render a scene with no shading (smoothing), 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. The benefit of using this less realistic mode is that LightWave can render it very fast, providing you with extremely fast previews of the scene.

Realistic
Select Realistic to render a scene with full shading, texture mapping, and any ray tracing options that were selected.

Trace Shadows
Activate Trace Shadows to render shadows. The following conditions must be set for shadows to render:
(a) Under Camera, Trace Shadows is active.
(b) Under Lights, the Ray Trace option is active for one or more light sources.
(c) Under Objects, one of the Self, Cast, or Receive Shadows options is active for one or more objects.

Note:
About Trace Shadows and Background Colors. If you have set Background colors for a sky and ground, the ground will not receive shadows, as the "sky and ground" are illusory and not a genuine object. To cast shadows onto the ground, you must create an object out of polygons and use it as a ground object.

Trace Reflections
Select Trace Reflections to instruct LightWave to render true reflections for surfaces for which you have set a reflection value. Trace Reflections requires the Realistic Render mode, 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. This includes particles (single point polygons), 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
Select Trace Refraction to instruct LightWave to render genuine refraction for surfaces that have some amount of transparency and a refractive index value above 1.0. Refraction is the bending of light as it passes through a semi-transparent surface. Useful values here range from 1.0-2.42 (normal to extreme refraction).

Note:
See the Ray Tracing note under Trace Reflections above.

Basic Resolution (pop-up menu)
Select the resolution level that you desire for the rendered image(s). This setting may be modified by other settings, such as Antialiasing and Adaptive Sampling.

Super Low Res
Super Low Resolution renders the fastest images, yet with very chunky or blocky quality. This is useful for test rendering images to check the appearance of textures, or even to test render 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 fairly quick test renderings where you need to see a bit more detail.

Medium Resolution
Medium Resolution is intended for all video work, and renders sharp image quality. For even sharper

images, use AntiAliasing and Adaptive Sampling. This allows LightWave to render the entire scene at Medium Resolution, and antialias the scene at a higher resolution, providing you with highly efficient, clean rendering.

High Resolution
High Resolution is LightWave's second highest image quality, intended for output to film or print mediums. RGB Images rendered and saved at High Resolution cannot be loaded into ToasterPaint due to their size. They may, however, be loaded into LightWave provided you have enough RAM to keep them in memory. For one High Res image, you would need approximately 5 megs of RAM.

Print Resolution
Print Resolution is LightWave's highest image quality, intended for output to film or print mediums. RGB Images rendered and saved at Print Resolution cannot be loaded into ToasterPaint due to their size. They may be loaded into LightWave provided you have enough RAM. One Print Res image requires approximately 23 megs of extra RAM to load into LightWave.

Custom Size button
This button allows you to select the rendered image size of your choice. When you select this button, you must enter the proper height and width dimensions that you wish to use for the rendered image size. Image sizes from 16x16 pixels to 8000x8000 pixels are acceptable.

Note:
When you use a Custom Size setting, the Overscan and Letterbox buttons will be ghosted from the menu, since they are not required when you render custom image sizes.

Overscan
Select Overscan to render the image out past the edges of the television screen display area (with no visible borders). When in the Camera view, you can see the overscan area.

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. Dotted lines will appear to show you the letterboxed area. (Note that letterbox on with overscan off will display a smaller central screen area that will be rendered by LightWave.)

Limited Region
Select Limited Region to instruct LightWave to render a specific portion of the screen rather than the entire screen itself. This saves a great deal of time by allowing you to render only that portion of the scene that you wish to render, instead of waiting for the entire screen.

There are two ways to turn on limited region rendering: from the Camera menu, or from the Layout screen.

The easiest way to activate limited region rendering is to do it directly from the Layout screen, while you view the scene from the Camera view. Hold the letter l on the keyboard. A dotted-line box appears. Use the mouse and drag the box by its invisible handles (on any side or corner) to set the correct size. Drag in the center of the box to move it around the screen entirely. Let go of the l key to return to regular editing. This action automatically activates the Limited Region button on the Camera Menu.

To turn off limited region rendering, you will need to go to the Camera menu and deselect its button.

Segment Memory
When LightWave renders an image, it works on a portion of the screen at a time. The number of segments that LightWave will use are listed in the camera panel information field. By adjusting the amount of memory that LightWave will use for rendering, you can cause fewer segments to be used, thus speeding up rendering time. This is especially useful when using motion blur. Once the frame is rendered, LightWave will send it to the selected display device (see Record panel)

Pixel Aspect Ratio (pop-up menu)
The Pixel Aspect Ratio button allows you to select the shape of the pixel in the rendered or saved image based on the output format. To select an aspect ratio, drag the mouse over this button.

D2
Select D2 (NTSC) for standard Video Toaster use.

D1
Select D1 (NTSC) for images that you intend to transfer to an Abekas digital disk recorder, or another D1 format device. This option creates an image that will appear incorrect when displayed by the Video Toaster, although it will be correct for the intended format.

Square Pixels
Select Square Pixels when you want to save the image for output via a desktop publishing system, such as the Macintosh, which uses square pixels (rather than the wider pixels used by NTSC video). You also have the options of D2 (PAL) and D1 (PAL).

Antialiasing (pop-up menu)
Antialiasing is the process of filtering out jagged edges on diagonal lines. Each level of antialiasing causes LightWave to re-filter the rendered segment an additional number of times, reducing any jaggedness it finds.

Off
Select Off to turn antialiasing off.

Low
Select Low for low-level antialiasing. LightWave will filter each rendered segment with 5 antialiasing passes.

Medium
Select Low for medium-level antialiasing. LightWave will filter each rendered segment with 9 antialiasing passes.

High
Select High for high-level antialiasing. LightWave will filter each rendered segment with 17 antialiasing passes.

Soft Filter
This setting invokes a special kind of filtering effect that simulates softer, more film-like edges in the rendered image. You may wish to use this instead of motion blur to soften the clean look on the edges of computer-generated imagery.

Adaptive Sampling
Adaptive Sampling is a particular method for antialiasing sometimes called "edge detection." When Adaptive Sampling is selected, LightWave studies the color values of each rendered segment of the image and compares neighboring pixels.

If any two pixels are below the Threshold level, they are ignored. Pixels above the Threshold level will be antialiased.

If you want greater control over LightWave's antialiasing controls, select Adaptive Sampling. Use the Threshold value (below) for determining how LightWave should antialias the image.

Sampling Threshold
The Sampling Threshold value is the cutoff level which LightWave uses to determine whether an area needs to be antialiased. It functions by comparing the green content of a pixel with its neighbors. If the content of the neighboring pixel is higher than the threshold, then it is antialiased. Values may range from 0 (full antialiasing) to 256 (no antialiasing). If the green component is below the threshold level, the red and blue are checked next.

Film Size (pop-up menu)
Changing the Film Size is useful when you are rendering LightWave imagery to incorporate into (or match) still frames or footage shot using a specific film format. This option changes the optics of the LightWave camera so that Depth of Field emulates that of the chosen format. The default Film Size is 35mm Motion Picture.

The following formats are available:

Super 8 motion picture
16mm motion picture
35mm motion picture
65mm Super Panavision motion picture
65mm Imax motion picture
Size 110 (pocket camera)
Size 135 (35mm SLR)
Size 120 (60 x 45mm rollfilm camera)
Size 120 (90 x 60mm rollfilm camera)
1/3" CCD video camera
1/2" CCD video camera

Zoom Factor
Zoom Factor sets the camera lens magnification. Zoom Factor works just as a camera zoom does, showing wide angle or narrow angle views. Zoom can be changed for the entire animation at any keyframe, or animated smoothly using an Envelope. Zooming in or out differs greatly from physically moving the camera into or out of a scene (which is known as dollying).

Rule of thumb for Zoom Factor
- The lower the zoom value, the wider the angle.
- The higher the zoom value, the narrower (more telephoto) the angle.

Although the Envelope Editor allows the Zoom Factor to go below the Camera's 0.0001 lower limit, Zoom Factor is only useful at or above this value.

E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate changes in the camera's zoom setting over a series of frames.

NTSC Widescreen

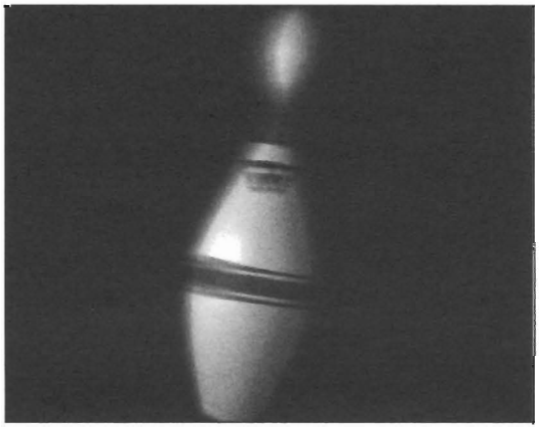
Field Rendering
When rendering an animation, Field Rendering instructs LightWave to render (and display) two distinct fields of information rather than one. The result is a smoother appearance to moving objects. This is most noticeable with objects that move horizontally across the screen (from left to right, or right to left), and with moving objects that dominate the screen.

For example, compare two frames taken from an animation. In this simple example, an object moves from Point A in frame 1 to Point B in frame 2. Looking at the two frames, you can see that the object has moved. Let's break the images down a step further. Since a frame consists of two fields, there are four fields of picture information. The first two fields, frame 1, look alike, and the next two fields, frame 2, also look alike. But what if you could render those four fields individually, so that the object is moving a little bit in each one? The result would be four distinct fields. If you could flip through them quickly, the object would move a little bit in each image. Of course, looking at the two fields as one frame, you'll see a jittery image, since there is movement within the frame itself. But, watching an entire animation play back, the effect is that of a smoother motion path than one that was frame-rendered, because there is twice as much motion information for the eye to register. It is a subtle difference, yet noticeable (more so with objects close to the camera).

Reverse Fields
This option which is only available while field rendering will reverse the field dominance (order) of the rendered images. This is useful if recording your imagery to a device that reverses the field dominance. Selecting this will cause the final output to appear correct.

Particle Blur
Use Particle Blur to cause single point polygon objects to blur, smoothing out their motion. Particles without some amount of blur may not render clearly in images. This is especially useful when simulating star fields, exploding sparks, or rainfall.

A bowling pin with 50% motion blur.



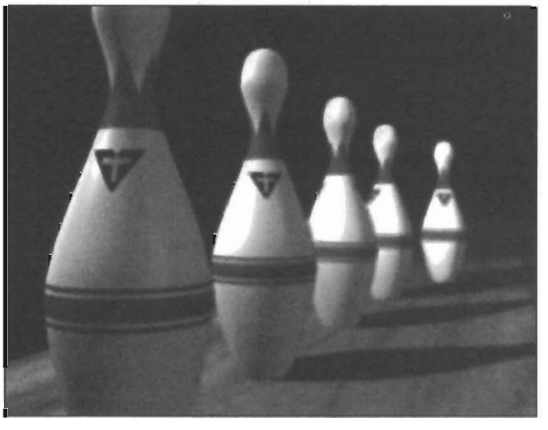
Motion Blur
Your eyes naturally blur fast motion. The motion picture camera, filming at 24 frames per second, also records this blur since fast-moving objects may move faster than the camera's shutter. Computer generated animation sometimes appears unnaturally sharp and clean because it lacks this natural motion blur. Select Motion Blur to reproduce the natural motion blur for fast-moving objects. A Blur Length of 50% is the equivalent to the natural blur of a film camera. This option, however, can greatly increase rendering time. To speed rendering when using Motion Blur, select a larger Segment Memory (see above)

When should you use motion blur?
When an object moves rapidly while near the camera, its motion can appear stepped or jumpy. This aspect of animation is called strobing, and it is more noticeable with larger objects. To reduce or eliminate strobing, use motion blur.

Blur Length
Blur Length alters the amount of motion blur applied to particles or objects that move during the course of the scene. The default Blur Length, 50%, is the equivalent to the natural blur of a film camera. Note that this option can greatly increase rendering time.

E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate the amount of blurring over a series of frames.

An example of Depth of Field.



Depth of Field
Depth of field is the term used to describe a range that encompasses objects that are "in focus." Normally, LightWave renders all objects within a scene in universally perfect focus, no matter how near or how far they are from the camera. In reality, cameras do not typically have so great a depth of field. When you focus a camera, you are ensuring that the important items in the frame are in focus. Usually there is a little play in the focus range so that objects near the focal point are also in focus. This is what is known as depth of field. Objects outside of the depth of field are blurred, more so with distance. Depth of field is affected by Zoom Factor, Focal Distance, and Lens F-Stop.

When you select Depth of Field, you enable two further options: Focal Distance and Lens F-Stop, which allow you to adjust LightWave's focus. The Focal Distance defines a

specific distance from the camera which is considered the focal point. Any objects that reside this distance from the camera will be in sharp focus.

The Lens F-Stop specifies how much light reaches LightWave's "virtual film." The more light that reaches the camera, the smaller the range of focus. The less light, the greater the range is. Any objects outside of this range will be rendered somewhat blurry, depending on how far from the focal range they are. If you are familiar with photography, objects tend to grow out of focus more quickly with distance, and less so in the foreground.

Depth of field also requires that Antialiasing be set to Medium (preferably High).

Focal Distance
Focal distance is the term used to describe the distance between the camera and the object(s) you want to be in perfect focus. Ideally, you should set this for the specific distance necessary for exact focus, unless you desire an out of focus look intentionally.

Rule of thumb for Focal Distance
Use the reference grid in Layout to determine the distance from the Camera to the element (or group of elements) that you want to be in focus. Use this distance as your focal distance.

E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate changes in the camera's focal distance over a series of frames.

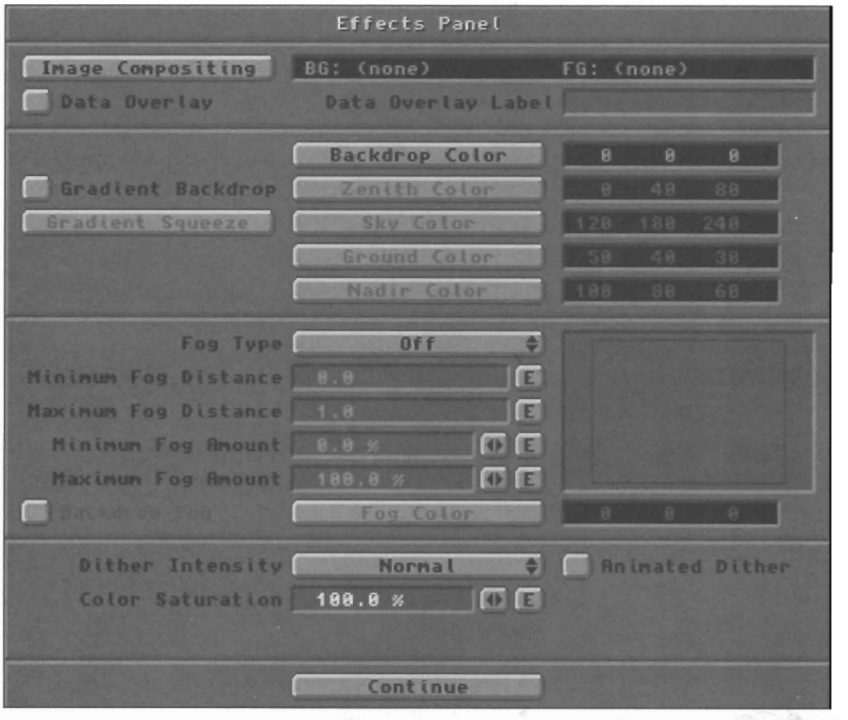
Lens F-Stop
Lens F-stop, technically, represents the amount of light allowed into the camera. This in turn affects the focus range of the depth of field. Typical F-Stops are 1, 1.4, 2, 2.8, 4, 5.6, 11, 16, 22, 32, 45, 64. Smaller numbers represent larger apertures and therefore more light reaching the film. Each successively larger number halves the amount of light admitted to the camera.

Rules of thumb for Lens F-Stop
- When the you lower the Lens F-Stop, you narrow the depth of field, and fewer elements in the scene will be in focus.
- When the you raise the Lens F-Stop, you widen depth of field, and more elements in the scene will be in focus.

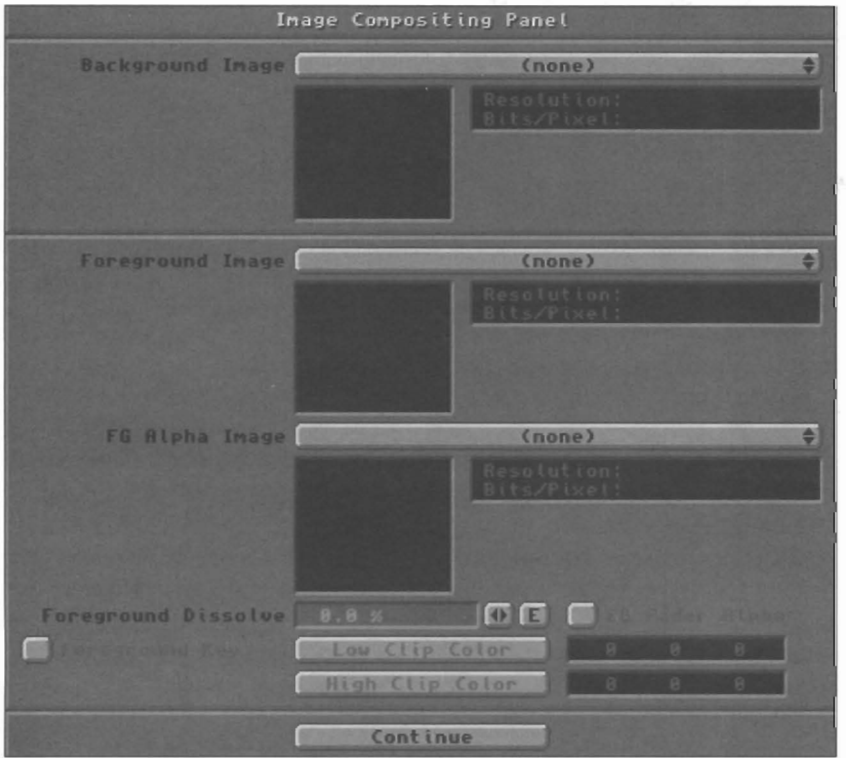
E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate changes in the camera's lens F-stop over a series of frames.

The Effects Panel

With the Effects Panel you can set up ramped background colors, select background or foreground images, even key foreground images. For backgrounds, you can choose between a bitmapped image or a ramp among four different colors. Among the special effects you can perform with the Effects Panel: fades to and from black (or any image) in an animation, foreground or background bitmapped images, keyholes within foreground images, color cycling for images with palettes of 256 colors or less, fog effects, black+white effects, and film grain looks with dithering routines.







◆ **Addendum** ◆

Image Compositing
Gradient Backdrop

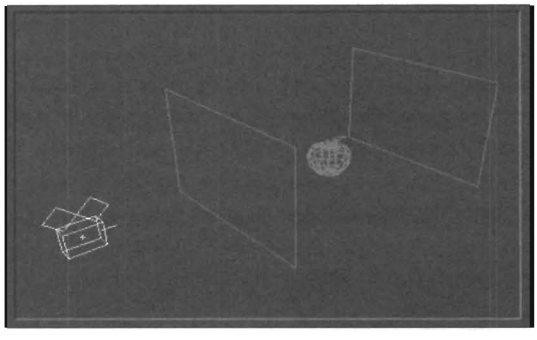
Buttons on the Effects Panel
Following is a button-by-button description of the controls on the Effects Panel.

Background Image
To place an image or image sequence in the background of the scene that LightWave renders, load it from the Images Panel and then select its name here. The image or sequence you select will be used as a backdrop behind all objects in the scene.

Wherever possible, you should use full resolution images (752 x 480 pixels). Such images fill the entire video image. LightWave will adjust the selected images as follows:

- If the image is 752 x 480 pixels, it will fill the picture entirely.
- If the image is less than 752 x 480 pixels, it will be centered on the screen *but will not fill the picture out to the edges*. You may see borders of the background color(s) around its edges.

Note:
The Background Image image is registered to the LightWave camera. This means that no matter where the camera turns, the image will remain perfectly lined up in the background at all times, almost as if it were "parented" to the camera.



If the foreground and background images were physically in the 3D universe, this is how they might appear. The foreground and background panels fill the entire screen. All objects in the scene appear in front of the background image, while the foreground image covers all items in the scene.

Foreground Image
The image (or image sequence) you select here will be used as a foreground in front of all objects in the scene. This means that the Foreground Image will cover up everything in the scene.

An example of using the foreground image would be if you wish to animate a fade to black at the end of an animation. Assume the animation is 300 frames in length, and you want a 30-frame fade to black at the end. Set up the animation as you desire. Load a full screen black image from the Images Panel. Select it as the Foreground image. Now select E and use the Envelope Editor to set up a 30-frame envelope (from frame 270 to frame 300) that dissolves the Foreground Image from nothing to 100%. When you render the animation, the scene will fade to black at the end.

FG Alpha Image
The FG Alpha Image button allows you to perform alpha channel image compositing. This enables you to composite an image over a scene (the rendered image of the scene as set up in Layout, and the loaded image selected as Foreground Image), or just two images together (the Foreground Image with a selected Background Image).

The FG Alpha Image will control the transparency of the foreground image by its luminance information. In the alpha channel image:

- White areas indicate total coverage by the Foreground Image (no background or objects shows through).
- Lighter shades of gray indicate a blend of more Foreground Image and less background.
- Darker shades of gray indicate a blend of more background and less Foreground Image.
- Black areas indicate undiminished background *added* to the foreground image.

In general, in order to add a foreground image of an airplane onto a background image of the sky using the alpha channel, you would:

- Load the sky image as the Background Image
- Load the airplane image as the Foreground Image
- Load the alpha image of the plane (black background, 100% white plane) as the FG Alpha Image.

Foreground Fader Alpha
LightWave normally uses an "additive" process to render the Foreground image on top of the background. In the example above, the airplane would appear correctly on top of the sky image *assuming* that the airplane image had a black background. If the airplane image had a blue background, the blue of the foreground image would be *added* on top of the background colors resulting in a much brighter image than expected. If you are compositing foreground images that contain non-black backgrounds, use Foreground Fader Alpha to correctly composite the foreground image with the background.

Foreground Dissolve
Use Foreground Dissolve to set the transparency of the Foreground Image or sequence.

E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate a dissolve between the Foreground Image and whatever is behind it (objects in the scene, the background image, or both).

At 0%, the Foreground Image is fully solid and visible. At 100%, it is fully dissolved and invisible.

Foreground Key
Activate Foreground Key when you want to "key out" a color (or range of colors) from the Foreground Image. Use the same color value for both Low and High if you wish to key out one color only. Use different values to key out the Low and High color values, and all those in between.

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 with a selected Foreground Image.

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 with a selected Foreground Image.

Gradient Squeeze
Select Gradient Squeeze to alter the location of the blend between the Zenith and Sky colors, or between the Ground and Nadir colors.

For the Sky Squeeze, the higher the value, the closer to the horizon the blend will occur. The result of a very high gradient squeeze for the sky will appear to be the Zenith Color for most of the sky, with a very short blend region into the Sky color very near the horizon.
For the Ground Squeeze, the higher the value, the closer to the horizon the blend will occur. The result of a very high gradient squeeze for the sky will appear to be the Nadir Color for most of the ground, with a very short blend region into the Ground color very near the horizon.

Negative values are not valid.

Backdrop Color
Use Backdrop Color to set a solid color background for the rendered scene when Solid Backdrop is selected. This is useful to speed up rendering when you are testing lighting, color, and position of objects, since the solid backdrop renders more quickly.

Note:

LightWave blends the color values from the Zenith to the Sky, and from the Ground to the Nadir. This creates the appearance of a blended upper and lower sky, a distinct horizon, and a blended distant and nearby ground.

To blend from the top of the image to the bottom, set the Sky and Ground colors to the same RGB values. This will cause LightWave to blend smoothly through the two center colors, since they are the same.

Zenith Color
Zenith is the color of the sky directly above the camera. Consider the Layout workspace as a giant sphere. Imagine that wherever your camera and objects are, they are always the center of this giant sphere. The zenith is directly overhead.

Sky Color
This button sets the color of the sky above the horizon.

Ground Color
This button sets the color of the ground below the horizon.

Nadir Color
Nadir is the color of the ground directly beneath the camera. Think of the Layout workspace as lying inside a giant hollow sphere. Imagine that wherever your camera and objects are, they are always the center of this giant sphere. The nadir is that part of the sphere directly underneath you, at the bottom of the sphere.

Fog Type pop-up
These three buttons govern the three fog settings: Off, Linear, Nonlinear. Just as objects seem to blend into real fog with distance, LightWave's Fog fades the objects away into the fog color you set. Fog surrounds the camera in all directions, as though the camera were in the middle of a huge spherical fog bank extending in all directions.

Off
This button turns off the fog effect. All fog buttons will be dimmed, and their settings ignored.

Linear
This button turns on linear fog. All fog buttons will be available to set the distance and color characteristics for fog.

Nonlinear 1
This button turns on nonlinear fog, which is somewhat more realistic in appearance than linear fog, since it appears to grow thicker with distance. All fog buttons will be available to set the distance and color characteristics for fog.

Nonlinear 2
This button turns on nonlinear fog with a steeper falloff curve than Nonlinear 1.

Fog Min Distance
Use Fog Minimum Distance to set the proximity of fog to the camera. At this distance, fog will just begin to be visible in the scene. You do not need to erase existing values in order to enter new ones in the numeric field—just start typing. When the cursor appears in front of the current value, enter a new value directly and press Return. The new value will be accepted.

E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate fog moving either toward or away from the camera.

At 0, the fog begins right at the camera's location.

Fog Max Distance
Use Fog Maximum Distance to set the maximum thickness for fog, the point beyond which no objects can be seen. From this distance on, nothing but the fog color will be visible in the scene. You do not need to erase existing values in order to enter new ones in the numeric field—just start typing. When the cursor appears in front of the current value, enter a new value directly and press r. The new value will be accepted.

E (Envelope)
Select Envelope to go to the Envelope Editor. Here you can animate the maximum fog setting, moving solid fog closer to or further from the camera.

Backdrop Fog
Use Backdrop Fog when you want the backdrop colors to be used as the fog color. Objects in the scene will blend into the background colors, rather than blend into a solid fog color.

Backdrop Fog is a toggle. Click on it once to activate it (and deactivate Fog Color), click on it again to deactivate it.

Fog Color
Use Fog Color to set the color for fog. A good fog color would be (150, 150, 160). For the most realistic fog effects, use Backdrop Fog since fog will never hide the background (only the objects). This way, Backdrop Fog will blend the objects into the background colors, enhancing the feeling of fog.

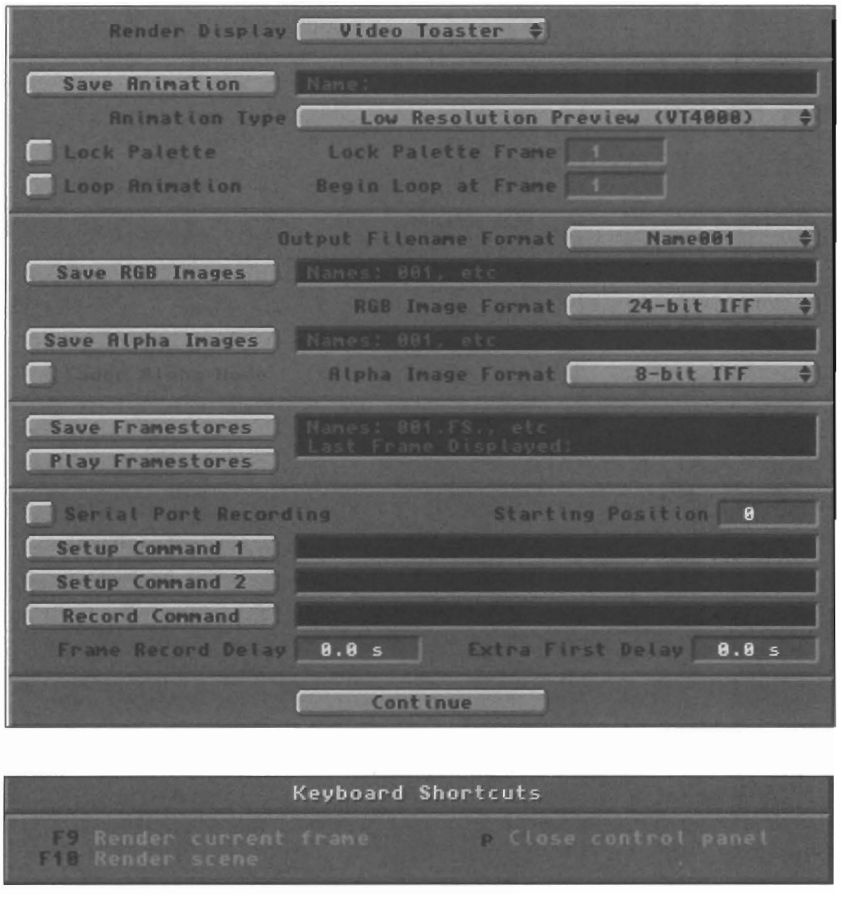
Dither Intensity
Dithering is the blending of two colors to simulate a third color between them, forming a more realistic blend. Dither Intensity allows you to set the amount of color blending used by LightWave when rendering an image. Even with 24-bits of color data, it is possible to perceive color banding where distinct changes in color or brightness occur within otherwise smoothly ramped colors. Off removes all dithering, and you will probably experience some color banding. Normal, the default setting, reduces banding to the point where it nearly disappears. 2x Normal increases the dithering even further, which may be useful for high-end systems that still retain some appearance of banding in the final image. 4x Normal boosts dithering so that the resulting image looks more grainy, like film, which may be a desirable effect (especially when used with Animated Dither, below).

Animated Dither
Select Animated Dither to change the dithering pattern used from one frame to the next. This ensures that dithering is randomly placed, so there is no apparent pattern to the dither blend. With a 2x Normal or 4x Normal Dither Intensity, this can be used to approximate the randomness of film grain moving through an image.

Color Saturation
Saturation allows you to control the amount of color in a scene (or in an animation, if using an Envelope). Saturation at 100% is a normal, full-color setting, while Saturation at 0% is a black and white setting. You do not need to erase existing values in order to enter new ones in the numeric field—just start typing. When the cursor appears in front of the current value, enter a new value directly and press r. The new value will be accepted.

The Record Panel

Use the Record panel to control various aspects of recording: saving images, alpha channels, and Framestores to a storage device, or sending the "record" command out to a single-frame controller.



◆ **Addendum** ◆

Output Filename Format

Buttons on the Record Panel

Following is a button-by-button description of the controls on the Record Panel.

Data Overlay and Data Overlay Label

The Data Overlay option allows you to place a descriptive title (of up to 20 characters) along with the current frame number in the lower portion of the rendered image. This is useful when you generate large numbers of animations for others to review and approve before final rendering. It can serve to identify the scene being rendered, and the specific frames you may wish to change.

Note that this option only works in low or medium res, whether you render 24-bit images or preview ANIM files. Also, it may be turned on or off by default with a configuration file option in the lw-config file.

If you do not input a Data Overlay Label, LightWave will only show you the frame number in the lower right hand corner.

Render Display (pop-up menu)

The Render Display pp-up allows you to pick from a list of supported output devices. You can choose None, in which case the rendered frame will not be displayed when rendered (useful if you are rendering and saving a series of frames) or any number of supported output devices or screen modes.

Note:

In order to take advantage of certain Display Devices, such as Toaster or Picasso II, the display device must be installed. Otherwise, you will be unable to select these options.

Save Anim File

Select Save Anim file when you wish to generate and save an animation that can be played back later. As with display devices, certain hardware is required to generate and use certain animations.

VT4000 ANIMs are 262,000-color animations that can be played back via the Video Toaster Switcher in an Amiga 4000 at either 30 frames per second or an even smoother 60 fields per second (depending on the method used to render the animation).

When you select one of these, LightWave will present you with a file requester, preset to the Toaster's Framestore directory (where Framestore images and LightWave animations are stored so that the Switcher can display them). LightWave will default to a name such as 100.FS.ANIM. Enter a different number (if required) and a text name that is 12 characters or less in length, and press r. Make sure to keep the ANIM name in the ###.FS.name format so the Toaster's Switcher will be able to find the completed animation. When you render the animation, LightWave will generate the animation and save it as directed.

LightWave offers you four kinds of animation that may be played on an Amiga 4000, based on the Anim Type you choose. See the chart below for specific information.

Anim Type	**Anim Size/Playback speed**
Super Low Res Preview	1/4 screen (centered) 30 frames per second
Low Res Preview	Full screen 30 frames per second
Medium Res Preview	Full screen 30 frames or 60 fields/sec*
Medium Res Overlay	Full screen (limited size) 30 frames or 60 fields/sec*
6-bit HAM Anim	Full screen Dependent upon CPU speed
8-bit HAM Anim	Full screen Dependent upon CPU speed

*The Medium Resolution Anim Types may be rendered with Field Rendering turned **on** for smoother-looking movement. Field Rendering will have no effect on the Super Low Res Preview or Low Resolution Preview types.

Super Low Res Preview
You will be able to play back an animation that is 1/4 of the screen in size at 30 frames per second. The image will be centered on your screen. This option generates the animation the fastest, and is recommended for quick previews of your work.

Low Resolution Preview
You will be able to play back an animation that fills the screen and plays at 30 frames per second. This option is useful when you need to see more of the screen image than the Super Low Res Preview allows.

Medium Resolution Preview
You will be able to play back an animation that fills the screen and plays at either 30 frames per second or 60 fields per second (with field rendering) as long as only about 1/4 of the visible screen area is undergoing changes. This frame-by-frame change of the screen display is known as delta information. If the delta changes in the animation are too great (for example, a bouncing basketball that fills the entire screen), you will be unable to play this animation back via the Switcher.

This kind of rendered animation is rendered at a higher resolution than the previous two. Therefore, the pixel size is smaller, and details appear sharper. The tradeoff is that you are limited in the amount of movement you can have within the scene. For example, if a flying logo moves on screen, then holds position while another elements flies on, the animation will work. If three separate logos move at once, the animation will likely fail. (LightWave will not generate any frames where movement is too great. Be aware that this may occur at any frame within the animation.)

As a reminder, to create smoother animations, activate Field Rendering before rendering.

Medium Resolution Overlay
This format is the same as Medium Resolution (above), but you will be able to play this animation back overlaid atop a video source. You will not be able to utilize true reflections, alpha channel shadows, or varying levels of transparency. The overlay is not antialiased beyond the resolution of the image itself.

When you select Medium Resolution Overlay, the entire background will be rendered invisible. This allows you to create a spinning globe effect or flying logo that flies over another video source. Nor can you have too much movement on screen at one time (just as for Medium Resolution). An example of this kind of animation effect is the over-the-shoulder spinning globe (one of the Switcher effects). You may also find that certain flying logo effects are also possible. You will have to do some experimentation. Note that moving light sources and moving the camera often cause a great deal of delta change—you may wish to avoid such maneuvers.

For example, if a flying logo moves on screen, then holds position while another elements flies on, the animation will work. If three separate logos move at once, the animation will likely fail. (LightWave will not generate any frames where movement is too great. Be aware that this may occur at any frame within the animation.)

As a reminder, to create smoother animations, activate Field Rendering before rendering.

6-bit/8-bit HAM Anim
Select either of these options to generate an Amiga-format IFF-compatible HAM animation. There are two forms of HAM, 6-bit (4096 colors) and 8-bit (256,000 colors). Select the format that your Amiga is capable of playing. Note that the Toaster cannot play back these two animation forms, you will need to do so through other software. There are many popular animation players, and many paint programs that can display HAM animations.

Lock Palette (and **Lock Palette Frame** number)
Select Lock Palette to lock the 256,000-color palette that LightWave uses when it generates an animation so that each

frame uses the same color map. Short animations and animations that do not have broad palette changes benefit when this option is turned on.

Enter a frame number to use for the master palette. This should be a frame with the most widely representative color information, so that you have as broad a spectrum of colors as possible for the entire animation. As an example, if you have an animation of a steel blue logo flying over black space, then settling above the planet Earth, you would want to lock the palette on a later frame that included the logo, space, and the Earth. If you locked the palette on the first frame, when there is nothing but black space, you will not have an ideal palette for the logo or Earth. There will not be as many color possibilities for the other objects in the scene, and the resulting animation may look less vibrant.

If your animation utilizes broad changes of color information (say it includes both a desert scene dominated by orange-yellow colors, and a cave scene dominated by deep blue colors), it may be preferable to leave Lock Palette off so that you have as broad a color sampling as possible.

Loop Anim (and Begin Loop at Frame number)
If you want the animation to repeat, select Loop Anim and enter a loop frame number. The resulting animation will play through, then repeat from this frame forward, when displayed from the Switcher.

Note Lock Palette and Loop ANIM are only available when rendering VT4000 style ANIMs.

Save RGB Images
Select Save RGB Images to save the rendered image(s) in the 24-bit file format chosen with the RGB Image Format pop-up menu. A file requester will allow you to select the location where the images will be saved, and to provide an image name. LightWave will automatically add a three-digit suffix to this name.

For example, images saved for an animation called "LogoSpin" will be saved as follows:
LogoSpin001
LogoSpin002
LogoSpin003, etc.

The numbering used is based on the frame number values set in the First Frame and Last Frame buttons.

If image saving is on when you save a scene, the image path (the location and name for the images to be saved) is retained within the scene file. The next time you load the scene, the output directory and image name will all be there. For safety reasons, to protect you from unintentionally writing over finished images, the Recording button will not be activated.

Save Alpha Images
Select Save Alpha Images to save an Alpha Channel image of the actual rendered image. A file requester will allow you to select the location where the images will be saved, and to provide an image name.

An alpha channel image is a grayscale image (usually 8-bit) whose luminance information is used to determine transparency levels and antialiasing for the corresponding color image. Selecting Save Alpha Images will save images in the selected Alpha Image Format. For additional information on the Alpha channel's use, see the introductory material at the beginning of the Effects panel.

Note:
If alpha saving is on when you save a scene, the alpha image path (the location and name for the alpha images to be saved) is retained within the scene file. The next time you load the scene, the output directory and alpha image name will all be there. For safety reasons, to protect you from unintentionally writing over finished alpha images, the Recording button will not be activated.

Fader Alpha Mode
Fader Alpha Mode is used to create images that can be used as a fade control for certain switchers that can use an alpha image as a fade control. These are different from normal Alpha Images.

Save Framestores
Select Save Framestores to save rendered frames in the Video Toaster Framestore format. Images saved with this button can be loaded directly by the Toaster Switcher (or ToasterPaint). A file requester will allow you to select the location where the images will be saved, and to provide a Framestore name suffix.

For example, frames saved for animation called "LogoTumble" will be saved as follows:
001.FS.LogoTumble
002.FS.LogoTumble
003.FS.LogoTumble, etc.
The numbering used is based on the frame numbers set in the First Frame and Last Frame buttons.

By rendering frames to a storage device, and using Play Frames to display them in sequence, less wear and tear is placed on the VCR when recording to a single-frame controller.

If framestore saving is on when you save a scene, the framestore path (the location and name for the images to be saved) is retained within the scene file. The next time you load the scene, the output directories and framestore names will all be there. For safety reasons, to protect you from unintentionally writing over finished framestore, the Recording button will not be activated.

Play Framestores
Use this button in conjunction with a single frame controller, to allow quick recall of rendered frames to be recorded to tape. Play Framestores only needs the prefix of the frame name. After you select a frame, *click in the filename window and* ***delete*** *the three-digit number along with the .FS.extension preceding the name*, then click OK.

The First Frame and Last Frame buttons (under the Scene button) will determine which frames are used, and the order in which they will be displayed.

Note:
You may need to use a delay value (set with Record Delay) to allow the single-frame controller and VCR to keep up, as the frames can come up very quickly. If you do so, remember to toggle the Recording button on, so that LightWave knows to use the value set in Record Delay.

Serial Recording
Serial Recording instructs the Toaster to send the "record" signal (via the serial port) to a single-frame controller for recording to tape.

Starting Position
Starting Position, which sets the starting frame position on the video tape, is only required if your single frame controller needs to receive a frame number from the computer. The value entered here would be the equivalent of a number 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 is added to this number to become the current frame number.

Record Setup 1
This sends a one-time command out of the serial port to the single frame controller. If your controller requires a single setup command, enter it here.

Record Setup 2
This sends a one-time command out of the serial port to the single frame controller. If your controller requires two separate setup commands, enter the second one here.

Record Command
This specifies the command string that gets sent out the serial port every time a frame is completed.

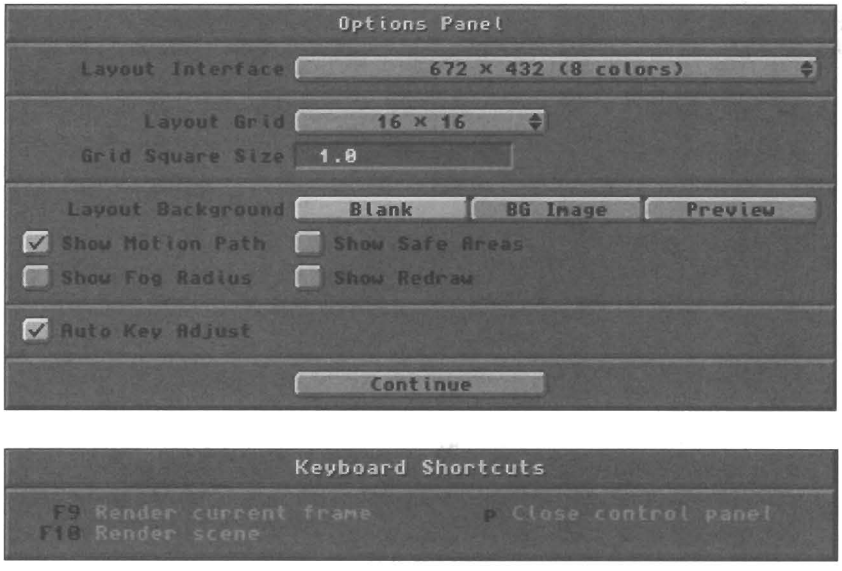
Frame Record Delay
This determines how many seconds LightWave will wait after sending the record command before starting on the next frame (to allow for preroll time on VTRs). For laser disc recorders, this could probably be zero. A typical VTR setting might be five seconds.

Extra First Delay
This extends the Record Delay for the first frame to allow for VTRs that need more time for the first preroll.

Note:
Single frame controllers should have documentation describing the record commands needed in order to function correctly with LightWave.

The Options Panel

With the Options panel you can tailor the appearance of the Layout screen to your liking. Turn on or off the display of objects, lights, motion paths and more. Any option button that appears lit is considered *active*.



Buttons on the Options panel.
Following is a button-by-button description of the controls on the Options panel.

Layout Interface (pop-up menu)
Using this pop-up, you can choose between the different screen resolutions and colors that LightWave and Modeler support.

Note:
Only certain monitors and graphics cards can handle certain resolutions. For instance, the standard 672x432 in 4 or 8 colors will work on a standard Amiga monitor. 800x600 will only work off of a graphics card and a Multisync monitor.

Layout Grid (pop-up menu)
The Layout Grid is the black wire frame reference grid that fills the Layout screen when you first enter LightWave 3D. This grid is a *reference tool* only, and it will not render as a part of any scene you create. It is extremely handy for indicating the horizon line, and for gauging distance as you manipulate objects in the scene.

Using this pop-up, you can choose from a 2x2 grid up to a 16x16 grid. Another option is to turn the grid off completely.

Grid Square Size
Grid Square Size adjusts the size of the squares for the Layout reference grid. It also affects the movement and rotation of objects in Layout. When the Grid Square Size is small, objects move in comparably small amounts. When the Grid Square Size is large, objects move in equally large steps. Occasionally you may need to adjust the Grid Square Size to position objects of widely varying sizes properly.

For example, if you load a very large object (the DC-10, for example) and a very small object (the apple) into the same scene, the Grid Square size will adjust itself for the larger object. If you then wish to place the apple just behind the cockpit window, you will find that the apple moves in steps that are too large for you to accurately place it just right. In such cases, go to the Options Panel and adjust the Grid Square Size to a smaller value. Afterward, you'll be able to position the apple with greater accuracy.

Layout Background
LightWave gives you the option of choosing how you want the Layout interface background to appear.

Blank
This is the default choice and will show nothing but the normal blank gray background.

BG Image
Select this button to toggle a 2-bit (dithered black and gray) representation of the image that was selected as the Background Image from the Effects Panel. This image is visible from the Camera view *only*. It can be used to help you align objects that need to be positioned properly with respect to the background image. It will also show when you render previews from the Camera's point of view.

Preview
Selecting this allows you to make the loaded preview the backdrop. As you move the Current frame slider, the background preview will update showing you a frame by frame match.

This can be incredibly useful when combining video footage with LightWave elements. You can load a video sequence into the Background Image (Effects panel) and generate a preview while the BG Image button is selected. you can then save this preview and later load it into a scene where you wish to combine LightWave elements with the footage.

Show Motion Path
Select this button to toggle the visibility of the motion path and keyframes *for the current active item* in Layout.

A motion path looks like a sequence of small white (+) symbols connected by light gray line segments. LightWave uses the + symbol to indicate a keyframe. A series of keyframes is connected by a line that displays the full motion path for the current object. Motion paths are subdivided into smaller segments corresponding to the number of frames between keyframes. Light-colored dots and medium-colored segments show the specific location of the object at each frame of the motion path, so that you can see the object's every position throughout its motion path.

When at a given keyframe for any item, hold down the t, c, or b key, and drag the mouse to alter the tension, continuity, or bias on screen for the current keyframe. The motion path will change on screen as you drag. This is extremely useful for editing motion paths without ever leaving Layout.

With Show Motion Path active for an object that is stationary during an animation, the graph will display a single keyframe symbol only, indicating that this is its only keyframe position. It has a stationary motion path.

Show Fog Radius
When you want to see the extent of the Maximum Fog Distance setting, turn this option on and go to one of the three orthographic views: XY, XZ, or ZY. You will see a circle that envelopes the LightWave camera. This circle indicates the radius beyond which all objects in the scene will be lost in fog (assuming your Max Fog Amount is set to 100%).

Note:
If you activate fog and the Show Fog Radius option, but do not see the indicator, check for the following conditions:

- Make certain that fog is turned on (either Linear, Nonlinear1 or Nonlinear2 must be selected).
- Make certain you are looking for the indicator in the XY, XZ, or ZY view only. It is not visible in any other view.
- Make certain that the scale is correct between the Grid Size and the Fog size. Your settings should allow the indicator to be visible somewhere between the camera and the objects in the scene. (As an example, if your scene is designed around a small grid size, say .1 (one-tenth) meter, and the Maximum Fog Distance is set to 10 meters, then the indicator will be huge, outside of the Layout scene display. Conversely, if the grid size is exceptionally large, and the Maximum Fog Distance is particularly small, the indicator may be too small to see.

Show Safe Areas
Select this button to toggle outlines on the Layout screen that indicate the Safe Text Area (the inner border) and the Safe Action Area (the outer border) for television. To allow for the differences in the display of different brands and designs of television sets, you should use this guide to ensure that text and action elements of your animations remain on screen when it is important that they be seen.

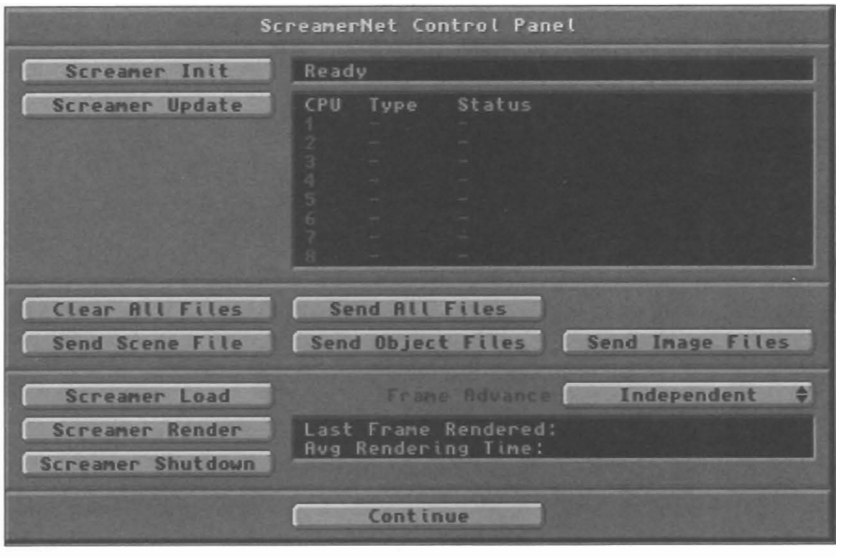
Show Redraw
LightWave has the ability to compute an object's appearance before displaying it in wire frame, or to show the object as it is being computed. Select this button to toggle the visibility of objects being redrawn in Layout.

Auto Key Adjust
With this option selected, changing an item's position, rotation or scale at any of its key frames will automatically rewrite the key with the updated information when you are finished.

This can be a nice timesaver when composing still images or initial keyframes, but can be a detriment when changing a position, etc. as a "test" too see if you like it.

The SN (ScreamerNet) panel

The ScreamerNet control panel is used when you have purchased ScreamerNet rendering software. ScreamerNet software allows you to remotely control up to 8 CPU's (MIPS, Intel, Alpha, etc) to render out LightWave images.





Buttons on the SN panel

Following is a button-by-button reference to the ScreamerNet control panel.

Screamer Init

The Screamer Init button is used to initialize the rendering engine (in this case, the Raptor). You should use this button when you first start LightWave.

Screamer Update

The Update Screamer LW button is used to update the version of LightWave installed on the rendering engine. You should only use this button when you are installing an updated version of LightWave 3D.

CPU Status window

This window shows the status of the CPUs that LightWave can communicate with via ScreamerNet. The display shows data for one to eight CPUs, the type of each CPU, and the activity status for each CPU.

Status messages include:

- *Initializing* (appears when you select Screamer Init)
- *Ready* (appears when CPU is idle)
- *Rendering Frame #* (appears when rendering)
- *Clearing* (appears when you select Clear All Files)
- *Offline* (appears when you select Screamer Shutdown)

Clear All Files

Use Clear All Files to remove the current scene from the rendering engine's hard disk. It's a good idea to select Clear All Files before sending a new scene (and its related files) to the renderer, so that you don't fill up its hard disk unnecessarily.

Send All Files

Use Send All Files to send the current scene, its objects, image maps, etc., to the rendering engine hard disk. This button transfers the scene and its supporting files to the remote system.

Send Scene File

Use Send Scene File to send only updated scene information to the remote system.

When would you use Send Scene File?

For example, suppose you have already used Send All Files to transfer data to the remote system; also, you selected Screamer Load to load the scene into the remote LightWave. After rendering a test frame, you decide to move the opening keyframe position of one object. Before rendering again, you would use Send Scene File to update the scene file for the remote system. (This saves a great deal of time. The alternative is to use Send All Files for every change, no matter how minor, which wastes time.)

After sending the updated scene file, select Screamer Load to update the remote version of LightWave before you render again.

Send Object Files
Use Send Object Files to send only updated object information to the remote system.

When would you use Send Object Files?
For example, suppose you have already used Send All Files to transfer data to the remote system; also, you selected Screamer Load to load the scene into the remote LightWave. After rendering a test frame, you decide to re-model one object and change one of its texture map images. Before rendering again, you would use Send Object Files to update the scene file for the remote system. (This saves a great deal of time. The alternative is to use Send All Files for every change, no matter how minor, which wastes time.)

After sending the updated object file(s), select Screamer Load to update the remote version of LightWave before you render again.

Send Image Files
Use Send Images Files to send only updated scene information to the remote system.

When would you use Send Image File?
For example, suppose you have already used Send ALl Files to transfer data to the remote system; also, you selected Screamer Load to load the scene into the remote LightWave. After rendering a test frame, you decide to change the background image map. Before rendering again, you would use Send Image Files to update the scene file for the remote system. (This saves a great deal of time. The alternative is to use Send All Files for every change, no matter how minor, which wastes time.)

After sending the updated image file(s), select Screamer Load to update the remote version of LightWave before you render again.

Note
If you update an image map that pertains to texture mapping for an object, you must use Send Object Files. Otherwise, images that are updated elsewhere in LightWave (such as for the background) only need the Send Image Files button.

Note:
If you do not have enough memory on your host machine to send all files at once, you would also choose to send files one group at a time.

Screamer Load
After you have sent a scene and its files to the renderer's hard disk, use Screamer Load to load it into the remote system's version of LightWave.

Any time you use one of the individual Send ... Files buttons to update the remote system files, you must then select Screamer Load to update the remote version of LightWave before you can render with the changes intact.

Screamer Render
Select Screamer Render to instruct the remote version of LightWave to begin rendering the current scene.

Screamer Shutdown
Select Screamer Shutdown to shut down the remote rendering engine. You must **always** select this option before powering down the remote system. The remote hard disk must be prepared for power off. Failure to do so may result in damage to the files on the disk, which might prohibit it from starting up the next time you turn it on.

Frame Advance pop-up menu
Use the Frame Advance setting to determine how the remote CPUs are used for rendering. There are three options.

Manual
All processors work on a portion of the same frame at one time. If one processor finishes early, it simply returns to its Ready state and waits. It does not "pick up the slack" of any other processor that is still working. The other processors must finish their rendering before you can continue working (unless you cancel rendering).

Automatic
All processors work on a portion of the same frame at one time. If one processor finishes early, it simply returns to its Ready state and waits until the other processors have completed the entire frame. Then all processors go to work on the next frame until all frames are finished or you cancel rendering.

Independent
Each processor works on an individual frame, one at a time, until all frames have been rendered or you cancel rendering. This method generally produces faster rendering times since each processor has fewer waiting periods.

Achieving Realism with Texture Mapping

Texture mapping is the overall term used to describe the application of an image or a textured appearance to a surface. There are several methods for texture mapping. Individually, they are not difficult to understand or master.

With LightWave, there are really only two considerations you need to think about—what effect you wish to achieve, and which kind of mapping to use. The effects LightWave can apply consist of the following:

Displacement —changing an object's shape to fit an image or a pattern.
Clipping —changing an object's shape by cutting away portions of it.
Surface Color —wrapping a surface with color, using either an image or a pattern.
Luminosity —making portions of a surface glow with their own intensity, using either an image or a pattern.
Diffuseness —varying the brightness of portions of a surface, using either an image or a pattern.
Specularity —affecting the highlights on a surface, using either an image or a pattern.
Reflectivity —causing a surface to reflect its surroundings or a specified image or pattern.
Transparency —making portions of a surface partially or fully see-through, using either an image or a pattern.
Bumpiness —causing a surface to appear bumpy or rippled, using either an image or a pattern.

Once you've chosen the effect, then you must choose the method for applying it:

An Image Map—This is a lot like wrapping a birthday present: you have a surface or shape to wrap (the object), and a roll of wrapping paper to cover it with (an image or a pattern). All you need to do is determine which method (out of the five available) you want to use to wrap the present.

A Procedural Map—This refers to the use of a pattern that is applied to the surface or object. More than this, it actually permeates the object surface, so that if you cut the object in two, the two inner halves would show the correct patterning also. There are nine procedural patterns within LightWave.

After selecting the type of map from the texture mapping control panel, other options will appear, allowing you to fine-tune the way the map is applied. This includes options such as the size of the texture, the location of its center, and more.

The most realistic-looking surfaces are typically the result of a combination of image maps applied to a surface. For example, if you map the wood paneling image onto a flat plane, it *will* look like wood paneling. However, if you *also* mapped the same wood paneling image using a Bump map, there would appear to be pits and depressions—irregularities—in the surface. This adds to the believability that it is a wood panel. Additionally, a Specular map would accent the apparent edges of those irregularities by adding specular highlights of light. You can see how, with a combination of maps, object surfaces can be made to appear *more real*.

The resulting "look" of a texture map is determined by the button you selected in order to access the map. For example, a Spherical Transparency Map is different from a Spherical Reflection Map. Both maps are spherical, yet they look very different because they were applied via a different surface quality button (Transparency versus Reflection).

How to apply a texture map to an object or surface
The way a texture map is applied to an object (or to a surface) is simple. Once you have loaded the object and selected the surface to modify, decide the net result of the effect you would like to apply to the surface. The descriptions within the manual should help give you an idea of the results you'll see, as well as the pictures in the manual. Let's assume you want to give an object the checkerboard pattern, with half the squares being transparent. You would select the T (texture) button beside Transparency, since this is the desired effect, then choose the Checkerboard pattern from the texture mapping control panel. Select and set up the options as you want, making sure to set the texture value at 100% (for total transparency of the pattern's squares). Then exit the menu and render the image to see your results.

As an example, load the scene named TextureExamples. Take a moment and step through the different surfaces that have been created. Note which ones have texture maps assigned (the T button will be highlighted to indicate this). Now render the image and see if you can connect the texture mapping settings with the cubes on screen.

Locate the surface CloudCube. Note the following settings: the cube's color is set to gray, with luminous on (so it appears self-lit), and Diffuse at 100%. These settings make

the object fully visible. Transparency is set to 0%. The highlighted T button beside Transparency indicates that there is a Transparency map active. Select Transparency, then select the Texture button. The texture type is Fractal Noise. Its Texture Value is set to 100%. Since this texture type was selected through the Transparency button, then the Fractal Noise texture will be mapped in such a way that the pattern it creates will be 100% transparent. (A lower setting for Texture Value would make the Fractal Noise pattern less transparent. For example, 0% would render a completely solid white cube, i.e., there would be no transparency).

Procedural texture patterns such as Fractal Noise use the texture value for its pattern, while the non-textured part of the surface uses the normal value for its surface. Therefore, for Fractal Noise, if Transparency is set at 50%, while its the Fractal Noise Texture Value button is set to 100%, then roughly half the surface will be 50% invisible, and half 100% invisible.

The texture map button beside each attribute will determine the effect of the texture on the selected surface. Multiple texture maps may be combined onto a single surface so that each has some added effect. Using Checkerboard from Transparency will map the checkered pattern in a transparent manner, while using Checkerboard from Reflection will map the checkered pattern in a reflective manner. The amount of luminosity, transparency, reflection, specularity, or diffuseness is set using values from the numeric field beside the Texture mapping button itself, and from the Texture Value button within the control panel of the texture map you select.

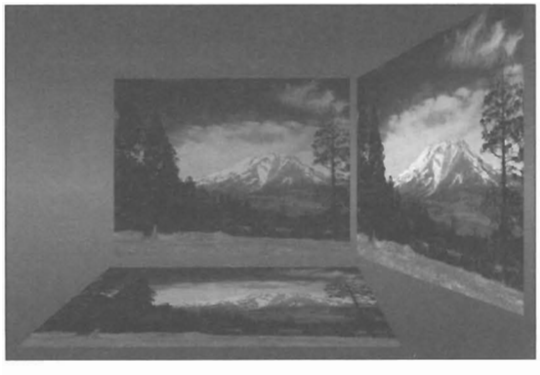
Texture Mapping Types in LightWave 3D

This section contains descriptions of LightWave 3D's texture maps: Projected Image Map and Procedural Pattern Maps. Afterward, you'll find the listing of all the texture mapping controls found on the texture control panels.

Projected Image Type Texture Maps

Following is a short description of each kind of projected image texture mapping featured in LightWave 3D. Remember that the T (texture) button that you use to get to the texture mapping control panels will determine the effect that the selected map will cause. In other words, select T beside Transparency to map transparency onto an item, select T beside luminosity to map luminous qualities to an item, select T beside Reflectivity to map reflection to an item, and so forth. Mapping types are applied in the same manner. It is the **attribute** that is being mapped that gives the different result..

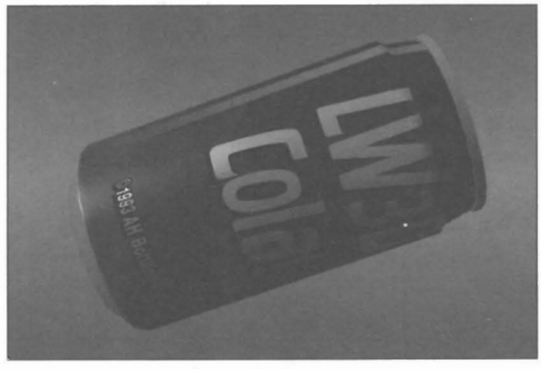
Numeric values for these settings are all expressed in the measurement unit of your preference. Since LightWave uses a base-10 numerical system, we recommend using meters.



A planar image mapped onto three flat planes, one for each axis- X, Y, Z.

Planar Image Map
(as a Displacement map, Clip map, Surface Attribute map, or Bump map)
Planar Image Map projects the image straight onto the object's surface, like a film projector projecting a slide onto a canvas screen. The image can be anything from a digitized picture of wood grain to an image created in ToasterPaint.

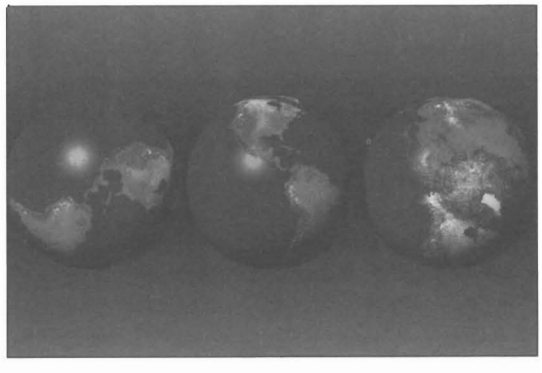
When to use Planar Image Mapping
This is best for flat surfaces such as billboards, dollar bills, sides of buildings, movie screens, etc. If the surface is completely flat, or very nearly flat, use a planar image map. (This is not a hard and fast rule, however. The result of a planar image map on rounded or oddly-shaped surfaces may be desirable.)



A cylindrical map applied to a soda can.

Cylindrical Image Map
(as a Displacement map, Clip map, Surface Attribute map, or Bump map)
Cylindrical Image Map projects the image outward, 360°, in a tube-like manner. In a Cylindrical Image Map the image is wrapped around the selected axis, like the label on a pop can.

When to use Cylindrical Image Mapping
This is best for tubular surfaces such as soda cans, barrels, pipes, rocket missiles, etc. (Again, this is not a hard and fast rule. Texture mapping types can overlap in their application. But this should give you an idea for a starting point.)

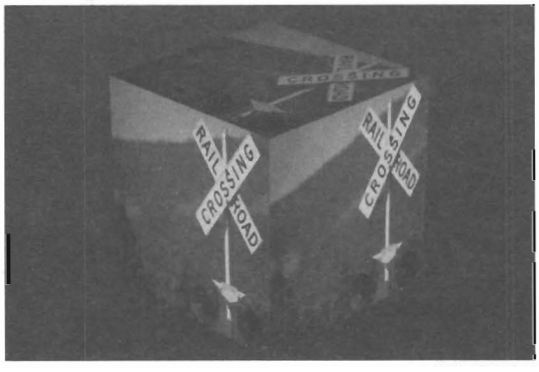


A spherical image of earth mapped onto three spheres, one for each axis, X, Y, Z. As you can see, it's important to select the correct axis in order to get the right look.

Spherical Image Map
(as a Displacement map, Clip map, Surface Attribute map, or Bump map)
Spherical Image Map projects the image outward in all directions from a single point. In a Spherical Image Map, the image is wrapped around the selected axis, like the label on a pop can, but the two ends are tucked in so that there is no excess.

When to use Spherical Image Mapping
This is best for rounded surfaces such as beach balls, planets, round knobs, etc. You might also use it on fairly curved surfaces that might not be perfect spheres, such as hemispheres or domes. (This is not a hard and fast rule. Texture mapping types can overlap in their application. But this should give you an idea for a starting point.) Also, it is a good idea to have a map that matches up so that it is seamless where the left and right edges meet.

Cubic Image Map
(as a Clip Map, Surface Attribute map, or Bump map)
Cubic Image Map projects the selected image onto the object's surface on all three major axes. The image can be anything from a digitized picture of wood grain to a picture created in Toaster Paint.



A cube with a cubic image map.

When to use Cubic Image Mapping
This is best for cubes of any dimension such as bricks, blocks, walls, buildings, etc. (Again, this is not a hard and fast rule. Planar mapping may be preferred, depending on your needs. Texture mapping types can overlap in their application. But this should give you an idea for a starting point.). Also, it is a good idea to use an image map with edges that match (top/bottom, left/right) so that the edges of the mapped object look correct.

Front Projection Image Map
(as a Clip Map, Surface Attribute Map, or Bump Map)
Front Projection Image Map projects an image straight into the scene from the camera's point of view onto the selected surface. This projected image is in essence pin-registered to the background, so that if you select the same image for the Background Image as you do for Front Projection Image Map, then the mapping on both the object and the background will line up perfectly. Note that it does not matter how the object is tilted, the image will always map evenly as if it was being projected from a slide projector.

Front projection is a production tool used often in Hollywood film work. Technically, it's a method of photographing live actors in the studio with a moving or still background shot elsewhere and projected onto a screen behind them. The name "front projection" comes from the fact that the background imagery is actually projected in from the front.

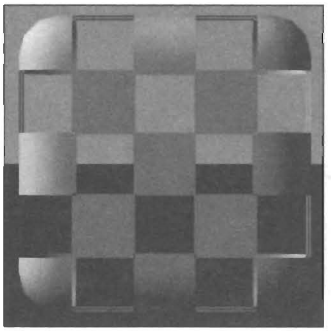
When to use Front Projection Image Map
Use Front Projection when you need to have an object appear "within" a scene when it might be otherwise difficult or time-consuming to model the remaining objects that make up the scene.

Here are a couple of examples:
Assume you need to have an object move behind a tree in a forest. You could grab a still frame of the forest, use it as a BG Image in Modeler, and trace around one of the trees to create a flat polygon in the form of the tree. Go to Layout and assign the forest image to the background, then load the tree and Front Projection map with the same forest image (you may need to position the tree to align it properly). Now, any objects that move between the tree and the background will be obscured by the tree.
Another use is when you need to have an object "interact" with the background. As in most cases, the image you use for the background is the same as the image you use for front projection. In this way, an object within the scene can slip "behind" the front projection mapped polygons as if you had cut slots in the image.

Procedural-Type Texture Maps

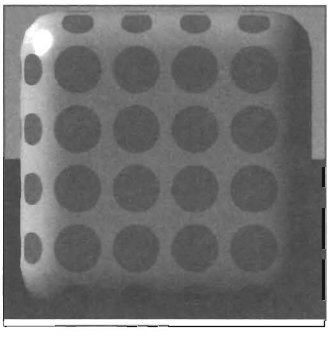
Procedural Texture Maps include those that must have their appearance calculated by LightWave, based on the specific parameters you select (texture size, frequencies, amplitude, etc.), rather than simply drawn onto a surface (as in image mapping). LightWave has nine procedural texture map types, described below. Note that not all procedural maps are available on every texture mapping panel; some are for specific uses only, and these are noted.

Numeric values for these settings are all expressed in the measurement unit of your preference. Since LightWave uses a base-10 numerical system, we recommend using meters.



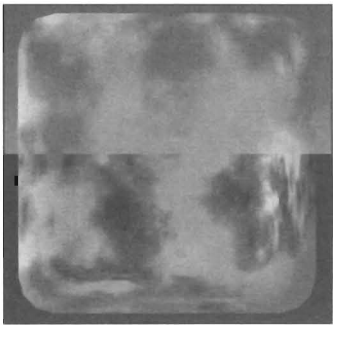
Checkerboard cube

Checkerboard
Checkerboard generates a tiled appearance on an object's surface, like that of a checker or chess board.



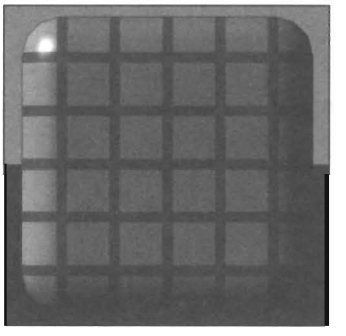
Dotted cube

Dots
Dots generates a pattern of dots on an object's surface.



Fractal Noise cube

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.

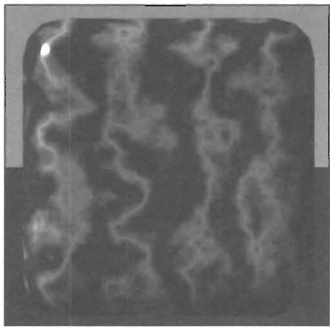


Grid cube

Grid
Grid generates a grid across an object's surface.

The grid is a three-dimensional grid. Therefore, there are lines projecting into *all three dimensions*. Often, users wish to have a 2D grid superimposed on an object's surface, such as the appearance of graph paper. In such instances where you use grid and see unwanted portions of the grid showing up, try expanding the size of the texture along that axis (this expands it off the surface of the object).

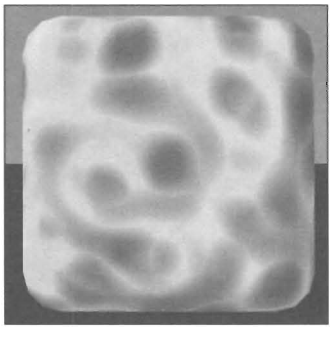
For example, if you load a 1-meter sphere in Layout, then map grid onto it, the texture size of the Z axis can cause the appearance of ripples that break up the nice graph paper look of the X and Y texture size. Use a texture size of .25, .25, 1.0 with all other values at their default and you will get the proper look. You may need to experiment.



Marble cube

Marble
Marble generates a marble pattern on an object's surface. The pattern is calculated in veins that wrap around a selected axis, much like rings wrap around the center of a tree.

A rule of thumb for using Marble: Start by selecting a Vein Spacing and Texture Axis that you like first, then set Frequencies, Turbulence, and Texture Size afterward. You may also wish to load the included Marble surface texture and simply resize its texture values to match your object.



Underwater cube

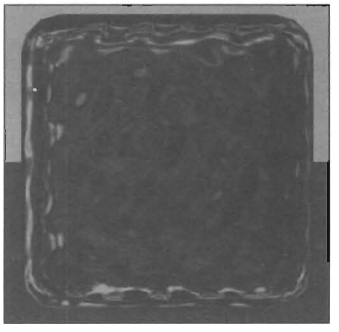
Underwater
Underwater generates a rippling pattern similar to the play of sunlight on the sides of a pool. You may think of Underwater as only useful for water effects. This is not so. It can simulate nighttime sky effects such as the Aurora Borealis, changes in cloud patterns, even electrical shocks. You'll find its patterns useful elsewhere as well.



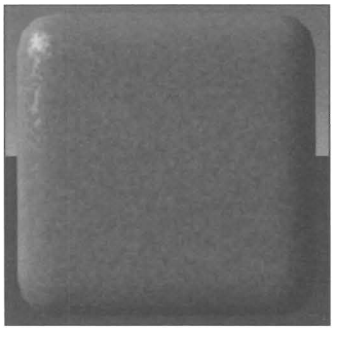
Wood cube

Wood
Wood generates a wood appearance on an object's surface.

A rule of thumb for using Wood: Start by selecting Vein Spacing and Texture Axis values that look good first, then set Frequencies, Turbulence, and Texture Size values afterward. You may also wish to load the included Wood surface texture and simply resize its texture values to match your object.



Ripples
The ripples map applies the appearance of fluid waves or ripples to a surface. Use it to simulate water, or to put a wave in a flag. Note that using a single Wave Source generates a single ripple, such as that of a water droplet falling onto the surface of a pond.



Fractal Bumps
Fractal Bumps maps an irregular bumpy pattern that may appear either raised or indented from the surface of objects.

Note about Using Fractal Bumps
Using a texture size that has one axis stretched (such as .1, .1, 10) will result in stretch or streak marks on the selected surface. This can be a way to "rough up" a clean looking surface, or provide the appearance of brushed metal.

Texture Mapping Parameters for All Texture Types

The texture mapping options available to you are roughly the same from texture to texture, with a few variations. Whether you choose a Checkerboard Transparency Map or a Ripples Displacement Map, the Texture Size option functions in the same manner. You use it to set the size of the map pattern.

Therefore, all of the texture mapping options are listed in the following section, with notes on specific textures where useful. When you enter a texture mapping control panel, if you need to refer to a specific function, turn to this portion of the manual for clarification.

Furthermore, the texture mapping buttons access the same basic control panel for all textures, with only a few variations. The important options on the panel are grouped into three main sections which may be described as follows: Texture Selection, Axis and Size Options, and Texture Parameters. For ease of use, the texture mapping options explained below are grouped in this manner.

Buttons on Texture Mapping Panels
Following is a description of the texture mapping options for all texture mapping panels.

Texture Type
Drag the pointer over the selector to choose your desired type of mapping. If you select a texture that requires an image as its mapped pattern, use the Texture Image pop-up button to choose the image.

Texture Image
Drag the pointer over the pop-up button to select the image or image sequence to use as the planar map. To be listed here, images must first be loaded from the Images button.

Texture Axis (and Size Options)
If the Texture you select requires a selected axis for mapping, use the Texture Axis buttons to select that axis. Depending on the texture type you select, some of these functions may not be available, since that texture type may not need them.

Planar Map
Select which axis to project the planar map along. Assuming the camera faces forward (the default camera direction), think of yourself standing in a room. To project onto the floor (or ceiling), select the Y axis; to project in directly front of you (or behind you), select the Z axis; to project to the left wall (or the right wall), select the X axis.

Cylindrical Map
Select which axis to wrap the cylindrical map around.

Spherical Map
Select which axis to wrap the spherical map around.

Marble
Select the axis which the rings of marble should wrap around. For instance, if the object is a Roman column standing upright, select the Y (up/down) axis so the rings will wrap around it properly.

Wood
This determines which axis the concentric ring pattern of wood will be wrapped around.

Automatic Sizing
Use Automatic Sizing to automatically calculate the proper fit between an image map and the surface size. Automatic Sizing will also place the Texture Center at the center of the surface. (Automatic Sizing will automatically set Texture Falloff and Texture Velocity values to 0. You may alter these afterward, but any values entered prior to selecting Automatic Sizing will be lost. World Coords will be turned off as well.)

Hint about Automatic Sizing
Automatic Sizing enters the values that it calculates into the X, Y, Z fields in the Texture Size button. Even if you intend to use a procedural map, you may wish to click on Automatic Sizing (on any of the image map panels) before selecting the procedural map texture. This often provides you with a good starting point for your texture size.

Texture Size
Use the X, Y, Z values to determine the size of the texture map on the selected surface. To ensure that the pattern is seen on the surface of the object, you may wish to use Automatic Sizing first. If the texture is too large (or too small), select Texture Size and enter smaller (or larger) values. You can also make any value negative "flip" the image (on any axis) and reverse the image map.

Checkerboard
Use Texture Size to set the size of each square in the pattern. For example, to see 10 checkerboard squares on the surface of an object, divide its length by 10. A 50-meter cube would yield a texture size of 5 to achieve 10 squares.

Grid
Use Texture Size to determine the space between the

lines in the Grid pattern. The size is in relation to the Grid pattern. For instance, a .3 texture size on a 1 meter surface would yield 3 grid lines across the surface, whereas a .1 texture size would yield 10 grid lines.

Dots
Use Texture Size to determine the spacing between dots for each axis. For instance, a .3 texture size on a 1 meter surface would yield 3 dots across the surface, whereas a .1 texture size would yield 10 dots.

Marble
Use Texture Size to determine the size of the marble pattern. The smaller the texture size, the more variance in the marble pattern. A good rule of thumb when first experimenting with marble would be to set this value to 1/2 the size of the Vein Spacing value.

Wood
Use Texture Size to determine the size of the wood pattern.The smaller the texture size, the more variance in the marble pattern. A good rule of thumb when first experimenting with wood would be to set this value to one-half the size of the Ring Spacing value.

Underwater
Use Texture Size to determine the size of the pattern that creates the individual ripples. Normally, Texture Size for Underwater should start at the size of the surface itself, and you can experiment from there.

Fractal Noise
Use Texture Size to determine 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. The Texture Size can vary greatly depending on what type of effect you are trying to achieve. In most cases, you'll want texture size to be some fraction of the surface size.

Ripples
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
This determines the central X, Y, Z coordinate of the pattern or image map. Normally, you want this to be the center of the surface being mapped (where Automatic Sizing places it). Some procedural patterns, such as Checkerboard, Grid, and Dots, are automatically offset so that the 0, 0, 0 center of the LightWave space falls inside the pattern.

Ripples
When Ripple mapping with one Wave Source, you may wish to offset the ripple using a different Texture Center coordinate. This would allow you to place a single ripple anywhere on a surface, rather than just in the center.

Front Projection Image Map
If you're using this image for the Background Image as well (the most often-used setting), Texture Center should be 0, 0, 0 in order to line up properly.

Texture Falloff
Texture Falloff determines the rate at which a texture map blends into the surface color value. The number you enter here is a percentage, specifying how much falloff should be apparent for every unit of distance moving away from the Texture Center. The falloff can occur along any one axis, along any two axes, or along all three axes.

Texture Velocity
Texture Velocity is used to move a texture across a surface. The default setting, 0, 0, 0, indicates no movement of the texture. Enter new values to shift the texture in an animation. You will not see this movement in a still image—only in an animation. It causes the texture to shift, by the distance entered here, for every successive frame in an animation. The shift can occur on any combination of the three major axes.

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. If the texture-mapped object moves, the texture map will appear to move across its surface (rather than remaining in place on its surface).

Texture Parameters
Texture Parameters include various settings that affect the resulting texture's appearance, such as the color of the pattern, the size of the bump map, etc. Depending on the texture type you select, some of these functions may not be available, since that texture type may not need them. Texture Parameters are listed alphabetically.

Amplitude
Ripples
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. Values for amplitude may be negative (for inverted bumps) or positive.

Fractal Bumps
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.

Antialiasing
Select Antialiasing to help eliminate the unwanted appearance of flicker 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, such as a receding checkerboard pattern, although it can help with other busy texture patterns and images as well.

Band Sharpness
Underwater
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.

Bump Strength
Crust and Veins
New parameter. Undocumented.

Contrast
Fractal Noise
This determines the contrast between the surface color and the noise color. The higher the level (above 1) the more pronounced the noise pattern is (like dark spots on a wall), whereas a lower value (between 0 and 1) produces a less visible pattern (like faint dust spots on a wall).

Coverage
Crust and Veins
New parameter. Undocumented.

Dot Diameter
Dots
This determines the size of the dots in the pattern.

Frequencies
Fractal Bumps
The frequencies value determines the complexity of the pattern. A low value will have a simple fractal pattern, whereas a higher value will increase the variation in the fractal pattern. With Bump Mapping it is not useful to use a value higher than 6.

Marble
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.

Wood
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.

Fractal Noise
Within the Fractal Noise Control Panel, Frequencies determines the level of detail produced in the noise pattern. Increasing this level will increase the variation in the fractal noise pattern. Values above 6 are not useful, may not be noticeable, and increase rendering time.

Height Tiling
Spherical Map
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.

Ledge Level
Crust and Veins
New parameter. Undocumented.

Ledge Width
Crust and Veins
New parameter. Undocumented.

Line Thickness
Grid
This value determines the thickness of the lines in the grid.

Negative Image
Select Negative Image to invert the color and luminance values of the image map. This is especially useful when bump mapping if the resulting bumps are raised the wrong way.

Pixel Blending
Select 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.

Ring Spacing
Wood
This determines the distance between between rings. A good rule of thumb here would be to make the Ring Spacing about twice the Texture Size.

Ring Sharpness
Wood
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.

Texture Color
(For Procedural Maps accessed via the T button beside Surface Color)

Checkerboard
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 main color field.

Grid
The color chosen here will be the color of the Grid lines themselves. The base color of the pattern (the squares between grid lines) is set in the Surface Color menu.

Dots
The color chosen here will be the color of the dot pattern. The base color of the pattern (the space between the dots) is set in the Surface Color menu.

Marble
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 Surfaces menu.

Wood
The color selected here will be the color of the rings in the Wood pattern. The base color (the wood color between rings) is set in fields beside the the Surface Color button.

Underwater
Select Texture Color to set the color for the Underwater ripple pattern. The base color of the pattern is set in the Surface Color menu.

Fractal Noise
Fractal Noise, like the other procedural textures, 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.

Texture Value
(For Procedural Maps accessed via the T button beside Luminosity, Diffuse Level, Specular Level, Reflectivity, or Transparency)
The value you enter here, along with the value specified in the main Surfaces field, form the low and high values for the texture map. For example, using Transparency as the form of mapping: assume the numeric field beside Transparency is 50%, and the Texture Value for Transparency is 100%. For the selected procedural pattern, the surface would be 50% transparent, and the texture would be 100% transparent.

Turbulence

Marble
The value specified here should be a fraction of the Vein Spacing value. It determines how close a vein may come to a neighboring vein. A good rule of thumb here would be to have the Turbulence set to 1/2 of the Vein Spacing value.

Wood
The value specified here is a percentage of the Ring Spacing. It determines how close a ring may come to a neighboring ring. A good rule of thumb here would be to have the Turbulence set to 1/2 of the Ring Spacing.

Vein Spacing

Marble
This determines the space between the veins.

Vein Sharpness

Marble
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.

Wave Sources

Underwater
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 useful.

Ripples
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 will create a single ripple pattern, like that of a water droplet falling into a pond. Values higher than 16 are not recommended; they require longer rendering time and may not add to the appearance of the texture.

Wavelength

Underwater
Wavelength controls the distance between the ripples. The lower the value, the closer the waves will appear to each other.

Ripples
Wavelength controls the distance between the ripples. The lower the value, the closer the waves will appear to each other.

Wave Speed

Underwater and Ripples

Wave Speed determines the rate at which waves spread 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.

In order to loop the movement of ripples throughout the course of the animation, use this formula to determine the proper Wave Speed: Wavelength divided by the number of frames over which the pattern should loop equals the Wave Speed, or:

$$\frac{\textbf{Wavelength}}{\textbf{\# of frames to loop}} = \textbf{Wave Speed}$$

Width Tiling

Cylindrical Map

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 Map

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.

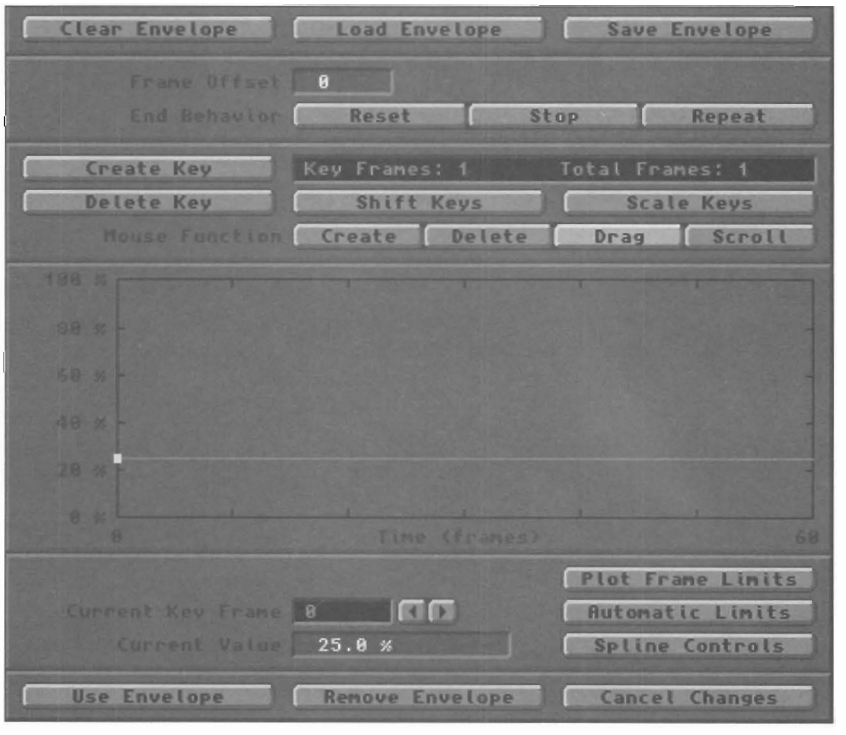
Animating Special Effects with the Envelope Editor

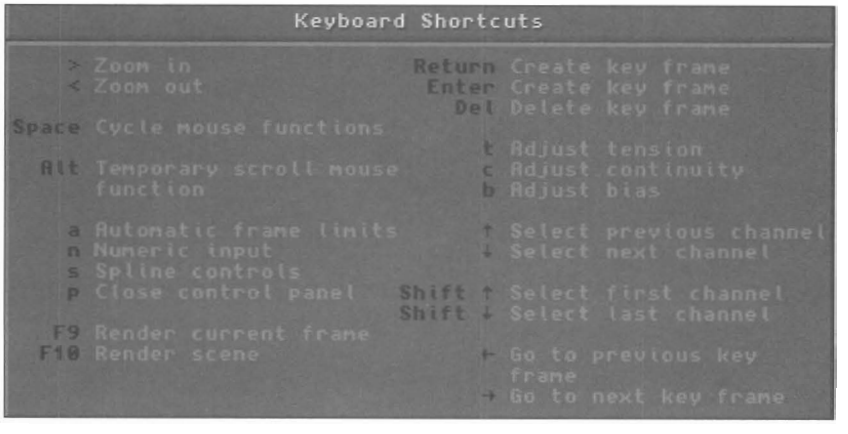
There are more than a dozen effects in LightWave that can be animated using an envelope. An envelope is a function of LightWave that allows you to alter the settings for an attribute over a series of frames. Like a scene, an envelope has its own keyframes that designate the status of the effect at a given moment. These keyframes affect their particular special effect only, not the motion or rotation of objects within the scene. Also like a scene, an envelope uses spline controls to make these changes either abrupt or gradual.

For example, one effect that may be controlled with an envelope is Light Intensity. These are just two examples of the versatility and usefulness of envelopes:

- If you wanted to simulate the effect of a scene gradually brightening as though the sun were rising in the morning, you could use an envelope for the primary light source. You might have only two keyframes for this envelope, one set at 0% (no light) and the other at 100% (fully lit), with spline curve representing the smooth increase in brightness.
- Alternately, if you wanted to simulate a railroad crossing light flashing at 3 times per second, you might have an envelope containing 30 keyframes, with the brightness changing suddenly, in a linear fashion, from 0% to 100% every 10 frames.

The following effects may be animated in LightWave 3D. They are each controlled by envelopes. They are listed by menu, to help you locate them. When you have used an envelope for a specific attribute or effect, the E button appears lit beside the effect name you have chosen.





The Objects Panel
Objects can change shape - *Metamorph Level*
Objects can change color - *Metamorph Level with Morph Surfaces*
Objects can dissolve in or out - *Object Dissolve*
An Object's polygons can change size, simulating explosions - *Polygon Size*

The Lights Panel
Lens Flares can globally ramp up and down - *Global Flare Intensity*
Ambient light can change brightness - *Ambient Light Intensity*
Light Sources can change brightness - *Light Intensity*
Lens Flares can change brightness - *Lens Flare Intensity*
Lens Flares can dissolve - *Flare Dissolve*
Spot Lights can change the width of their spot - *Spotlight Cone Angle*
Spot Lights can change the gradual softness of the edges of the spot - *Spot Soft Edge Angle*
Shadow-mapped spot lights can alter the spread of their shadow map - *Shadow Map Angle*

The Camera Panel
The Camera can zoom in or out on a scene - Camera Zoom Factor
The Camera can adjust its amount of blur - Blur Length
The Camera can change its focal distance - Focal Distance
The Camera can change its depth of field - Lens F-Stop

The Effects Panel
The foreground image can dissolve in or out - Foreground Dissolve
The front edge of Fog can move nearer or further from the camera - Fog Min Distance
The solid depth of Fog can move nearer or further from the camera - Fog Max Distance
The amount of fog at the minimum setting can be changed - Minimum Fog Amount
The amount of fog at the maximum setting can be changed - Maximum Fog Amount
Images can go from color to black-and-white - Color Saturation

Envelope editor

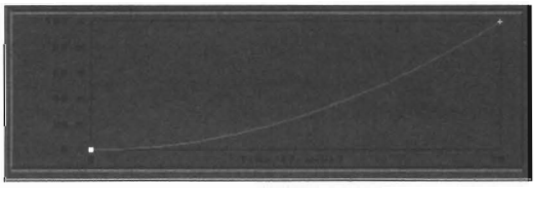
The basic functions of the Envelope Editor are these: to create keyframes, to determine the amount of change at each keyframe, to set up linear or spline changes, to scale keyframes, and to shift the effects of the envelope forward or backward in time.

All of your work is displayed on the large window called the Envelope Graph. There are both keyboard and mouse functions for the envelope editing. As you create keyframes, you will see small symbols that represent these designated frames appear on the graph. Each keyframe will be connected to those next to it by a line, indicating the gradual transition of the special effect from one keyframe to the next.

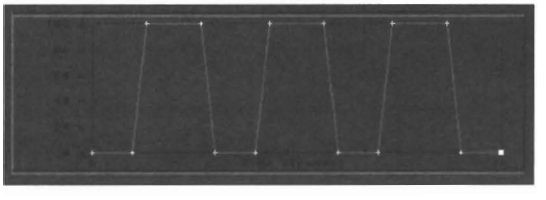
For example, here are two sample Envelope Graphs, showing the envelopes that were described at the beginning of this chapter: the rising sun envelope, and the flashing railroad light envelope. These envelopes also provide an example of the difference between the gradual changes formed by a natural spline curve (the rising sun), and the direct changes formed by a linear path (the flashing light).

Just as you created keyframes in Layout, you create them in the Envelope Editor. However, the keyframes utilized by the Envelope Editor are independent of the keyframes utilized by Layout. These keyframes are not motion-related frames. This means that while the items in Layout may be involved in any number of keyframes governing their movement, you can create keyframes here that govern these special effects separately. In other words, object movement can occur at different times and at different keyframes from, say, object metamorphosis. The two elements in this case, movement and metamorphosis, both affect the same object. They simply affect it on their own schedule, so to speak. You can see immediately how powerful LightWave is, with its ability to layer effects one atop another, and control each one independently.

The general procedure for creating an Envelope is simple and straightforward. You create a keyframe, then specify its value. Repeat this for as many frames as you desire. LightWave builds the display as you create new keyframes,



The rising sun envelope



The flashing light envelope

showing you graphically the results of your work. That's about it, really.

Here's an example, using the steps we used to create the flashing light envelope. This is a racehorse example, so there won't be any in-depth explanation of each step.

Setting up the scene and light source

- Load the railroad light (this object was created in LightWave Modeler previously).
- Go to the Lights Panel. Add a second light source to Layout.
- Designate this second light source as a Point Light Source (this is not necessary, but it will make it easier to place the light source symbol in the proper position on screen).
- Turn on Lens Flare for this light source. We turned off all options except for Central Glow, since we just wanted the lamp to glow nicely.
- Go to Layout and place the Point Light source within the railroad lamp housing.

Editing the Envelope

- Return to the Lights Panel, go to Lens Flare Options, select Flare Intensity, and select Envelope.
- The Current Keyframe is 0. Select Current Value, and change it from 50 to 0. Return.
- Select Create Key. Enter 7. Return. Do the same and create keyframes at 12, 19, and 24. Notice that every new keyframe created has the same value as the current keyframe.
- Select Create Key. Enter 1. Return.
- Select Current Value. Enter 100. Return. This sets keyframe 1 to 100% brightness.
- Select Create Key. Enter 6. Do the same for 13, 18, 25, 30. Again, notice that every new keyframe created has the same value as the current keyframe.
- The last step is to go from keyframe to keyframe, select Spline Controls, and activate the Linear button. This ensures that all light changes occur in straightforward, abrupt steps. On, off, on, off.

Buttons on the Envelope Panel

Following is a button-by-button description of the controls in the Envelope Editor.

Clear Envelope

Click Clear Envelope to clear any envelope values for the current object. This removes all values from the current envelope. Note: Clear Envelope will not delete any envelope files from your hard drive.

Load Envelope

Click Load Envelope to load a previously saved envelope to the current object.

Note:

You should be aware that a 30-frame envelope, loaded into a 90-frame scene, will need its keyframes adjusted (or a Frame Offset value) so that its effects occur at the proper times, since its timing is based on thirty frames overall.

Save Envelope

Click Save Envelope to save the current envelope for future use on other objects or effects.

Frame Offset

Frame Offset is a temporary shift in time for the current envelope. As with image sequences, if you enter a Frame Offset of 10, frame 10 of the envelope will appear at frame 0 of the animation. If you would like frame 0 of the envelope to appear at frame 10 of the animation, you would enter a Frame Offset of -10. The simple rule to follow here is to add the Frame Offset value to your First Frame (Scene Panel) value to determine where the first frame of your envelope will occur. If you have Repeat selected for your End Behavior, the Frame Offset will only occur once at the beginning of the animation. After the initial run through the envelope, it will repeat again starting at the 0 frame value.

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

Reset will reset all object values in the frame immediately after the final Keyframe. X, Y, Z (position) and H, P, B (direction) reset to zero. Object size resets to a factor of one.

Stop

Stop will cause the object to stop, leaving it where it is upon reaching its final Keyframe.

Repeat

Repeat will have the object loop back to the beginning of the envelope and repeat until the end of the animation (if it is shorter than the animation itself).

Create Key **Return or Enter**

To create a Keyframe, click this button, enter the frame number, and click OK. Like scene files, there is always a keyframe at frame 0 for envelopes as well.

Delete Key **Delete**

To delete a Keyframe, click this button, enter the frame number, and click OK. Note that you cannot delete the Keyframe at frame 0.

Shift Keys

With Shift Keys you can shift the keyframes either forward or backward in time. You have a choice of performing this shift on either the entire envelope (all frames after frame 0) or on a range of user-specified keyframes.

Low Frame

Enter a number for the first keyframe to be shifted.

High Frame
Enter a number for the last keyframe to be shifted.
Shift Frames By
Enter the number of frames to be used for the shift.
Shift Values By
Enter a number to be either added to or subtracted from the value for each keyframe.

Scale Keys
Scale keys allows you to multiply the keyframes within the envelope, stretching or compressing it over time. For example, suppose you wanted a 30-frame (1 second) envelope to occur over 90 frames (3 seconds) instead. Select Scale keys, and enter 3 to expand the envelope from 30 frames to 90 frames. The envelope still occurs only once, except that now it will take 3 seconds to occur.

Low Frame
Enter a number for the beginning keyframe to be scaled.
High Frame
Enter a number for the ending keyframe to be scaled.
Scale Frames By
Enter a multiple to scale frames by. For example, a value of 10 will multiply the length of the animation by 10 times. A value of .1 will reduce it to one-tenth its current length.
Scale Values By
Enter a number to be multiplied by the value for each keyframe.

Mouse Functions
The Envelope Graph can be operated with the mouse in much the same way that you manipulate objects on the Layout screen. There are four mouse functions available here for interactive editing of the graph. Furthermore, if you hold down the t, c, or b keys on the keyboard, you can drag the mouse to adjust tension, continuity, and bias interactively.

Create (keyframe)
Left-click to create a keyframe in the envelope graph. Keyframes are created at the nearest frame to the pointer.

Delete (keyframe)
Left-click to delete a keyframe in the envelope graph. You must click on the keyframe you wish to delete.

Drag (keyframe)
Left-drag (up/down) on a keyframe symbol to adjust the value of the keyframe in the envelope graph. Right-drag (right/left) on a keyframe symbol to adjust the time-location of the keyframe. In essence, you are moving the keyframe through time in the envelope graph. A keyframe may be moved to an earlier or later time location. It may not be dragged beyond its neighboring keyframes.
Left- and right-drag (with both buttons held down) to affect both values at the same time.

Scroll (keyframe)
Left-drag (left/right) scrolls the entire motion graph display.

The Envelope Graph
The Envelope Graph shows the current envelope in a graphic form. The left side displays the value at the keyframe, in increasing or decreasing percentages. Increments of time are shown across the bottom of the graph.

Current Keyframe
Click the left/right arrows beside this window to advance to the next keyframe or step back to the previous keyframe.

Current Value **n**
Press n to activate the Current Value numeric field, or click Current Value to set the percentage amount of effect that should be present for the current keyframe. Generally, 0 means that there is no visible effect at this keyframe, while 100 means the effect is fully apparent. Different envelopes use 0% and 100% differently, however, so be sure to see the comments for each envelope in the manual to be certain.

Plot Frame Limits
Plot frame limits sets the first-frame and last-frame shown in the envelope graph. This allows you to view an entire time line within the window, or zoom in and view only a limited portion of it.

For example, if you have a 180-frame envelope, and you want to see it all displayed in the window, set the frame limits to 0 and 180. If instead you wish to see a small portion of it, set the limits to 30 and 50, for example. The graph will then show frames 30 through 50 only.

Automatic Limits **a**
Automatic Limits will automatically fit the entire envelope to the graph, no matter how many keyframes have been designated.

Spline Controls **s**
Spline Controls are advanced animation tools use to fine-tune envelope changes. For specific details about the use of spline controls, and their function, see "Advanced Animation with Spline Controls."

You can adjust tension, continuity, and bias independently by holding down the appropriate key on the keyboard and dragging with the mouse while watching the Envelope Graph.

Tension **t**
(Values: -1 = low tension, 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

keyframe, and to accelerate (resume speed) as it passed. Without tension the object would pass through the keyframe position at a constant speed.

Continuity **c**
(Values: -1 = sharp , 0 = normal , 1 = smooth)
Continuity is use to accentuate a break or change in an object's motion path.

There are hardly any cases where you would want to use a positive continuity—this will cause an object to overcompensate as it passes through the keyframe and appear to stutter or "roller coaster" at the frame.

Bias **b**
(Values: -1 = more slack incoming, 0 = equal slack, 1 = more slack outgoing)
Bias controls the slack at keyframes that is the nature of spline paths. This serves to accentuate motion: the incoming motion by undershooting the keyframe (creating a feeling of anticipation) or the outgoing motion by overshooting the keyframe.

Linear
Select Linear to remove the gradual, smooth nature of spline curve changes and replace it with more direct, sudden change. Linear affects the changes between current keyframe to the previous keyframe only. By turning Linear on or off at different keyframes, envelopes may contain both gradual and sudden changes.

Exiting the Envelope Editor Panel

Use Envelope
Exit the panel and use the current settings. (This is the same as clicking on another panel. Any changed settings are accepted and used.)

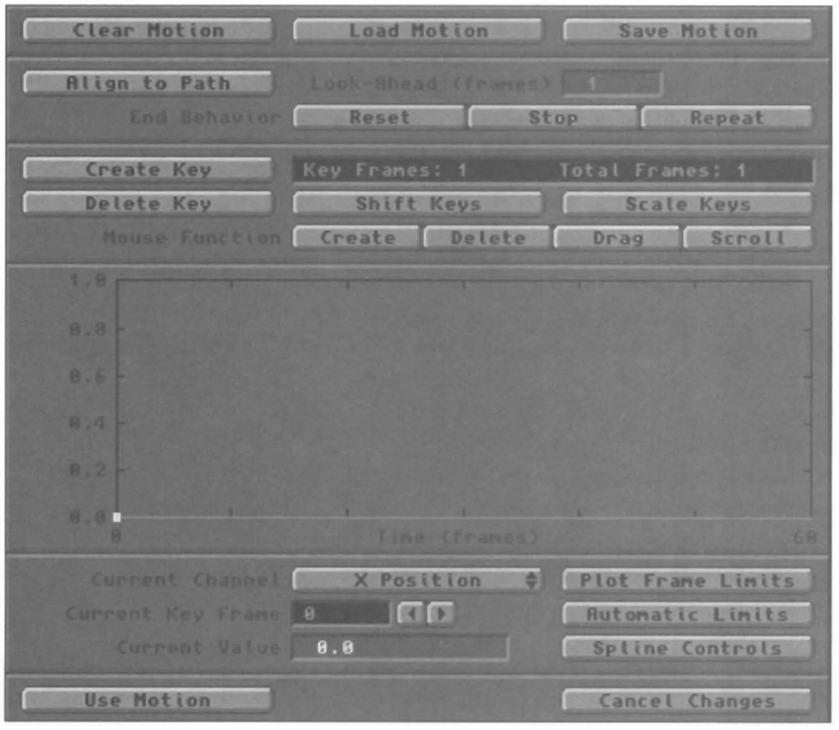
Remove Envelope
Exit the panel and turn off the envelope settings (as if they were never set).

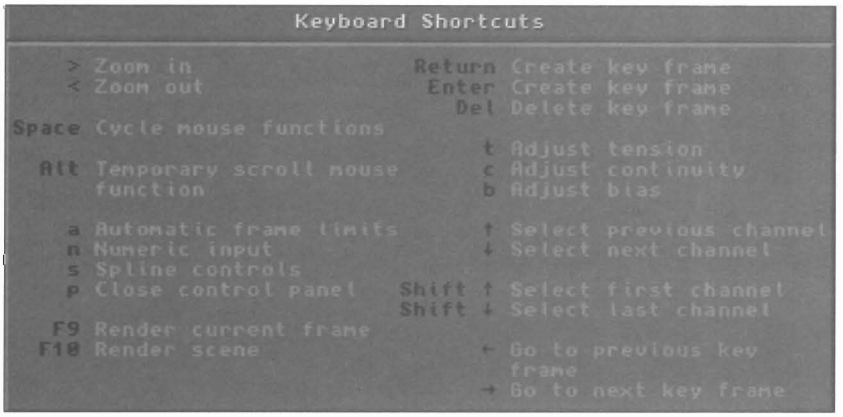
Cancel Changes
Exit the panel, and ignore any changes that were made while it was open. The previous settings remain in effect.

Fine-Tuning Motion Paths with the Motion Control Editor

In Layout, when you place objects and designate Keyframes, you are creating a *motion path* for those objects. A motion path is a set of keyframes containing object position and orientation information. When you save the Scene, LightWave stores this information within the saved file so that it can recreate the motion the next time the scene is loaded.

You can go to the Motion Control Editor for any object, bone, light source, or the camera at any time within Layout by pressing m on the keyboard when the proper item is active, or by selecting the Motion button from the Layout screen or that item's main menu.





The Motion Control Editor allows you to alter the settings governing an object's motion and position in the course of an animation. You can fine-tune the motion path's characteristics visually, looking at a single channel of information as a line drawn across a graph.

This is useful for applying that motion path to other objects at another time, or other objects within the scene that need to mimic a certain motion (such as a squadron of space fighters following the lead fighter). Only objects, lights, and the camera can have motion files.

You can display the Motion Control Editor from the Motion Graph button on the Layout screen, or by pressing the letter m on the keyboard. (Note that the currently selected item must be of the type that has a motion associated with it. You cannot be editing the View and select m, for example.)

The basic functions of the Motion Control Editor are these: to create keyframes, to determine the amount of change at each keyframe, to change keyframe values or occurrences in time, to set up linear or spline changes, and to move the motion path forward or backward in time.

All of your work is displayed on the large window called the Motion Control Graph. There are both keyboard and mouse functions for the motion path editing. As you create keyframes, you will see small symbols that represent these designated frames appear on the graph. Each keyframe will be connected to those next to it by a line, indicating the gradual transition of the motion path from one keyframe to the next.

The Motion Control Editor provides a method of looking at the motion of an item displayed on a graph in two dimensions. You have the same capabilities of creating, modifying, and deleting keyframes in the Motion Control Editor as you do from Layout. The changes you make are reflected by the appearance of the graph, as you adjust the manner in which the item behaves. The advantage of the Editor is that you can study and fine-tune individual aspects of an object's motion with greater clarity and detail. The reason for this is that the Motion Control Graph displays a single element at a time (X, Y, Z position, H, P, B angle, and for some items, X, Y, Z scale).

Here's an example of one use for the Motion Control Editor. How would you move an object from one keyframe to the next, and have it slow down as it reached its resting position? Traditionally, you would need to move the object a bit, make a keyframe, move it a little less, make a keyframe, move it a little less, etc., until it had reached its final position. Not only is this tedious, but difficult! Using the Motion Control Editor, you can make slight or sudden changes in an object's behavior more easily. Once you grow familiar with these aspects of animation, you'll be able to make such changes directly in the Layout screen, since the same controls also work there.

How do you read the Motion Control Graph ? Actually, it's very simple. It displays the changes of a single setting, remember (X, Y, Z position, H, P, B angle, or X, Y, Z scale), and the range of that change. Let's assume the simplest of motion paths: a bouncing ball originally set up on the Layout screen. It bounces straight up and down in one place, so that the only motion change it undergoes is its Y position (up and down). It does not move on X (left or right) or Z (toward or away). At frame 1 the ball is at 10 meters, and at frame 15 it is at 0 meters, and at frame 30 it is at 10 meters again. It starts in the air, drops downward, then bounces back up.

In the Motion Control Editor for this motion path, the X and Z channels would show three keyframe symbols, at frames 0, 15, and 30. The value for each keyframe is zero. Therefore, the motion path connecting these symbols is a straight line, indicating no change from keyframe to keyframe. Since there is no change for the X and Z position of the ball, the graph shows those channels as a straight line. However, the Y channel would show a different picture. The Y channel would also show three keyframe symbols at frames 0, 15, and 30. In this case, however, the value at keyframe 0 is ten, the value at keyframe 15 is zero, and the value at keyframe 30 is ten. LightWave draws a smooth curve from the high value in frame 0 to the lower value in frame 15 and back up to the higher value in frame 30, a broad U-shaped curve showing the changes in the Y channel. This is a graphic representation of the Y movement of the motion path.

The smoother the curve of the graph, the more gradual the change for a given channel. The less smooth the curve, the more sudden the change. This can be fine-tuned using Spline Controls.

It's important to know that a motion path contains the object's X, Y, Z position at various keyframes. Applying the motion path from Object A to Object B means that both objects will occupy the exact same coordinates in 3D space. Although this sounds like a mistake, it is not. If you had created an animation using one object, then decided to recreate it with another, you could load the new object, load the old motion path to it, and have the object follow the exact path instantly.

But if instead you desired to have one object mimic another without occupying the same location, you would have to change that motion path in the Motion Control Graph to move the object some distance away. For this kind of replicated motion, you have two options: use hierarchical motion (where one object duplicates another's motion exactly) via the parent button, or use the motion path from the first object loaded onto the second object (with some amount of X-Y-Z position offset so that they do not overlap). To achieve the latter, load the motion path from the original object to any other objects in the scene. Use the Shift button to shift the values of a few channels to move each object a certain distance away from the main object. The result will be a group of objects following the same path, but remaining a certain distance from one another.

Parenting and motion paths result in similar effects, although there are subtle differences depending on the motion of the objects. Two jet fighters perform two perfect barrel rolls, side by side, when using the same motion path with a slight positional offset in every keyframe. But the

same two planes parented don't act the same way. The parent will barrel roll in a perfect circle while the child swings around it, fixed beside the outside wingtip. The parent plane will rotate on its center axis, or center of gravity. The child plane now shares the same axis, which is off to one side of it (centered on the parent plane), so it performs its barrel roll in a wide sweeping arc.

Following is a button-by-button description of the controls in the Motion Control Editor .

Clear Motion
Click Clear Motion to clear any Motion values for the current object. This removes all values from the current Motion.

Note:
Clear Motion will not delete any Motion files from your hard drive.

Load Motion
Click Load Motion to load a previously saved Motion to the current object.

Note:
You should be aware that a 30-frame Motion, loaded into a 90-frame scene, will need its keyframes adjusted (or a Frame Offset value) so that its effects occur at the proper times, since its timing is based on thirty frames overall.

Save Motion
Click Save Motion to save a Motion file for future use with other objects.

Frame Offset
Frame Offset is a temporary shift in time for the current Motion. If you had set up a Motion, and wanted it to begin 150 frames into the animation, you would enter 150 here. The first keyframe will remain as-is for frame 0, but all other keyframes will have been shifted by 150 frames. The remainder of the motion path will last for the designated number of frames, using the proper repeat value set in End Behavior afterward.

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
Reset will reset all object values in the frame immediately after the final keyframe. X, Y, Z (position) and H, P, B (direction) reset to zero. Object size resets to a factor of one.

Stop
Stop will cause the object to stop, leaving it where it is upon reaching its final keyframe.

Repeat
Repeat will have the object loop back to the beginning of the Motion and repeat until the end of the animation (if it is shorter than the animation itself).

Align to Path
Align to Path will cause the selected object to align itself to the motion path that it is travelling. For example, if you create a motion path for an airplane, you want to jet to "face forward" as it banks into a turn. Normally, you would need to position/rotate the plane at every keyframe. With Align to Path, the jet will always face its motion path. To determine how far ahead the object faces it path, use the Look Ahead button.

Look-Ahead (frames)
Look Ahead determines how far ahead of itself an object "looks" as it travels a path, when Align to Path is activated. An object looking 3 frames ahead will smoothly round a corner as it travels through the turn, whereas as object looking 15 frames ahead may appear to "turn out" of the corner before it has actually travelled through the turn itself.

Create Key **Return or Enter**
To create a Keyframe, click this button, enter the frame number, and click OK. Like scene files, there is always a keyframe at frame 0 for motion paths as well.

Delete Key **Delete**
To delete a Keyframe, click this button, enter the frame number, and click OK. Note that you cannot delete the Keyframe at frame 0.

Shift Keys
With Shift Keys you can shift the keyframe values for the current channel. You have a choice of performing this shift on either the entire motion path or a range of user-specified keyframes.

Low Frame
Enter a number for the beginning keyframe to be shifted.

High Frame
Enter a number for the ending keyframe to be shifted.

Shift Frames By
Enter the number of frames to be used for the shift.

Shift Values By
Enter a number to be either added to or subtracted from the value for each keyframe of this channel. For example, if you are editing the Y position channel, and you enter 1 here, the Y position of the selected item will be raised by 1 meter throughout the animation.

Scale Keys
Scale keys allows you to multiply the keyframes within the motion path, stretching or compressing it over time. For example, suppose you wanted a 30-frame (1 second) motion path to occur over 90 frames (3 seconds) instead.

Select Scale keys, and enter 3 to expand the motion path from 30 frames to 90 frames. The motion path still occurs only once, except that now it will take 3 seconds to occur.

Low Frame
Enter a number for the beginning keyframe to be scaled.

High Frame
Enter a number for the ending keyframe to be scaled.

Scale Frames By
Enter a multiple to scale frames by. For example, a value of 10 will multiply the length of the animation by 10 times. A value of .1 will reduce it to one-tenth its current length.

Scale Values By
Enter a number to be multiplied by the value for each keyframe of this channel. For example, if you are editing the Y position channel, and you enter 5 here, the Y position of the selected item will be multiplied by 5 meters throughout the animation so that it is 5 times higher.

Mouse Functions

The Motion Graph can be operated with the mouse in much the same way that you manipulate objects on the Layout screen. There are four mouse functions available here for interactive editing of the graph. Furthermore, if you hold down the t, c,or b keys on the keyboard, you can drag the mouse to adjust tension, continuity, and bias interactively.

Create (keyframe)
Left-click to create a keyframe in the Motion Graph. Keyframes are created at the nearest frame to the pointer.

Delete (keyframe)
Left-click to delete a keyframe in the Motion Graph. You must click on the keyframe you wish to delete.

Drag (keyframe)
Left-drag (up/down) on a keyframe symbol to adjust the value of the keyframe in the Motion Graph.
Right-drag (right/left) on a keyframe symbol to adjust the time-location of the keyframe. In essence, you are moving the keyframe through time in the Motion Graph. A keyframe may be moved to an earlier or later time location. It may not be dragged beyond its neighboring keyframes.
Left- and right-drag (with both buttons held down) to affect both values at the same time.

Scroll (keyframe)
Left-drag (left/right) scrolls the entire Motion Graph display.

The Motion Graph

The Motion Graph shows the current motion path in a graphic form. The left side displays the amount of motion, in increasing or decreasing percentages. Increments of time are shown across the bottom of the graph.

Current Channel
The Current Channel pop-up menu allows you to select a specific attribute of the current object's motion path for viewing and editing. There may be up to ten entries in this menu, as explained below.

Velocity
Velocity allows you to adjust the speed of an object's movement by shifting individual keyframes left or right along the timeline. Dragging a keyframe in the velocity channel shifts the keyframe's occurrence in time (so that the keyframe is reached either sooner or later by the object traveling the path). This serves to speed up or slow down an object as it passes through the location defined by the keyframe, depending which direction you adjust it.

Time appears horizontally across the bottom of the graph (in frames). Velocity appears vertically along the left edge (in meters-per-frame). Adjust velocity by dragging a keyframe to the left or the right with the right mouse button. As you drag, the graph will adjust its appearance to display the new velocity setting. Shortening the distance between keyframes increases the velocity of the object for that interval. This is indicated by a rise (or hill) on the graph to show the higher speed between keyframes. Lengthening the distance between keyframes levels out the object's rate of travel, as indicated by a straight (or nearly straight) line between keyframes to show a rate of speed that is more steady.

Note:
If there is no movement between two keyframes, adjusting the velocity will not create a rise since there is no movement to affect.)

Tip:
Use the Tension control to adjust the velocity up or down at any keyframe. a Tension of 1.0 will slow the velocity down to 0.

X, Y, or Z Position
Select one of the position channels to edit an object's current position. Adjust the value for the current keyframe by dragging with the left mouse button in the motion graph editor. This is equivalent to working with a single channel at a time in Layout—selecting the Move button, selecting one of the three axes, and dragging with the left mouse button to position an object.

H, P, or B Angle
Select one of the angle channels to edit an object's current rotation on that axis. Adjust the value for the current keyframe by dragging with the left mouse button in the motion graph editor. This is equivalent to working with a single channel at a time in Layout—

selecting the Rotate button, selecting one of the three axes, and dragging with the left mouse button to position an object.

X, Y, or Z Scale
Select one of the scale channels to edit an object's current size on that axis. Adjust the value for the current keyframe by dragging with the left mouse button in the motion graph editor. This is equivalent to working with a single channel at a time in Layout—selecting the Stretch button, selecting one of the three axes, and dragging with the left mouse button to position an object.

Current Keyframe
Press the left or right arrows keys, or click the left/right arrows beside this window to advance to the next keyframe, or step back to the previous keyframe.

Current Value
Click Current Value to set the percentage amount of effect that should be present for the current keyframe. A value of 0 means that there is no change at this keyframe, while any other value means there has been an change in this channel.

Plot Frame Limits
Plot frame limits sets the first-frame and last-frame shown in the Motion Graph. This allows you to view an entire time line within the window, or zoom in and view only a limited portion of it.

For example, if you have a 180-frame motion, and you want to see it all displayed in the window, set the frame limits to 0 and 180. If instead you wish to see a small portion of it, set the limits to 30 and 50, for example. The graph will then show frames 30 through 50 only.

Automatic Limits
Automatic Limits will automatically fit the entire motion to the graph, no matter how many keyframes have been designated.

Spline Controls
Spline Controls are advanced animation tools used to fine-tune envelope changes. For specific details about the use of spline controls, and their function, see "Advance Animation with Spline Controls."

You can adjust tension, continuity, and bias independently by holding down the appropriate key on the keyboard and dragging with the mouse while watching the Envelope Graph.

Tension **t**
(Values: 1 = low tension, 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 keyframe, and to accelerate (resume speed) as it passed. Without tension the object would pass through the keyframe position at a constant speed.

Continuity **c**
(Values: -1 = sharp , 0 = normal , 1 = smooth)
Continuity is used to accentuate a break or change in an object's motion path.

There are hardly any cases where you would want to use a positive continuity—this will cause an object to overcompensate as it passes through the keyframe and appear to stutter or "roller coaster" at the frame.

Bias **b**
(Values: -1 = more slack incoming, 0 = equal slack, 1 = more slack outgoing)
Bias controls the slack at keyframes that is the nature of spline paths. This serves to accentuate motion: the incoming motion by undershooting the keyframe (creating a feeling of anticipation) or the outgoing motion by overshooting the keyframe.

Linear
Select Linear to remove the gradual, smooth nature of spline curve changes and replace it with more direct, sudden change. Linear affects the changes between current keyframe to the previous keyframe only. By turning Linear on or off at different keyframes, envelopes may contain both gradual and sudden changes.

Exiting the Motion Graph

Use Motion
Click Use Motion when you have completed working with this motion and are ready to return to the main screen.

Remove Motion
Click Remove Motion when you want to clear this motion and return to the main screen.

Advanced Animation with Spline Controls

Spline Controls s,
Spline Controls are advanced animation tools used to fine-tune changes in envelopes and motion paths. If you animate a great deal, you will find these controls highly useful. Recommended values for each characteristic are given, and smaller value increments between these may be used as well.

You will find the spline controls on the Layout screen, in the Envelope Editor, and in the Motion Control Editor. Access the Spline Controls menu from one of these screens by pressing s on the keyboard, or selecting the Spline Con button from the screen. Alternately, you can adjust tension, continuity, and bias independently if you hold down the corresponding key (t, c, b) on the keyboard and drag with the mouse while watching a window display the changing value.

As is the case with many aspects of computer graphics, the term spline is borrowed from another profession—drafting. To a draftsman, a spline is a flexible strip of wood shaped into a curve that passes through a number of control points. As the spline moves from point to point, it bends this way and that way at certain angles. By adjusting the control points, you adjust the curvature of the spline.

In a sense, there is a similar process in keyframe animation. Think of an object's motion path as the spline strip mentioned above. Each control point represents a keyframe, where an object has a known position and orientation (just as the draftsman's curve had). By adjusting certain parameters at each keyframe, you can adjust the nature of the curve and affect the object's motion.

There are three elements of spline controls that the animator can control: tension, continuity, and bias. Each exerts a slightly different influence over object motion. In order to properly explain spline controls, we're going to use a little imagination. However, your best bet for seeing the difference in spline controls is to try them out, one at a time. As you adjust the spline controls in LightWave, you'll actually see the motion path adjust itself, giving you an idea of the change you are causing. Once you have a grasp of how splines function, you'll find LightWave's spline controls a breeze.

Let's start with a hypothetical animation—a flying logo for a local business. This is a 100-frame animation. Imagine the logo's motion path as a rubber band forming a sweeping arc in space. Imagine 100 tiny knots in the rubber band, one for each frame of the animation. The logo must travel this knotted motion path at a speed of 30 knots-per-second, since 30 frames-per-second is the standard rate of video playback. Whether those knots are spaced far apart, or close together, the logo must pass 30 of them every second.

Now assume you have the ability to grasp this rubber band anywhere along its length and stretch it. In what ways would you be able to affect the rubber band, and the logo's behavior as it travels the knots? You could affect its tension, continuity, and bias, as discussed below.

Tension t
(Values: -1 = low tension, 0 = normal tension, 1 = high tension)
Tension affects the apparent speed of an object as it passes through each keyframe. Tension causes an object in motion to slow down (move a little bit less in each frame) as it nears the keyframe, and to accelerate (resume speed) as it passed. Without tension the object would pass through the keyframe position at a constant speed.

To increase the tension on the rubber band motion path, you could pull it taught at both ends. The knots at either end will start to space themselves further apart, while the knots in the middle remain closer together, less affected by the outward tugging. The result is that there are more knots concentrated toward the center of the band than there are toward either end.

Now the flying logo enters the scene, traveling along this rubber band motion path. Remember, it travels at 30 knots per second. However, the logo will appear to slow down as it passes over the center section where there are more knots. Why? Because as it nears the keyframe, the logo is travelling a little less distance as it goes from knot to knot. It still has the same number of knots to travel through in the same period of time, but there are more knots there, slowing it down. It's going to have to slow down a bit to cover that stretch of rubber band in the same length of time. And, it will appear to speed up again as it passes the center section.

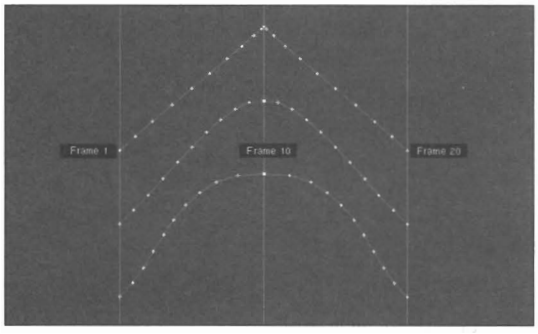
This is the result of increased tension. The middle knot on the rubber band represents a keyframe. Increased tension of the motion path on both sides of the keyframe tends to bunch frames together, closer to the keyframe. This allows objects that move in an animation the ability to "ease in" to or "ease out" of the keyframe position.

The opposite is also true if you decrease tension. Travelling on this path of decreased tension, the logo will appear to speed up as it passes over the center knots because, as it nears the keyframe, it is travelling a little more distance as it goes from knot to knot. It still has the same number of knots to travel through, and it still has to travel through them in the same period of time. But it's going to have to speed up a bit to cover that stretch of rubber band in the

same length of time.

Tension affects the apparent speed of an object. The greater the tension (between 0 and 1), the more an object will decelerate while passing through the keyframe. The less the tension (between 0 and -1), the more an object will accelerate while passing through the keyframe.

You'll see the effect of tension especially when combined with Continuity and Bias.



Motion paths with varying tension settings

For the above image, imagine these three paths to be side-views of the path of a bouncing ball. There are three keyframes for the path, at 0, 10, and 20. White crosses indicate the individual frames of the motion path. Notice the effects of tension, which has been modified at keyframe 10, for each of the paths. This is the effect it would have on any object using such a spline setting.

When the tension is -1, the ball slows as it reaches the top of its bounce, then moves away, slightly increasing speed. Since tension pulls frames closer together near the center keyframe (notice how the crosses are slightly bunched toward the center), the ball will appear to slow somewhat as it nears frame 10, and speed up somewhat as it leaves frame 10. Tension at -1 is often used to accentuate motion.

When the tension is 0, the ball moves smoothly through the top of its bounce. This is the default setting.

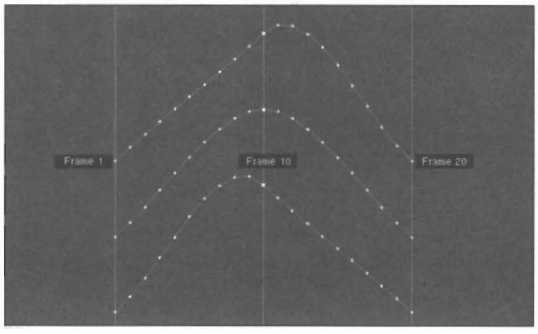
When the tension is +1, the ball "rounds off" its movement, no longer moving through the keyframe at a tighter angle.

Bias b
(Values: -1 = more slack incoming, 0 = equal slack, 1 = more slack outgoing)
Bias controls the slack at keyframes 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 keyframe or the other. This serves to accentuate motion: the incoming motion by undershooting the keyframe (creating a feeling of anticipation) or the outgoing motion by overshooting the keyframe.

Bias affects where the rubber band's knots "bunch up" when you increase tension on the rubber band itself.

In the example of the rubber band motion path used above, increased tension on both ends of the rubber band caused equal distribution of the knots. The bunching was equally spread out on both sides of the keyframe at in the middle. With the bias control, you can move those bunched up knots to the left or right of the keyframe itself. This means you can shift the slowing down/speeding up behavior so that it happens a little before the object reaches the keyframe position, or a little after.

Bias means that you are bunching up knots, or frames, to one side. The slacked is biased, or leaning a little more toward one side than the other. You can set the bias to either side of the keyframe, or balance it equally.



Motion paths with varying bias settings

For the above image, imagine these three paths to be side-views of the path of a bouncing ball. There are three keyframes for the path, at 0, 10, and 20. White crosses indicate the individual frames of the motion path. Notice the effects of continuity, which has been modified at keyframe 10, for each of the paths. This is the effect it would have on any object using such a spline setting.

When the continuity is -1, the ball reaches the top of its bounce and rebounds at what appears to be a hard angle. Although this appears similar to tension -1, it is not. There is no "bunching together" of frame near frame 10, so the ball never slows down as it passes that point. It maintains a constant speed, with the appearance of a hard bounce at that frame.

When the continuity is 0, the ball moves smoothly through the top of its bounce. This is the default setting.

When the continuity is +1, the ball seems to "bounce" in the air for a moment as it moves through the top of its bounce. This effect of continuity seems to have no purpose. However, when combined with the effects of tension and bias, it can create the appearance of a slight pause at frame 10 before continuing.

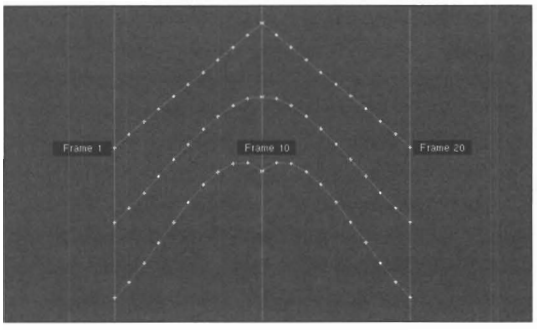
Continuity c
(Values: -1 = sharp , 0 = normal , 1 = smooth)
Continuity is use to accentuate a break or change in an object's motion path. It has no effect on the incoming or outgoing speed of the object, which is the function of tension. A bouncing ball provides a good example of both tension and continuity. 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.

Continuity is based on the word continuous, and it affects the appearance of continuous motion.

When you want an object's motion to appear more sudden, even jerky, change its continuity setting. Here's a good example. A bouncing ball typically slows down as it bounces up into the air, then speeds up a bit as it falls. It strikes the ground hard and bounces up again.

- The continuity of the ball slowing and falling again should be smooth and uninterrupted. Continuity would be set to 0 for the keyframe at the top of the ball's motion path.
- The continuity of the ball striking the ground is sharp and sudden. Continuity would be set to -1 for the keyframe at the bottom of the ball's motion path.

Note:
There are hardly any cases where you would want to use a positive continuity—this will cause an object to overcompensate as it passes through the keyframe and appear to stutter or "roller coaster" with an erratic bounce at the frame. You will not use a positive continuity value very often, if at all.



Motion paths with varying continuity settings

For the above image, imagine these three paths to be side-views of the path of a bouncing ball. There are three keyframes for the path, at 0, 10, and 20. White crosses indicate the individual frames of the motion path. Notice the effects of bias, which has been modified at keyframe 10, for each of the paths. This is the effect it would have on any object using such a spline setting.

When the bias is -1, the ball will overshoot the keyframe, bouncing a little higher than expected after reaching the frame 10.

When the bias is 0, the ball moves smoothly through the top of its bounce. This is the default setting.

When the bias is +1, the ball will undershoot the keyframe, bouncing a little higher than expected before reaching the frame 10.

Linear
(no keyboard command; appears on the Spline Controls menu only)
Linear determines the type of change—straight or curved. Normally, envelopes in LightWave change along a spline path, i.e., in a non-linear fashion. Click Linear to set envelope changes to straight lines at a constant rate of change.

Note that by turning Linear on or off at different keyframes, envelopes may contain both smooth, curving arcs and straight-line segments. The Linear button only affects the path between the current keyframe and the previous one.

LightWave automatically "rounds off" all envelope and motion path changes using a curve or spline. If you do not want an object to experience gradual changes (i.e., in an envelope you might want a flashing light to switch on and off instantly rather than grow brighter and dimmer gradually), you will need to turn on the Linear button on the Spline Controls panel. This removes the spline curvature of the motion path from the current keyframe to the previous one, causing the motion to be linear and direct.

A Spline Control Tip - Anticipation

One of the most common tricks in filmmaking and animation is anticipation. When a cartoon character draws his hand back to punch the bad guy, his hand pulls back, slows to a stop, pauses a moment, then rockets forward to deliver the punch. The slowing and pausing serve to accentuate the action, because the viewer begins to anticipate the punch before it actually occurs.

Anticipation can be duplicated by increasing the tension (setting tension to 1) for the keyframe where the arm pulls back, bunching up more frames in front of that same keyframe (setting bias to -1), and allowing the arm to shoot forward (setting continuity to 1). In this way the frames are closer together before the leading edge of the keyframe, and farther apart after the keyframe has been passed. The continuity setting serves to accentuate the forward motion by breaking the smoothness of the pullback motion. An object travelling this path will appear to slow, then accelerate quickly as it passes through the keyframe. The higher tension value will serve to involve greater numbers of frames, making the motion more pronounced.

Questions and Answers About Keyframe Animation

Keyframe animation is one of the simplest and most powerful methods of 3D animation. It is based on the same principles of classic cartoon animation in that certain important, or **key**, frames, are drawn by the lead character artist. There may be any number of keyframes, serving as a kind of storyboard or outline describing the animation.

In one short sequence, for example, in the first keyframe the character looks to the left, in the next he looks to the right, and in the next he smiles to himself. Once these keyframes are drawn and approved, in-betweeners begin to draw the necessary frames that fall in between the look to the left, the look to the right, and the smile, fleshing out the actual motion. All the while they refer to the original keyframes to ensure that the character appears correct at all times.

When you consider the number of keyframes for each character in an animated film, and consider the vast number of in-between frames, you'll begin to see that it is a massive job to carry out by hand. A 90-minute film may contain 129,699 frames, each drawn by hand!

This is where a computer graphics system steps in. LightWave performs the job of the in-betweeners, that of tweening, allowing you to exercise your utmost creativity without having to bother with the tedium of drawing every frame. After you have completed laying out the scene, and positioning the elements at each keyframe, LightWave takes over and generates the intermediate frames. The result is a smooth, flowing animation.

There are a few things you should know about keyframe animation and Layout. These can confuse new animators, and even catch seasoned animators by surprise. We'll present them in the form of these commonly-asked questions.

Why does LightWave move objects back to their original positions when I render images? I can't get objects to stay where I put them.

You need to create a keyframe for those objects before you render the scene. Creating a keyframe instructs LightWave to memorize the current positions of these objects at the frame number you select. Then you can render the scene, knowing that you'll see what you expect to see.

If you forget to create a keyframe, then the moment you click Render. LightWave will return all objects to their "originally loaded" positions, and render that image instead.

You can create a keyframe for the currently selected object, or for all objects in the scene. The option for this appears after you select the Create Keyframe button.

Sometimes my objects seem to be moving, even when I have successive keyframes in the same position. Why?

LightWave uses spline curves to round off motion. What's happening is that LightWave's default spline controls are causing the object to move between the two keyframes. Based on the object's position prior to the first keyframe, or after the second keyframe, LightWave is approximating a natural curve of movement for the object that moves through the keyframe, causing movement even though you might want to object to hold still during that time.

In this case, you want no spline interpolation to occur motion between the two keyframes. The solution is to go to the second keyframe where the object should be holding still, select Spline Controls, and activate the Linear button. This will cause the object to move along a straight line between this keyframe and the keyframe before it. Since, in this case, the two keyframes are in the same exact location, the object will not move involuntarily.

By the way, you might notice that when an object has a single keyframe, it does not move at all during the animation. The reason is that it has been assigned a single location, so it remains. If you assign another keyframe, LightWave will automatically calculate a smooth spline, since smooth motion looks more realistic that way. Use the Linear button as necessary to turn off this feature between keyframes.

Why does LightWave default to creating the first keyframe at frame 0, but default to rendering from frame 1?

When you load objects into Layout, frame 0 records the location of all objects. Since frame 0 is the frame that contains object positions before the animation begins, the first keyframe you create should be at frame 0, since the animation actually begins in frame 1.

Generally there is no need to make any Keyframes at frame 1 itself. In a two-keyframe, looping animation of 1 second in length, your keyframes will be 0 and 30. You begin rendering at frame 1, and the objects are on their way to the next Keyframe, which is just like the beginning of any other tween in the animation (a tween refers to the frames in between one keyframe and the next).
For example, let's say you're doing a 30 frame animation, with keyframes at 0, 10, 20, and 30. The tweens (the space from one Keyframe to the next) will then be 1-10, 11-20,

and 21-30, which are all of equal length. If you were to make a Keyframe at frame 1, then all the movement in the first tween would take place in frames 2-10 (instead of frames 1-10), making that tween different than the other two. Movement in it would be faster.

On the other hand, if you began rendering at frame 0, then the scene would be 31 frames long, probably not what you want when your last Keyframe is at 30. So the numbers work out better when your first Keyframe is at 0 and you begin rendering at 1.

Another advantage of this system is that it allows for easy sequential scenes and looping scenes. Think of frame 0 as the last frame of a previous scene. Let's say you wanted to split a single "shot" into two or more LightWave scenes, for whatever reason. Let's use a 60-frame scene, divided into two 30-frame scenes.

Make the final Keyframe of the first scene (frame 30) the same as the beginning frame of the second scene. (In other words frame 30 of scene A is exactly the same as frame 0 of scene B.) This way, things will continue where they left off. Notice however that if you did render frame 0 of scene B, then there would be two frames in the final rendered movie where everything is in the same place (the end of the first scene and the start of the second), causing a stutter in motion. The same situation would occur if you accidentally set up frame 1 of scene B to be the duplicate of frame 30 from scene A, and rendered it as part of the entire combined scene.

Likewise, if you wanted to loop a scene, say of a spinning object, you could give it a heading of 0° at frame 0 and 360° at frame 30. You would then repeat frames 1-30 on the tape and the object would spin seamlessly. However if you were to start rendering at frame 0, then there would be a jerk in the otherwise seamless looping motion because the object would appear with 0° heading (the same as 360°) for two frames in a row. The same situation would occur if you accidentally set up frame 1 at 0° heading, frame 30 at 360° heading, and rendered frames 1-30.

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Notes

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LightWave 3D Modeler

LightWave 3D Modeler

LightWave Modeler 3D Object Designer

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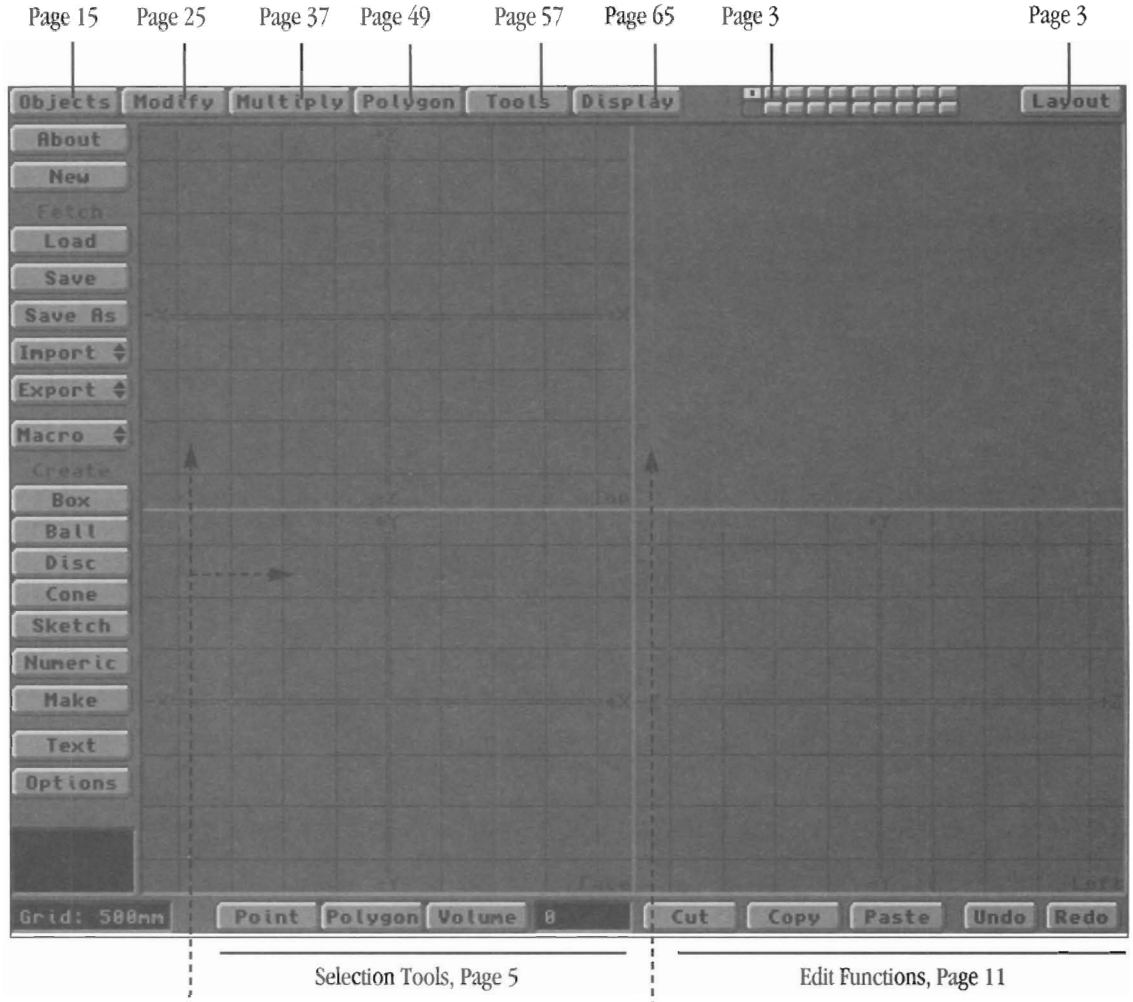
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The Modeler Screen



The Modeler Screen, continued

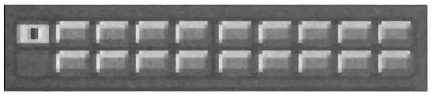
Modeler features numerous screen displays and controls to facilitate 3D object creation. Not all of these tools look like buttons, hence they may seem hidden to you. A complete understanding of Modeler requires that you at least be familiar with these controls. Like the keyboard shortcuts, they can dramatically increase your efficiency, and make Modeler easier to use. You may wish to start LightWave and go to the Modeler screen as you read about its features below.

The Modeler Screen layout
This outline of the Modeler screen begins in the upper left hand corner and continues clockwise around the screen.



The menu buttons across the top of the screen

Menu buttons
The menu buttons always appear across the top of the Modeler screen. They allow you to access different command button groups that appear on the upper left side of the screen. Select a Menu button by clicking on it.



The layer buttons. Upper buttons are the foreground buttons. Lower ones are background buttons. A dot indicates that the layer contains an object.

Layer buttons
The layer buttons allow you to work on multiple screens as you edit objects. Modeler uses the powerful concept of layers to provide eight independent workspaces in which to design, modify, and compose 3D models. Think of these layers as see-through transparencies, with each one stacked atop the other. You can choose to work in one layer or several, with or without the transparency of the others active. This provides great control and flexibility.

There are two rows of layer buttons in the upper right corner of Modeler's screen. The upper row contains the Front layer buttons, and the lower row contains the Back layer buttons. The layers themselves are unlabeled, but considered 1 through 10 (from left to right). When a layer button displays a black dot, it indicates to you that it contains items. Select a front layer button to activate a layer and its contents for editing. Select any background layer button, and the front layer will be overlaid on top of it. Hold Shift and select any combination of front and back layers to edit and view multiple layers at once.

Everything that you can do in Modeler, you do in one layer or another, or in a combination of layers. You can load objects, edit objects, and save objects. When you need to work on another object, Modeler allows you to go to another layer rather than forcing you to clear the current object out of the workspace. Ten layers allow you to maintain up to ten different versions of an object-in-progress at one time, ten variations of an object, ten different pieces of a whole object, or ten wholly different objects!

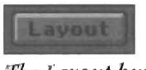
A layer can contain any number of points, polygons, or complete objects, and may be set to one of these three states: Foreground (visible and active, its contents can be seen and will be affected by editing operations); Background (visible but inactive, its contents can be seen yet will not be affected by editing operations); Off (invisible and inactive, its contents cannot be seen and will not be affected by editing operations).

Consider how you might design a bicycle using layers to aid in its construction. We built its parts 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.
Layer 8 contains the horn.
Layer 9 contains the fenders.

To widen the tires only, which are in layers 1 and 3, you would hold Shift and select the front layer buttons for layers 1 and 3. This makes them active for editing. Objects in these active layers appear white, or light gray. All other layers are "off," and not visible, at least as far as we're concerned.

Now, if you wanted to be able to see how much you wanted to widen the tires in relation to the other parts of the bicycle, you'd need to activate those other layers as "background layers." Hold Shift and click on the back layer buttons (the ones in the lower row) for all other layers. The objects in these layers will appear in the window, drawn in black to indicate that they are not available for editing. Now you can see the objects within all layers, yet edit only those layers you want, without changing the other layers.



The Layout button

The Layout button Shift+q
The Layout button is always visible in the upper right hand corner of the screen. Click it to go to the Layout

screen. It does not quit the Modeler, so that when you return, everything in Modeler will remain exactly as it was when you left.

To exit Modeler
Click Layout, or press Shift+q on the keyboard. Modeler remains active and available (note that its button on the Layout screen remains solid). If you have objects in any layers, they will still be there when you reenter Modeler.

To shut down Modeler
Click Layout, or press Shift+q on the keyboard. At the Layout screen, hold Shift and click on the Modeler button. LightWave will ask you to confirm this action. Click Yes to shut down Modeler. Any objects left in any layers will be lost, unless you saved them to the hard drive prior to exiting.



The edit buttons.

Edit buttons
The four edit buttons (Cut, Copy, Paste, Undo) represent common and useful editing commands. Therefore they are always on screen, on the lower right edge. See page 15 for a full description of these commands.



The selection buttons. There are many ways to select and deselect objects and portions of objects.

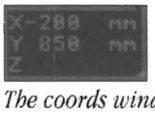
Selection buttons
The three selection buttons are key to Modeler's "select and do" style of operation. These buttons allow you to specify what portion of an object you wish to edit. As useful as they are, they are always on screen, roughly centered on the lower edge of the screen. Choose a selection mode by clicking on one of these buttons or pressing the Spacebar.


The grid size box

Grid Size
The grid changes its display automatically so that you always have a usable reference size on screen. Don't be confused by its operation, this makes modeling easier! For example, with the grid sized at 1 meter increments, suppose you wish to make a pencil object. First select the Zoom In function several times. As you zoom in closer to the grid, the scale of your view changes, reorienting itself to a smaller value. After a few clicks, it will indicate that the grid is now is displayed in 10 millimeter increments. At this point, you can create the pencil, knowing that you will build it to proper scale.

To change the grid size
Click the In and Out buttons on the Display menu, or press > to zoom in, < to zoom out (these keys are unshifted, the shifted versions zoom you in larger steps). Every two or three clicks of the grid size button will zoom far enough that the grid will reset itself to the next increment.

Note that every grid size has two or three "working sizes" of screen grids, so that (for example) at the 1 meter grid size, there are two differently sized screen grids that can appear. This is to provide you with additional control over the grid, when you may need to get just a little closer, but still use the same grid setting. (If necessary, use Size to expand or contract the object if it has grown unmanageable at that screen size. This, too, is a method for scaing objects correctly that were built at the wrong size originally.)



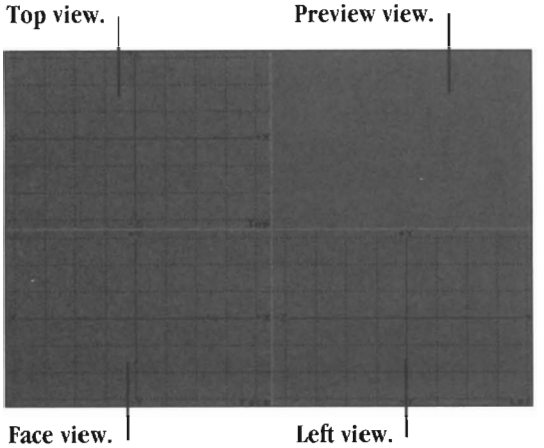
The coords window

Coordinates Window
The coordinates window in the lower corner displays the **X, Y, Z, position** of the pointer and the **status** of the operation in progress. Since each of the view windows shows a two-dimensional view, only two coordinate values are "active" at any time, depending on which window the pointer is within. For example, when the pointer is in the Face view, the X and Y axes will display coordinates, while the Z axis will remain blank. When you engage a Modeler tool such as Rotate, this window displays the amount of rotation (in degrees). For other tools it may display the angle of bending or twisting, the distance the pointer has moved, or the size/stretch factor. This enables you to manipulate an item on screen and know just how much you have affected it.



A group of command buttons

Command buttons
The Command buttons are always placed on the left-hand side of the screen. They appear and disappear, changing to reflect the current menu selection. A different set of command buttons will appear for each menu button selected. Choose a command tool by clicking on it.



The four edit windows, or views.

Edit Windows
There are three edit windows, each displaying a different view of the Modeler workspace. The Face view is like a frontal view, looking directly at the object. The Top view is like an overhead point of view, looking down on the object. The Left view is as if you were standing to the left of the object, looking at its left side. To aid in your modeling work, you can turn on and off many of the object and grid attributes displayed in the edit windows.

Preview Window
The fourth window is a preview window that displays a 3D perspective representation of the object being edited. It can be turned on and off from the Options button in the Display menu. When the window is off, it acts as an extension of the Window Resize button—meaning you can drag the workspace around by dragging in it.

When the window is active, it can be used either as a fourth edit window for item selection, or as a moving wireframe preview window to give you a better idea of the object's shape. Also, when activated, the preview window displays a black circle surrounding the 3D wireframe object. This is Modeler's "virtual trackball," which enables you to rotate the object without affecting it in the true edit windows. Drag from top to bottom, from left to right, or around the perimeter of the trackball to rotate the object around each of the three axes.

Window Resizing Tool
The four windows are divided by a light gray crosshair that spans the workspace. This crosshair is a button that you can use to reposition the screen display. Position the pointer anywhere on the crosshair and drag with the mouse. Move the windows as needed so you can concentrate your editing in any one large window, or any configuration of the four windows.

You can reorient the position of these windows using the View Options command in the Display menu.

Blank Area
The blank area is that portion of the screen that borders the command and menu buttons. This unused portion of the screen serves a function as a "deselect" button, toggling off the selected status of points, polygons, or volumes that have been selected. You can also use the / key to deselect any selected items.

Selection and the Selection Tools

In order to modify objects, you need to have some method for choosing that portion of the object that you wish to modify. Only then can you modify it. This concept of "select and do" is a common function in 3D. You select an item, whether it is a point, polygon, or an entire object, then you perform an action upon it. Following this, you typically deselect the item and move on to another. Therefore, we begin with a discussion of selection, and the myriad of tools that support it.

If you already understand this concept, feel free to skip the next few paragraphs and begin learning the selection tools themselves. If you're a little unclear, read through the following material before you go on.

Why Selection?

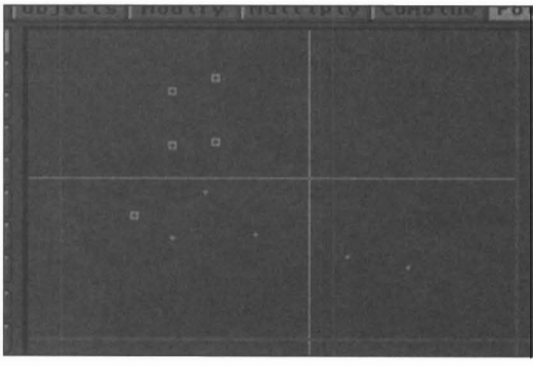
Well, in order to stretch the hood of a 3D automobile, you need to be able to tell Modeler that you want to stretch only the hood so that the stretch operation does not stretch the entire car. You have to select the hood by selecting the elements that make up the hood. Since all 3D objects, like the automobile, are comprised of points and polygons, you first choose the Point or Polygon selection button to specify the type of item you want to edit. Then you select the points or polygons involved, i.e., the ones that make up the hood. Then you choose the tool, in this case Stretch. Finally you operate that tool on the selected item.

In certain instances, you may need specialized methods for selecting specific points or polygons. Therefore, Modeler features a variety of selection operations using s, the Lasso tool, the Select Connected keyboard function, the Volume selection button, and the Statistics Menu.

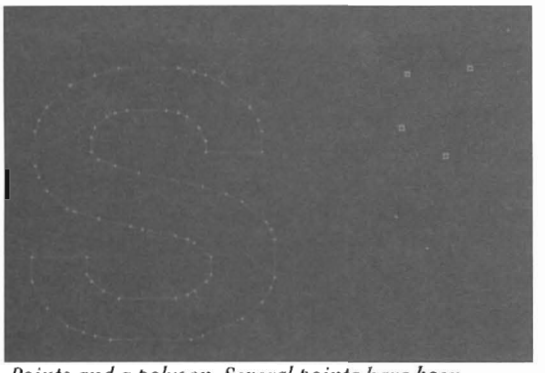
Points and polygons can be collected in various ways to form groups within Modeler, groups that can be selected more easily by virtue of this shared aspect. Generally, this is referred to as selection level. The selection level, or selection mode, you are using allows you to choose specific items for editing. To choose another kind of item, you must first pick another method of selection. For example, you can select points or polygons individually, by shared surface names, by virtue of the number of points or polygons present, by physical connection to one another, by dragging a lasso or volume box around them, and by other criteria. You may not learn (or need) all these methods of selection, but they are present and available should you require them. They allow you to select items by physical attributes or by visual ones. It's an extra measure of versatility, to give you the option of using the methods you like most. After selecting the necessary items, you can use the editing tools on them.

For the sake of simplicity, often all of the portions of an object that will have the same surface qualities are given the same surface name. For example, consider a sports car as a 3D object. So while the hood, side panels, and roof might be modeled as distinct objects, they might be assigned the same shared surface name of "Exterior." Suppose you decide to taper the front end of the sports car so that it appears more sleek and arrow-like. You can select the three objects individually, and resize each individually, which involves at least six separate steps; or you can just select them using the surface name Exterior and resize all three at once, which involves only two steps. Either way, you will have selected and altered the hood, side panels, and exterior. This example is intended to show that there are different methods for grouping and selecting items, and that learning these methods can save you time and effort.

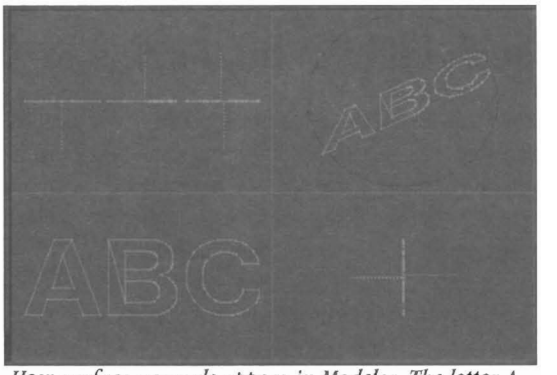
Here are the building blocks of objects, points and polygons, and how they appear on screen. Afterward, you'll find a discussion of the individual tools for selection.



A group of selected points (small boxes), unselected points (gray dots), and the point creation crosshair (in light gray). Notice how selected points are highlighted.



Points and a polygon. Several points have been selected and converted into a polygon resembling the letter S. Additional points lie in the same plane to the right, some of which are selected.



How surface normals appear in Modeler. The letter A is a single-sided polygon with its normal facing backward. The letter B is a single-sided polygon with its normal facing forward. The letter C is a double-sided polygon; its surface normals face both directions.

If you ever click on a polygon and see no surface normal, you should probably replace it. It will probably cause rendering errors.

Selecting Points, Polygons, and Volumes

Selection and **deselection** are arguably among the most important skills you will learn in modeling 3D objects. These two states toggle, meaning that the items you work with in Modeler may be switched between the two states of being selected or being deselected. When you click on an unselected item, you select it (it is now **active**). When you click on a selected item, you deselect it (it is now **inactive**). Active items will be affected by Modeler's editing tools, while the inactive items beside them remain unaffected.

The ability to deselect an item is as important as the ability to select it. Once you have selected an item and performed some action upon it, you may need to deselect it in order to move on to the next item. The simplest method for deselecting an item is simply to move the pointer over it and click the left mouse button. This toggles the item to its opposite state. When there are so many items on screen that clicking them all to toggle them off is not an easy task, there is a shortcut—press / to deselect all selected items.

The next 8 pages contain a breakdown of the individual selection methods and the tools by which they operate.

Point selection

Click the Point selection button to be able to select one or more points for editing. You can select points either individually, in groups, by virtue of their being connected, or by using the Lasso.

Quite often, editing an object requires that you first select more points than you need, then deselecting the unnecessary ones until only the pertinent items are left. The same tools for selecting points also allow you to deselect them. You can toggle points from a selected state to a deselected state. So, if a group of points is selected and you need to deselect a few before performing an edit function, you can deselect those points from among them by choosing them again.

When no points are selected
Use any of the selection methods described below to select some.

Once some points are selected, selecting them again will toggle them to a deselected state.
Use any selection method to deselect points from among the currently selected group.

To select more points in addition to the currently selected ones
Hold Shift and use any selection method to add more to the currently selected group.

Note about Point selection
When the Point selection button is active, and no points have been selected, then all points are considered selected. This is a convenient shortcut that saves you from having to select everything. In this case, any tool you use will affect all points in the current layer.

To select one or more points
Click the Point selection button, move the pointer into any view window and over the desired point, then click the left mouse button. The point will highlight to indicate that it has been selected. At this stage, you can choose a tool (such as Move) and manipulate the selected point.

Select multiple points by holding down the mouse button and dragging over the points you want to activate.

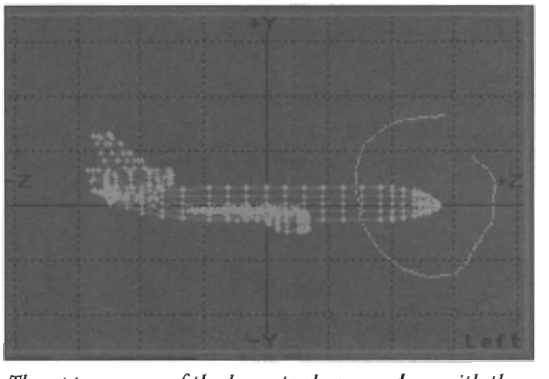
Note about selecting points and creating polygons
If you are selecting a group of points with the inention of creating a polygon, make certain that you select them in a counterclockwise order. This is a specific requirement for Modeler and Layout to "know" which direction this polygon faces (which way its surface normal points). Whichever edit window you are in, try to get in the habit of always selecting points in this manner.

To deselect points from a group of selected points
After selecting a group of points (and letting go of the left mouse button), simply go back and click on specific points individually, or drag the mouse over a number of points. They will become un-highlighted, thus deselected.

You can also use the Lasso method (described below) to encircle portions of a group of selected points that you wish to deselect.

To add more points to a group of selected points
After selecting a group of points (and letting go of the left mouse button), hold Shift as you click on points individually, or drag the mouse over multiple points. They will become highlighted, thus selected.

To select all points that are connected to the currently selected point(s)
Press the] key.



The appearance of the lasso tool as you drag with the right mouse button.

To select points using the Lasso
Click the Point selection button, and move the pointer to any window. Hold down the right mouse button and drag the mouse around the items you wish to select. Be careful that you do not just click the right mouse button—hold it down. Continue to hold it as you drag the mouse, as this engages the Lasso mode.

The Lasso method of selection uses Shift in the same manner as regular selection. Hold Shift while you drag to select more points. Also, after having selected a number of points, you can deselect some from the selected group by lassoing them.

To select or deselect certain Points from within a Volume
See the Statistics Menu (later in this section).

Polygon selection

Click the Polygon selection button to select one or more polygons for editing. You can select polygons individually, in groups, by virtue of their being connected, by virtue of their surface names, or by using the lasso. Selected polygons have perpendicular dotted lines appearing from them. These are called surface normals, and are discussed below.

About Surface Normals

Polygons have the unique ability to be **one-sided** (visible from one side only) or **two-sided** (visible from both sides) as a memory-saving feature. A **surface normal** is an indicator that looks like a dotted line sticking out from the face of a selected polygon. It indicates which side of the polygon is its visible side. A one-sided polygon, when selected, displays one surface normal, while a two-sided polygon displays two.

Quite often, editing an object requires that you first select more polygons than you need, then deselecting the unnecessary ones until only the pertinent items are left. The same tools for selecting polygons also allow you to deselect them. You can toggle polygons from a selected state to a deselected state. So, if a group of polygons is selected and you need to deselect a few before performing an edit function, you can deselect those polygons from among them by choosing them again.

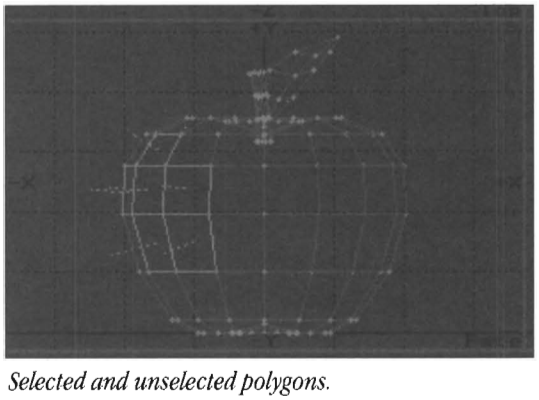
There are only a few rules about polygon selection that you should know.

When no polygons are selected
Use any of the selection methods described below to select some.

Once some polygons are selected, selecting them again will toggle them to a deselected state.
Use any selection method to deselect polygons from among the currently selected group.

To select more polygons in addition to the currently selected ones
Hold Shift and use any selection method to add more to the currently selected group.

Note:
When the Polygon selection button is active, and no polygons have been selected, then all polygons are considered selected. Any tool you use will affect all polygons in the current layer.



Selected and unselected polygons.

To select one or more polygons
Click the Polygon selection button, move the pointer into an edit window and over one edge of the desired polygon, then click the left mouse button. The polygon will highlight to indicate that it has been selected.

Often you will end up selecting two or more adjacent polygons, since they may share the edge you selected. To deselect the unwanted polygon(s), click them again on a different edge. This is often easier from another angle in a different edit window. (Using the static display in the preview window can help a great deal when working on a complex object.) At this stage, you can choose a tool (such as Move) and manipulate the selected polygon.

Select multiple polygons by holding down the mouse button and dragging over the edges of the polygons you want.

To deselect polygons from a group of selected polygons
After selecting a group of polygons (and letting go of the left mouse button), simply go back and click on the polygons you wish to deselect.

To add more polygons to a group of selected polygons
Hold down Shift and select by clicking on the desired polygons, or by dragging the mouse over them.

To select all polygons that are connected to the currently selected polygon(s)
Press the] key.

To select polygons using the Lasso
Click the Polygon selection button, and move the pointer to any window. Hold down the right mouse button and drag the mouse around the items you wish to select. Be careful that you do not just click the right mouse button—hold it down. Continue to hold it as you drag the mouse, as this engages the Lasso mode.

The Lasso method of selection uses Shift in the same manner as regular selection. Hold Shift while you drag to select more polygons. Also, after having selected a number of polygons, you can deselect some from the selected group by lassoing them.

To select or deselect certain Polygons from within a Volume
See the Statistics Menu (below).

One-sided polygons save memory, which makes the rendering process faster. However, a one-sided polygon can end up facing the wrong way. A single wrong-way polygon in the surface of a baseball would look like a black hole, as if there were no polygon there at all. This is generally called a rendering error. Check the surface

normals to see which way polygons are facing. In this manner you can ensure that your models will not suffer from rendering errors that you will need to correct.

When should you use one-sided or two-sided polygons? Consider whether the objects you are creating will be seen from both sides, or from one side only. This is dictated by the needs of the animation. An apple might be built of single-sided polygons only, with the polygons facing outward, whereas a dollar bill that will be seen from both front and back should be built of two-sided polygons.

Layout keeps track of every single polygon in an object. Double-sided polygons count as two polygons. Complex objects, and double-sided objects, make more demands on Layout. The more complex objects you use, the more things can slow down. When rendering an image, Layout has to take into account the appearance of all sides of all polygons that make up an object, even those that face away from the camera. If a polygon will not be seen from both sides, then it makes sense to build it out of single-sided polygons. The computer has fewer polygons to calculate, hence it will require less time to render.

Volume selection

The Volume selection button allows you to manipulate a specific portion of an object defined by a draggable box. You define the volume by dragging out the boundaries of an adjustable box to enclose some part of the object.

There are two states of the Volume selection button: **Exclude** and **Include**, discussed below. Click the Volume button repeatedly to switch between them. Volumes can also be used to select and manipulate points or polygons that fall either inside or outside its boundaries, by selecting the Statistics command after dragging out the Volume.

Note:
When the Volume selection button is active, and no volume has been defined, then everything is considered selected. Any tool you use will affect everything in the current layer.

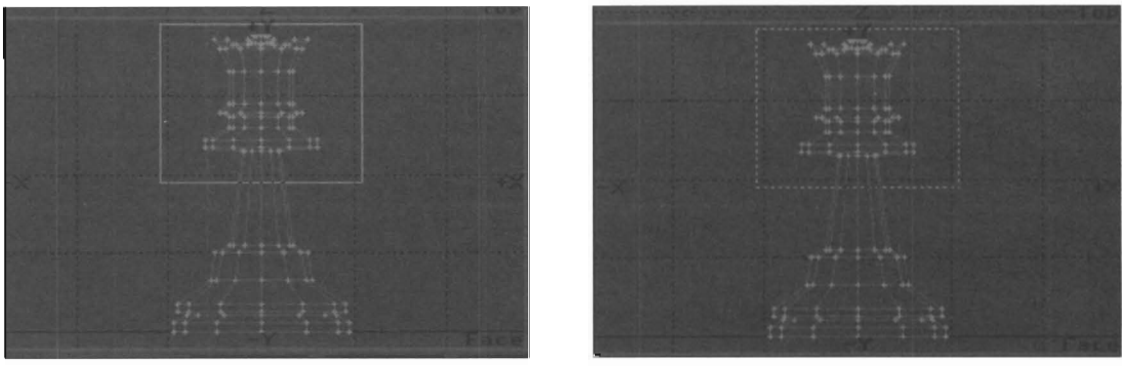
Exclude (boundary box is a dotted line): any polygons lying partially inside and partially outside the dotted line volume will not be affected by any operation. Think of the Exclude mode as the mode that excludes certain polygons, the ones not totally inside the volume.

Include (boundary box is a solid line): all polygons within the solid line volume, and all polygons partially within the solid line volume, will be affected by any operation. Think of the Include mode as the mode that includes everything that it touches in an operation.

To select a Volume for manipulation
Click the Volume selection button, move the pointer into an edit window, and drag out a box surrounding the items you wish to select. In another view window, drag out depth to the box, forming a cubic space. Make sure the boundary correctly encloses what you want in all three views. To resize the boundary, move to any view and drag the mouse to adjust its size. At this stage, you can choose a tool (such as Move) and manipulate everything within the defined area.

To define a Volume using the Lasso
Click the Volume selection button, move the pointer to any window, and drag with the right mouse button around the items you wish to select. Be careful that you do not just click the right mouse button. Continue to hold it down as you drag the mouse, as this engages the Lasso mode of selection. Note that although the Lasso Volume is drawn in only one edit window, it extends along that axis into the 3D workspace of that window.

Note:
If you have dragged out a Volume, then realized you accidentally selected the wrong Volume mode, simply click the Volume selection button again. The mode will change without affecting the Volume you defined.



The Volume tool in both Includemode (solid box) and Exclude mode (dotted box).

Additional Tools for Selection and Deselection

There are additional methods for selecting points and polygons that you will find useful. These include the Deselect All command, for deselecting items; Statistics, an extremely useful tool for selecting items using a variety of criteria; and the Select Connected button (described under the Display menu), for selecting connected items.

Blank Screen Area (Deselect All) /

What Deselect All does
This function allows you to deselect points, polygons, or the volume operator, so that you may select other items.

How to use Deselect All
To deselect an item, press / on the keyboard or click in the margin area on screen. make sure that you have no tools selected in order for Deselect All to function.

Notes and tips about Deselect All
You can also move the pointer into any border area of the screen and click with the left mouse button. The blank outer area on screen is the portion of the interface that falls "between the buttons."

Sel Conn (Select Connected)]

(on the Display menu)

What Sel Conn does
Select Connected automatically selects all points or polygons that are connected to the currently highlighted points or polygons.

How to use Sel Conn
Using point or polygon selection, select one or more points or polygons. Press] on the keyboard (or click on the Sel Conn button in the Display menu).

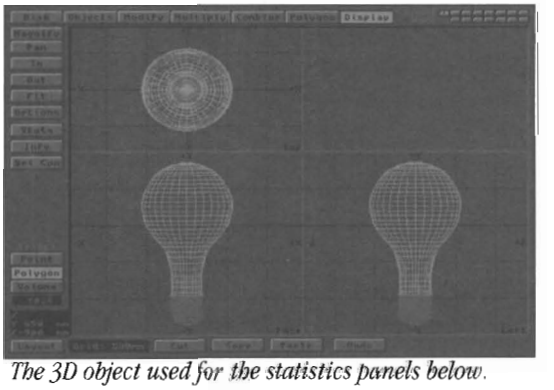
Statistics w

What Statistics does
Statistics allows you to select and deselect items based on point count, polygon count, surface name grouping, and volume inclusion or exclusion. Also, you can use it to find non-planar polygons.

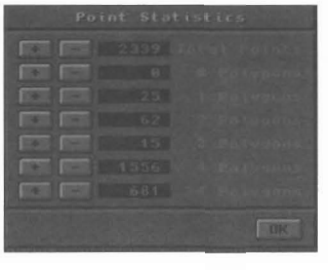
How to use Statistics
First, choose a selection mode: point, polygon, volume include or volume exclude. This will determine the type of statistics screen Modeler will display. Then, press w or click the Stats command in the Display menu.

All three types of statistics menus are categorized. Click on the plus button (+) beside the item you wish to select, or the minus button (-) beside the item you wish to deselect (if it is selected) Modeler will accept your selection and return you to the screen. If you wish to make further selections, press w again and continue.

Below is a LightWave object, followed by the three types of statistics panels you would see displayed for it.



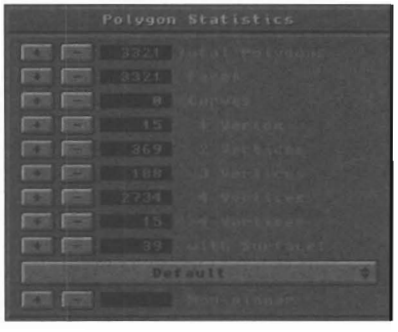
The 3D object used for the statistics panels below.



The point stats panel for the above object.

Point Statistics allows you to select points based on the number of polygons they share. For example, an object may consist of 48 polygons: 36 polygons consist of three points, while 12 polygons consist of four points each. Using Point Statistics, you could easily select either group since they are listed in separate categories.

To select/deselect points with Statistics
Click the Point selection button, select points if desired, then press w. Each entry in the panel will display the number of points that are shared by some number of polygons. Click on the plus button (+) beside the item you wish to select, or the minus button (-) beside the item you wish to deselect.



The polygon stats panel for the light bulb.

Polygon Statistics allows you to select polygons based on a number of attributes. You may select Polygons; Faces; Curves; Polygons consisting of 1-4, or more, vertices; Polygons belonging to a given surface name; Non-planar polygons (based on the Flatness Limit, found in Options, under Objects).

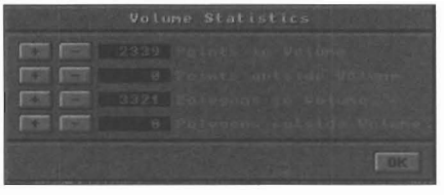
To select/deselect polygons with Statistics
Click the polygon selection button, then press w. The panel will display the total number of polygons, and how many points (vertices) they contain. Click on the plus button (+) beside the item you wish to select, or the minus button (-) beside the item you wish to deselect.

To select/deselect polygons by surface name
Click the Polygon selection button, then press w. Near the bottom of the panel, there is a surface name selector. Drag the mouse while the pointer is directly on top of the selector. A pop-up menu will appear, containing a full list of all available surface names. Drag the pointer to the name you want and let go of the mouse button. Click the plus (+) sign beside the entry with Surface:" (just above the pop up menu) to select the polygons using that surface name.

If you need to select more polygons, you can use Statistics repeatedly to add to the selected group.

To locate/select/deselect non-planar polygons
Click the Polygon selection button, then press w. The non-planar listing is at the bottom of the panel. To locate any non-planar polygons, click the plus (+) sign. The menu will disappear, and any non-planar polygons will be highlighted. By default, Modeler considers any polygons more than 0.5% out of alignment to be non-planar. You can change this value using the Flatness Limit value, which is in the Options command under the Objects menu.

Click the plus (or minus) button to select or deselect any polygons that are not planar. Non-planar polygons are those that are not completely flat, or in one plane. The result is a polygon that will probably not render properly, especially from frame to frame in an animation. These should be removed and replaced with proper polygons.



The volume stats panel for the light bulb.

Volume Statistics allows you to select either points or polygons using these options:
(a) the number of points inside the volume
(b) the number of points outside the volume
(c) the number of polygons inside the volume
(d) the number of polygons outside the volume

To select points or polygons by volume inclusion or exclusion:
Click the Volume selection button (make sure you are in Include or Exclude mode, whichever you prefer), define the volume, then press w. Click on the plus button (+) beside the item you wish to select, or the minus button (-) beside the item you wish to deselect.

Note:
The Volume Statistics display changes depending whether you use the inclusion or exclusion mode when you invoke statistics.

Common Edit Functions

The Edit buttons at the bottom of the Modeler screen represent basic functions that are available at all times. These are standard editing functions, such as those found in most household and business applications, like word processors and spreadsheets.

Cut x



What Cut does
Cut will remove the selected point(s), polygon(s), or object(s) from the workspace. A copy of the object will remain in memory until it is replaced by the next cut or copy operation.

How to use Cut
Select the item to be cut. Press x on the keyboard, or click Cut.

Notes and tips about Cut
If you have ever used Cut and Paste in a word-processor program, you have an idea how this works: the item is stored temporarily in memory in case you want to relocate it to another layer, or make a duplicate of it, using Paste.

Cut holds only the most recently cut item in memory. If you cut one object, then cut another, only the second object will be able to be restored, since it replaced the first item in memory.

Copy c



What Copy does
Copy will copy the selected point(s), polygon(s), or object(s) into memory. The copy of the object will remain in memory until it is replaced by the next cut or copy operation.

How to use Copy
Select the item to be copied. Press c on the keyboard, or click Copy.

Notes and tips about Copy
The section of memory used by Copy is the same that Cut uses, so be careful not to Cut an item you wish to Paste, then Copy another right away. The copied item would replace the cut item. Unlike Cut, Copy does not remove the selected item(s) from the view window. It will only make a duplicate of it in memory.

Paste v



What Paste does
Paste will restore to the current layer whatever item was last cut or copied.

How to use Paste
After cutting or copying an item, press v on the keyboard, or click Paste. The item that was last cut or copied will be pasted back into the workspace in the same location from which it was cut or copied.

Notes and tips about Paste
The item will be restored to the same coordinate location from which it was cut or copied. If you paste an item into the same layer from which it was cut or copied without first moving the original, you won't see it because it will occupy the same position as the original. Generally, after a cut or copy operation, you either go to a new layer and Paste the item, or you move the original item and paste the copy back in beside it.

Undo u



What Undo does
The Undo function allows you to take back the last command performed. This allows you to try different numeric settings for all Modeler's tools, since each step may be undone.

How to use Undo
After performing an action, press u on the keyboard, or click Undo.

Notes and tips about Undo
Undo undoes the last command performed, therefore Undo will also undo itself. If you Undo a command, then decide you would prefer it the way it was, click Undo again. This allows you to toggle back and forth, comparing the changes of the last edit.

Undo will also undo the Delete command. Undo will not undo the New command. Remember to save any objects before quitting Modeler or using the New command. An interesting feature of Undo is that you can modify an

object with a command, then save it to disk, then select Undo to return to the original state of the object. The saved object will be unaffected by the Undo, since it was saved in a changed state. This is a useful tip for morphing an object through several unique shapes, each shape built upon the same original object.



Redo

What Redo does

Redo works in conjunction with Undo. Whereas Undo takes back the last modeling operation, Redo restores it.

As an example, if you make a sphere, then stretch it, then flip its polygons, you could click Undo three times to take back each operation (to the point where you had nothing on scren, in this case). You could then use Redo to restore each step, in case you decided to continue with this model.

How to use Redo

Click Redo to restore the last step that was undone (by the Undo button). You can restore up to three operations this way, if you have not changed the model in between steps.

Notes and tips about Redo

When there are no steps to restore, the Redo button will appear dimmed.

Delete z (keyboard command only)

What Delete does

Delete will remove an item from the workspace without holding a copy of it in memory.

How to use Delete

Select the item to delete, press z on the keyboard. If no items are selected, then all items will be deleted.

Notes and tips about Delete

Undo will recover an accidentally deleted item, if you use Undo immediately afterward. Paste will not restore a deleted item.

Since the deleted item is not copied to memory, delete is useful if you have one item in the memory buffer already and wish to remove another without losing the item just copied. First, Copy the item you wish to use. Then, select the item you wish to remove. Press z to delete it. Now Paste the first item back on screen.

The Objects menu



The Objects menu contains two sets of basic commands: those relating to file access (between Modeler and the hard disk, and between Modeler and Layout), and those relating to object creation (object primitives, text, options). If you've ever been exposed to a computer before, you probably already understand the file access commands. But you may be wondering why Modeler utilizes such simple objects as boxes and balls with which to model.

The reason is that these are the basic building blocks of 3D modeling—built-in shapes for you to use as starting points as you assemble more complex objects. Each of these objects is created by first selecting a shape, then dragging out a bounding box with the left mouse button. Once the shape is to your liking, click the Make button to generate the 3D object. As a shortcut, use the right mouse button as you drag in the last window—the shape will be generated automatically the moment you let go of the button. You may wish to use this feature later, after growing more familiar with the tools of Modeler. Alternately, you can select a primitive shape tool, then select Numeric and enter size and/or coordinate values from the keyboard. After you exit the menu, as above, select Make to generate the geometry.

If you use the mouse to drag out these shapes, you should know that Modeler's four built-in primitive tools have handles along their edges for sizing, and all (except Box) have a center handle for positioning. There is a handle at each corner (drag any corner to size and stretch from there), a handle near the center of each edge (drag any edge to stretch the object), and a handle at the center (drag this handle to move the primitive to another location before creating it).

For users who prefer to draw freehand on the screen, Sketch allows you to draw any shape by hand, which Modeler will then convert to a polygon or curve for further modeling. Sketch is also extremely useful for drawing over a background image on screen (see the BG Image button, in the Display menu).

About



What About does
Displays information about this version of Modeler (revision, memory available, and the programmer's name).

New Shift+n



What New does
With New you can reset Modeler functions and layers to their initial default state. The New command will clear the paste buffer, all layers of all objects, re-center all windows, set the grid to 500mm spacing, and activate the Point selection mode. (It does not remove any loaded PostScript fonts, clear the Macro list, nor clear the Background Image, if any.)

How to use New
Click New, or press Shift+n on the keyboard. Click OK to reset Modeler, or Cancel to cancel the operation.

Notes and tips about New
The contents of all layers will be erased when you select this command. If you have not saved any objects to the hard drive, and you wish to, use the Save or Save As command first.

New does not reset the values found within the numeric menus. To do this, go to the specific numeric menu in question and click its Reset button. This is only necessary if you wish to reset the values of a particular numeric menu.



Load l

What Load does
With Load you can load an object into the first active foreground layer.

How to use Load
Click Load, or press l on the keyboard. A file requester will pop up, preset to either the "Objects" directory on the hard drive or the last-accessed objects directory via the Layout screen. Select the proper object file, then click OK. The object will load into the current layer.

Notes and tips about Load
If you have multiple foreground layers active, the object will load into the first layer only. The remaining layers will be unaffected.

The Objects directory defaults to an internally-set location on the hard drive, unless you loaded or saved an object from the Layout screen prior to entering Modeler. In that case, the file requester will set itself to that directory. Use the buttons on the file requester dialog to locate other objects on other devices.

You can modify the default location of LightWave's file requesters, if you wish. See "Customizing LightWave."

You cannot load foreign object file formats (such as AutoCAD DXF files) directly into Modeler. Instead, load them into Layout using the Load Object button in the Objects menu. At this point, you can enter Modeler and Import the object, or save it from Layout and load it into Modeler.



Save s

What Save does
Save will save the current foreground layer(s) as one object. The name of the last-loaded object, if any, will be used by this new object, when you choose Save. (To choose a new name, use the Save As button.)

How to use Save
Select one or more layers as foreground layers. Click Save, or press s on the keyboard. A menu will pop-up, asking you "OK to save foreground layers(s) as file:(name)." The name Modeler supplies will be the same as the last object name either loaded or saved. This is a shortcut to save you from having to retype the name of an object every time you wish to save a change. To confirm that you want to save this object right over the old object, click OK. Click Cancel if you do not.

Notes and tips about Save
To save objects under different names, use the Save As command.

If you have created the individual parts of an object in several different layers, you can save them as one object. Hold Shift and select the layers that contain the object parts. With all layers selected as foreground layers, click Save As. Enter a name, click OK, and all layers will be saved as the one object.

If you wish to save an object and have Modeler remember which portions of it are in different layers, you can hold the s key and click on the foreground layer button for each layer that you wish to save. Now hold the a key on the keyboard and click on the Save As button. You will see the standard file requester for saving an object. Enter a name and save the file. The object will be saved in its "layered" state. In the future, when you re-load this object into Modeler, each layer will receive the correct portion of the whole object.

Important:
A layered object file cannot be loaded into LightWave Layout. It must be saved as a single object in order to load into Layout for rendering and animation.

When you save an object, its location in relation to the origin plays an important role in LightWave Layout—it acts as the "handle" for objects. This handle is the movement and rotation point for the object in Layout. When an object is created in Modeler, its location in relation to the origin (0, 0, 0) is known and saved as part of the object description. This known point acts as the "pivot point" for the object. For example, when you model an object so that the origin is at its center, then save the object and load it into Layout, it will move and rotate around that point as its center of gravity. However, if you model the same object so that the origin is 5 meters away, then save the object and load it into Layout, it will move and rotate erratically as if it were lopsided. Its pivot point is off-center, so the object moves in an off-center fashion.

Save As Shift+s



What Save As does
Save As will save the current object using a different file name.

How to use Save As
Select one or more layers as foreground layers. Click Save As, or press Shift+s on the keyboard. A file requester will pop up, preset to either the "Objects" directory on the hard drive or the last-accessed objects directory via the Layout screen. Select the proper directory, 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.

Notes and tips about Save As
If you have created the individual parts of an object in several different layers, you can save them as one object. Hold Shift and select the layers that contain the object parts. With all layers selected as foreground layers, click Save As. Enter a name, click OK, and all layers will be saved as the one object.

Import (pop-up menu)



What Import does
Import will transfer objects that have been loaded into Layout to the current Modeler layer. It's a shortcut, allowing you to fine-tune objects quickly and easily as you work on scenes in Layout.

How to use Import
Move the pointer to the Import button and hold down the left mouse button. A pop-up menu will appear, containing the list of all loaded objects in Layout. Drag to the object you wish to import, then let go of the button. The object will be loaded into the first currently active layer.

Notes and tips about Import
Imported models are added to the current layer. Any existing objects that were in the layer first will remain after another model has been imported.

If you import a model, edit it, then export it to Layout so that it replaces its original version, be sure to save the new version of that object when you return to the Layout screen. On the Objects menu, either select Save All Objects, or select the object's name and use Save Object to save the newly edited model.

Export (pop-up menu)



What Export does
Export sends the contents of the current layer(s) to the Layout screen.

Export has two options: you may export the current object into Layout so that it replaces an exisitng object there, or you may export it as a new object if it did not previously exist in that scene.

How to use Export
When the object on the current layer has been modeled to your liking, move the pointer to the Export button and hold down the left mouse button. The top item reads <<NEW>>.

If you are sending a new object to Layout
Highlight <<NEW>> and let go of the mouse button. The Save Object file requester appears, asking you for a name for this new object. Navigate to the appropriate directory for this new object and enter a name. Press r or click OK to save the object **and** load it to the Layout screen.

If you are replacing an existing object in Layout
Highlight that object's name and let go of the mouse button. Modeler will ask you for confirmation before replacing the object.

Notes and tips about Export
If you import a model, edit it, then export it to Layout so that it replaces its original version, be sure to save the new version of that object when you return to the Layout screen. On the Objects menu, either select Save All Objects, or select the object's name and use Save Object to save the newly edited model.



Macro (pop-up menu)

What Macro does
The Macro command allows you to create or execute macros. A macro is a text file that contains a sequence of commands which allow you to perform a series of steps from one initial action. Modeler uses macros that have been written in the ARexx command language. Often, they perform very specialized functions that would be otherwise difficult to carry out by hand.

How to use Macro (to select a pre-loaded macro script)
When you drag the pointer over the Macro button, a pop-up menu appears. Three sub-menus appear at the top of this menu, and below them a list of the current active macros. Move the pointer to the submenu you wish to access (or the macro script you wish to execute) and let go of the mouse button to select it.

See each entry below for a description of each submenu and its function.

How to use Macro/<<Configure List>>
With Macro << Configure List>>, you can add macro scripts to the pop-up Macro menu. Select this option to display the Macro Script List control panel. This panel allows you to create and maintain separate lists of macro command scripts on the hard drive. Each list can contain a group of related macro files, or perhaps your preferred favorite macro files. When the list is active, the files whose names it contains will appear on the main Macro pop-up menu for easy accessibility. The controls on the Macro Script List panel are explained below.

Macro List field
The window beside this label displays the name of the current macro list. The script whose name appears here indicates the default startup list for Modeler. The macro names it contains will appear on the Macro pop-up menu each time you enter Modeler, ready for use.

With the three buttons beside this field you can Load, Save, or Clear lists. For example, you might create a list named "Boxes" that contains four different macro scripts for generating different kinds of cube shapes—Box1, Box2, Box3, and Box4. Use the Load and Save buttons to load and save your own lists. Use the Clear button to clear the window of any script names so that no scripts start up when you activate Modeler.

List Entry
This pop-up menu button contains a list of all the macro scripts that have been loaded into Modeler. It allows you to select any one of the scripts contained in the current Macro List.

Name
This text field contains the name of the script shown on the pop-up menu button (above). To change this name, enter a new one in this field and click the Change button. To create a new name, enter a new name and click the Create button. To delete this name, click the Delete button.

Command
This text field contains the specific ARexx command script that is invoked when you select the macro shown on the List Entry button. To change this script, enter a new one and click the Change button. To create a new script, enter a script and click the Create button. To delete this script, click the Delete button. Use the >> button beside this field to invoke a file requester to aid in locating any commands you wish to change or create.

Startup Macro
If you enter the name of one of your macros here (not a macro list, but a macro script itself), then every time you start up Modeler this macro will be executed automatically. For example, you may wish to have a specific object loaded automatically, like your company logo, every time you load Modeler. Use the >> button beside this field to invoke a file requester to aid in locating the script you wish to run at startup.

How to use Macro/<<Configure Keys>>
Select this option to display a menu that allows you to assign one macro to each of the ten function keys at the top of the keyboard. This is useful for making your 10 favorite or most-used commands instantly available at the press of a button.

Note that the entry field beside each function key **must** contain the entire ARexx command as it appears in the Command field on the Configure List panel. For example, to assign the Bounding Box command to function key F1, you must enter the following text (this is exactly as it appears in the Command field on the Configure List panel):
/ARexx_Examples/lwm/BBox.lwm.
An error in typing, a missing script, or another kind of error, will result in Modeler displaying an **error message** when a function key is pressed.

To assist you in locating the ARexx commands on your system, select the **>>** button to the right of the macro fields. This will present you with a file requester for you to locate the correct macro script. Selecting a script will enter the entire correct pathname as Modeler expects it. The macro will be available immediately.

Macro/Direct command
With Macro << Direct Command >>, you can enter Macro commands directly using the Direct Macro Command pop-up menu. Enter the name of the macro script you wish to execute, then press r.The script will execute.

How to use Macro (Direct option) Shift+x

With Macro>>>Direct, you can enter macro commands directly using a pop-up selection menu. Drag the pointer over the Macro button and select the Direct option. Enter the name of the macro script you wish to execute, or click on the Browse button to locate it with a file requester. Press Return or click OK to engage it.

Notes and tips about Macro:
It is best to identify LightWave Modeler scripts and store them in a consistent location on your hard drive. NewTek recommends the following naming convention: filename.lwm, as in MakeBox.lwm. Also, we recommend you store all Modeler scripts together in the default drawer NewTek provides.

Box

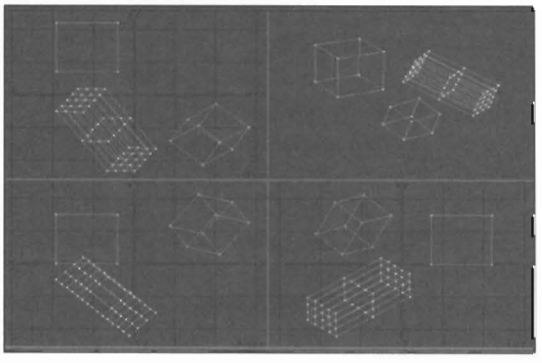


What Box does
Box creates 2D squares and rectangles, or 3D cubes and solids.

How to use Box
Move the mouse to any view and drag out a bounding box. Move to another view to drag out the third dimension, depth. Click Make to generate the box.

Modifiers for Box
The Ctrl key constrains the initial 2D box to an even-sided square.

Numeric parameters for Box
Use the Numeric menu to create boxes with specific X, Y, Z coordinates of your choice, and to determine whether the sides of the box will be subdivided.





Low parameter
Enter the X-Y-Z coordinates for the front lower left corner of the cube.

High parameter
Enter the X-Y-Z coordinates for the back upper right corner of the cube.

Segments parameter
Enter the number of segments for the X-Y-Z axes (to create a cube with subdivided faces).

Units parameter
Select a unit of measurement for the operation.

Reset button
Reset all menu values to their original settings.

Ball

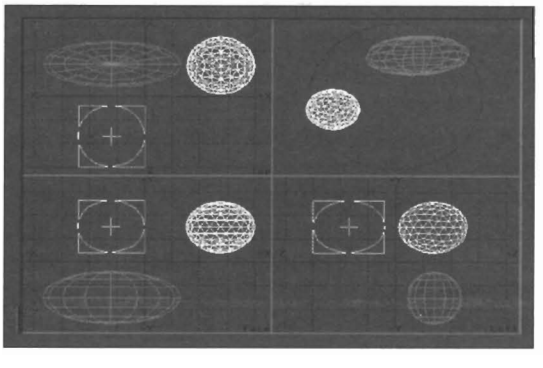


What Ball does
Ball creates 2D circles and ellipses, or 3D spheres, and ovoids.

How to use Ball
Move the mouse to any view and drag out a bounding box. The box defines the boundaries of the ball. Move to another view to drag out the third dimension, depth. Click Make to create the sphere.

Modifiers for Ball
The Ctrl key constrains the initial 2D circle to a perfectly round disk.

Notes and tips about Ball
Modeler can create two types of spheres: globe and tesselated. Select which type from the numeric menu (globe is the default).



To create smooth globe spheres, there should be half as many Segments as there are Sides in the ball. For example, if you enter 24 for Sides, try 12 for Segments.

Otherwise, use a tesselated sphere.

Numeric parameters for Ball
Use the Numeric menu to create spheres with user-

specified parameters such as the number of sides and segments the sphere should contain.

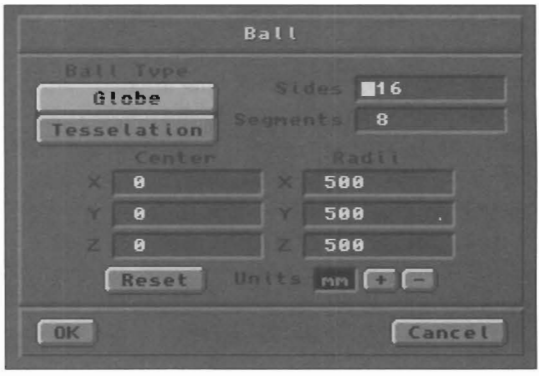
Ball Type parameter
Select the type of sphere to generate: a globe or tesselation. Use tesselation for spheres with smoother profiles. If the edges of the sphere do not need to be smooth, use globe.

Sides (Globe) parameter
Enter the number of sides (radial wedges, like sections in a pie) for the globe.

Segments (Globe) parameter
Enter the number of segments (horizontal slices) for the globe.

Level (Tesselation) parameter
Enter the level of complexity for the Tesselated sphere. Values of 0-1 produce rough spheres, while values from 2-4 are best. Values higher than 4 result in very complex spheres that will require a very long time to create and manipulate.

Center parameter
Enter the X, Y, Z coordinates for the center of the sphere.



Radii parameter
Enter the radius of the sphere for each axis. For example, a smaller Y radius would create a flatter, more squashed sphere.

Units parameter
Select a unit of measurement for the operation.

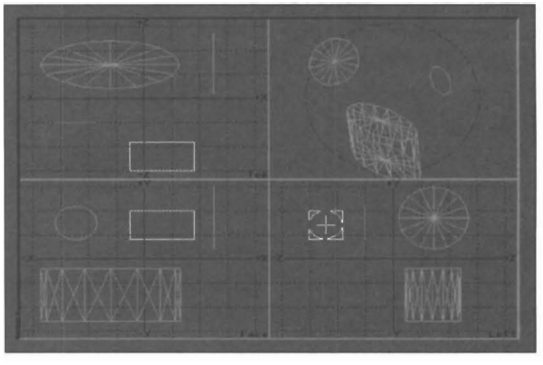
Reset button
Reset all menu values to their original settings.



Disc

What Disc does
Disc creates 2D discs or 3D cylinders.

How to use Disc
Move the mouse to any view 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.



Modifiers for Disc
The Ctrl key constrains the initial 2D circle to a perfectly round disk.

Numeric parameters for Disc
Use the Numeric menu to create shapes with user-specified parameters such as the number of sides and segments the disk or cylinder should contain, as well as its location.

Sides parameter
Enter the number of sides (radial wedges, like sections in a pie) for the disc.

Segments parameter
Enter the number of segments (horizontal slices) for the disc.

Bottom parameter
Enter the coordinate for the bottom end of the disc or cylinder.



Top parameter
Enter the coordinate for the top end of the cylinder.

Axis parameter
Select the major axis along which the disc will lie.

Center parameter
Enter the center coordinates for the disc or cylinder.

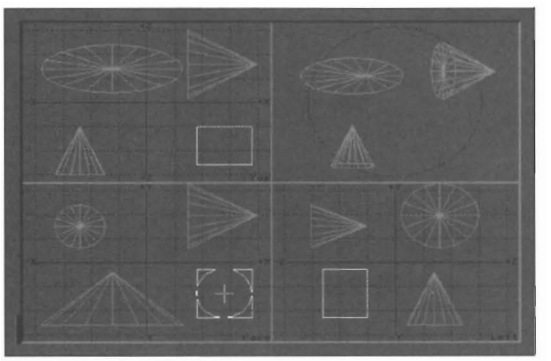
Radii parameter
Enter the radii for the disc or cylinder. Differing values here will create a stretched or squashed shape.

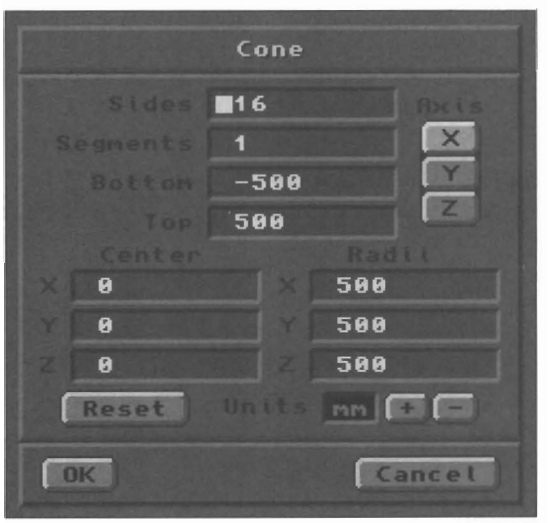
Units parameter
Select a unit of measurement for the operation.

Reset button
Reset all menu values to their original settings.

Cone







What Cone does
Cone creates 2D discs or 3D cones.

How to use Cone
Move the mouse to any view 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.

Modifiers for Cone
The Ctrl key constrains the initial 2D circle to a perfectly round disk.

Numeric parameters for Cone
Use the Numeric menu to create cones with user-specified parameters such as the number of sides and segments the cone should contain, as well as its location.

Sides parameter
Enter the number of sides (radial wedges, like sections in a pie) for the cone.

Segments parameter
Enter the number of segments (horizontal slices) for the cone.

Bottom parameter
Enter the coordinate for the bottom end of the cone.

Top parameter
Enter the coordinate for the top end of the cone.

Axis parameter
Select the major axis along which the cone will lie.

Center parameter
Enter the center coordinates for the cone.

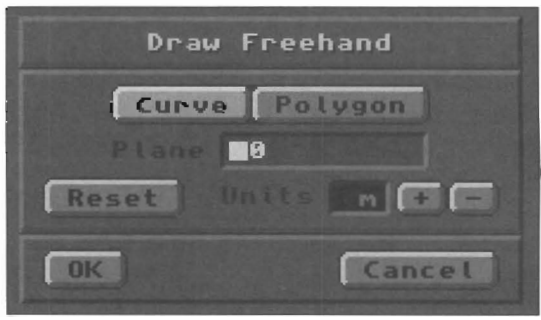
Radii parameter
Enter the radii for the cone. Differing values here will create a stretched or squashed cone shape.

Units parameter
Select a unit of measurement for the operation.

Reset button
Reset all menu values to their original settings.

Sketch

Sketch



What Sketch does
Sketch allows you to draw freehand shapes on the Modeler screen, which it then converts into curves or polygons. After selecting Sketch, you can choose curve or polygon creation using the Numeric menu before or after drawing a shape, as long as you do so prior to generating the shape into an object.

How to use Sketch
Move the mouse to any view and drag with either mouse button to draw a freehand shape (see below for the difference between the left and right button). Select Numeric and choose curve or polygon as the object to generate. Click OK to close the menu. Select Make to generate the shape.

If you drag with the left mouse button
A dotted line will follow the pointer. Press r or click Make to generate the shape, curve or polygon, depending on the setting in the Numeric menu.

If you drag with the right mouse button
A solid line will follow the pointer. As soon as you let go of the mouse button, Modeler will automatically generate the shape, curve or polygon, depending on the setting in the Numeric menu. (Note: You should go to the Numeric menu and select curve or polygon creation before drawing with the right mouse button.)

Numeric parameters for Sketch
Use the Numeric menu to select whether Sketch creates a curve or a polygon out of your freehand drawn shape, and to set the plane value for curves.

Curve/Polygon
Choose Curve to generate an open curve out of the sketched shape. Choose Polygon to generate a polygon.

Plane parameter
Think of Plane as a depth control. If you sketch a shape in the Face (XY) window, then Plane will set the Z depth of the location of the shape you generate. As an example, Sketch a heart in the Face window, select numeric, choose Polygon, enter -10 for Plane, click OK, then select Make. The heart shaped polygon will lie -10 units back along the Z axis.

Units parameter
Select a unit of measurement for the operation.

Reset button
Reset all menu values to their original settings.

Notes and tips about Sketch
The shape you sketch is affected by *how fast* you move the mouse while drawing. The slower you draw, the better Sketch approximates the curvature of the shape.

Sketch leaves the original hand-drawn line on screen, in case you wish to generate another shape, or if you generated the incorrect form (a polygon when you wanted a curve, for example). In such cases, click Undo. Then select the numeric menu and choose the other form. Click OK and select Make to generate the new form. Every time you make a curve from Sketch the result is slightly different. There is a randomness to the curve fitting process so the results will always vary.

Numeric

Numeric n

What Numeric does
Activates the Numeric menu for the command previously selected. This enables you to change the way in which the tool functions, or to engage it using specific numeric values.

How to use Numeric
After selecting an operation or a tool, click Numeric or press n on the keyboard. Enter or change the values as needed. Click OK to accept the new values.

Make

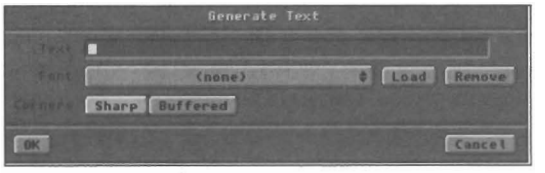
Make Return or Enter

What Make does
The Make button in the Objects menu completes the creation of basic building block objects that you have dragged out or numerically set.

How to use Make
For example, after defining the boundaries for a sphere, either with the mouse or numerically, press r or click Make to generate the sphere.

Text Shift+W

Text



What Text does

With the Text command you can access Adobe Type 1 fonts directly from Modeler, converting letters, numbers, symbols, and words into flat (unextruded) 3D objects.

How to use Text

There are two steps. The first step is to load one or more Adobe fonts: select the Load button, locate the directory where you store Adobe fonts, and select the correct font. The second step is to select the correct font in the font pop-up selector, enter the text, and press r.

Font

The pop-up menu button beside this label allows you to scroll through the list of loaded fonts and select one for text generation.

Text

The text field beside this label allows you to enter the text to be generated into a 3D object. The characters that may be available within the selected font may be limited, depending on the the design of that font's creator. Therefore, you may or may not have all possible characters allowed by the PostScript format.

Corners

Some PostScript fonts, when converted into 3D objects, have additional points near their corner vertices. When these polygons are bevelled, they can cause bevelling inaccuracies. Use the default setting, Sharp, for the majority of your text generation, as this will avoid the creation of such points. The Buffered setting allows them to be created, should you decide that you wish it.

Load Font* and *Remove Font

Use Load Font to locate and select a PostScript font to be loaded into Modeler for text generation. A file requester will appear. Use Remove Font to unload the current font from memory.

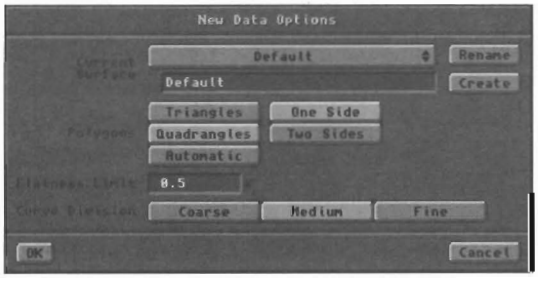
Notes and tips about Text

Modeler looks for PostScript fonts in a standard directory. If you know how to edit text files, you can customize this directory by editing the Modeler configuration file. See "Customizing LightWave" for details.

When you load Abode Type 1 PostScript fonts into Modeler, more RAM is consumed. If you load too many fonts, or no longer need fonts you loaded earlier, use the Remove button to unload a font—one at a time— from memory.

Options O

Options



What Options does

The Options menu under Objects allows you to set up new object creation parameters such as the surface name for new polygons, whether they are one- or two-sided, and more.

How to use Options

Click Options. All objects created afterward will take on the qualities you select here. Any objects created prior to changing these settings will be unaffected.

Current Surface

The four controls found beside the heading Current Surface allow you to enter, create, and rename surface names. This is an important step in modeling, one that allows you to identify portions of the object that will receive different color and texture qualities in Layout. These are the names that LightWave uses to assign color and texture to objects when rendering.

To assign a surface name to newly created polygons

Use the Surface Name selector. The name shown here will be assigned to all newly created polygons.

To create a new surface name

Enter the name in the New Surface Name field and click Create.

To rename an existing surface name

First select the surface name using the Surface Name selector, then enter the name in the New Surface Name field, and click Rename.

Note about Surface

The Surface controls here are used to create surface names, rename surface names, and direct Modeler what surface name to use for newly created polygons. To select a name and assign to existing or previously created polygons, use the Surfaces command found in the Polygon menu.

The Surface Name selector is a pop-up menu that displays a list of all available surface names, including any that you create using the other surface name controls found here. This is convenient for creating and assigning surface names as you build an object, since all new polygons created after you exit this menu will have this name as their surface name. The alternative, which is optional, is to design the object first, then select sections of it and assign surface names at that time. This approach can be more tedious, depending on the complexity of the object.

Polygons
Choose the appropriate settings for the creation of new polygons. There are two selections to make here: Triangles/Quadrangles/Automatic, and One Side/Two Sides.

Polygons that you create "by hand," by creating points and making them into polygons, will not be affected by this option. Polygons created by Modeler, such as those for the built-in objects, and those created during extrusion or lathing, will be affected by this command.

Triangles
Triangles causes all of Modeler's polygon creation to use 3-sided triangles rather than multi-sided polygons. Note: To turn existing polygons into triangles, refer to the Triple command from the Polygon menu.

Quadrangles
Quadrangles causes all of Modeler's polygon creation to use 4-sided polygon quadrangles rather than 3-sided polygon triangles.

Automatic
The automatic setting causes Modeler to determine whether triangles or quadrangles are preferred when creating new data polygons. This is based on the Flatness Limit. If Modeler cannot create a quadrangular polygon that falls within the Flatness Limit, it will subdivide the quadrangle and create a set of triangular polygons.

One Side
When selected, One Side causes all new polygons created by Modeler to be single-sided.

To make a single-sided polygon into a double-sided polygon: select the single-sided polygon. Copy it to memory. Flip the surface normal of the highlighted polygon. Paste the copy back into the edit window. Select both the original and the copy. Merge points. The result is a double-sided polygon.

This option affects Modeler's built-in primitive objects (Box, Ball, Disc, Cone), and well as all commands that create new polygons (Extrude, Lathe, Skin, Morph, Bevel). All polygons whose points are created by hand will be single-sided.

Two Sides
When selected, Two Sides causes all new polygons created by Modeler to be double-sided.

To make a double-sided polygon into a single-sided polygon: use the Unify command. Its purpose is to convert a two-sided polygon into a single-sided polygon.

This option affects Modeler's built-in primitive objects (Box, Ball, Disc, Cone), and as well as all commands that create new polygons (Extrude, Lathe, Skin, Morph, Bevel).

This option does not affect polygons whose points have been created/placed by hand. All polygons whose points are created by hand will be single-sided.

Flatness Limit
Flatness Limit specifies how bent or distorted a polygon may be before Modeler will consider it non-planar. This value is used by Modeler for the Automatic polygon creation option, and for the polygon statistics pop-up panel. A polygon that is not perfectly or very nearly flat is not likely to render correctly in LightWave. This is of most concern if the object will be animated, where a non-planar polygon may scintillate into and out of visibility as its host object moves through the scene.

The Default Flatness Limit for polygons in Modeler is 0.5%

Note:
To find any questionable polygons in an object, choose the polygon selection mode, press w to access the polygon statistics menu, then click the + key beside the non-planar heading. Any polygons that are outside of the Flatness Limit will become highlighted.

Curve Division
With Curve Division, you can set how smoothly curves should be calculated when curves are involved (all Multiply operations that use curves, Postscript text, etc.). Before generating objects from curves, choose how smoothly the curve should be interpolated: Coarse, Medium, or Fine. The greater the smoothness, the more polygons are used, and the smoother the resulting curve division.

When creating points (prior to converting them into a curve), you can force more accurate curve division anywhere along the curve by placing several points very close together. This results in more straight-line segments along that section of the curve, creating a smoother profile to that portion of the curve.

Note:
Many of these options are saved by Modeler when you exit. If, in later sessions, you find that you are inadvertantly creating unwanted polygons, check your Options settings.

The Modify Menu



The Modify menu contains various tools for modifying items on screen, from simple rotation and movement to advanced twisting and bending. Tools are grouped into three sections. Each section contains commands that are somewhat more specific than their same-position counterparts within the group above. For example, the Move command (first button, first group) is for general movement, while the Shear command (first button, second group) is a more specific form of movement where only one portion of the item moves, and Magnet (first button, third group) is even more specific, where you define a specific area affected by movement.

Move t



What Move does
Move will move the selected item to a different location.

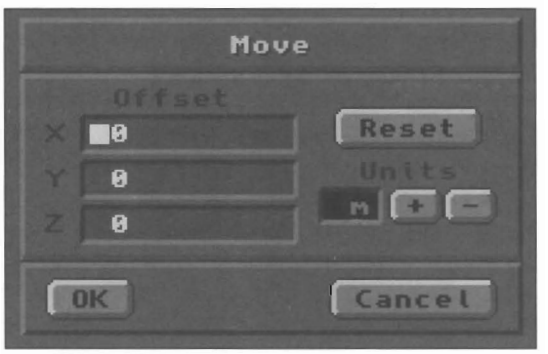
How to use Move
Select the item to manipulate. Click Move. Move the pointer to an edit window, and drag the mouse to move the selected item. As you drag the mouse, the distance you move is displayed in the Coordinates window.

Modifiers for Move
If you hold down Ctrl as you drag the mouse, you will limit the movement of the selected item to up/down, left/right, or diagonal movement. This is useful for moving the selected item in one direction only, without shifting it on other axes at the same time.

Notes and tips about Move
You can drag with the cursor positioned anywhere within any of the three view windows. The pointer does not need to be located on top of the item you are moving. The view you choose for the operation you are working in determines on which two axes the selected objects may be moved.

When moving points, there are two other useful point movement tools which may be more useful, depending on what you need to do. They are Jump and Drag.

- Jump j moves the selected point to the current location of the cursor instantly. The move is immediate, and the point appears to jump to the cursor. (If you select multiple points, all points will jump to the new position while maintaining their relationship to one another, with the last-selected point jumping to the location of the pointer.)
- Drag (Modify menu) allows you to move points individually. With nothing selected, Drag allows you to drag any point to a new location. With one or more points selected, only those may be dragged. With a polygon selected, only those points attached to the polygon may be dragged.



Numeric parameters for Move
The numeric menu allows you to enter exact values for the Move command, and the unit of measurement. Values are stated in terms of distance along the X, Y, and Z axes in relation to the object's current position.

X parameter
Enter a value to move the object along the X axis. Values may be either positive or negative. A value of 0 indicates no movement along this axis.

Y parameter
Enter a value to move the object along the Y axis. Values may be either positive or negative. A value of 0 indicates no movement along this axis.

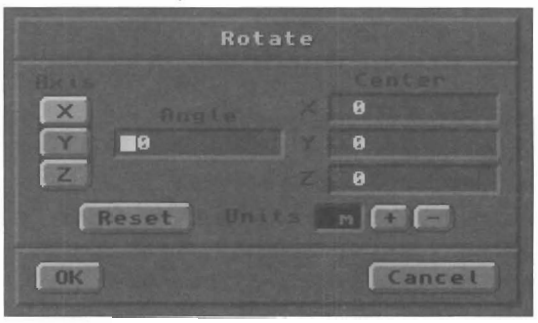
Z parameter
Enter a value to move the object along the Z axis. Values may be either positive or negative. A value of 0 indicates no movement along this axis.

Units parameter
Use the plus/minus buttons to select a unit of measurement. For example, an X value of *5* with Units set to *mm* will move the object 5 millimeters toward the positive end of the X axis.

Reset button
Click Reset to clear all fields to 0 and reset the Units setting.

Rotate

Rotate y



What Rotate does
Rotate will rotate the selected item around a single axis.

How to use Rotate
Select the item to manipulate. Click Rotate. Move the cursor to an edit window, and drag the mouse to rotate the selected item. As you drag the mouse, the degree of rotation is displayed in the Coordinates Window.

Modifiers for Rotate
The Ctrl key constrains rotation to increments of 15°.

Notes and Tips about Rotate
The axis of rotation is centered on the pointer's location. For the selected item to rotate evenly around a central axis, center the pointer on this axis before rotating. To "twist" objects or offset the rotation, select the item and perform a rotation with the pointer off to one side.

There are two useful shortcut rotate commands which may be invoked from the keyboard, no matter what Modeler menu may be active. These commands are e (rotate 90° counter-clockwise) and r (rotate 90° clockwise). No matter which edit window you are in, these commands rotate the selected item(s) around the current location of the pointer.

Numeric parameters for Rotate
The numeric menu allows you to operate the Rotate command with greater precision. Here you can select an axis for the rotation, the amount of rotation, the coordinate location on which the rotation is centered, and the unit of measurement.

Axis parameter
This is the axis around which the rotate operation will occur.

Angle parameter
This is the angle to which the selected items should be rotated. This value can be positive or negative. An angle value of 0 would be no rotation.

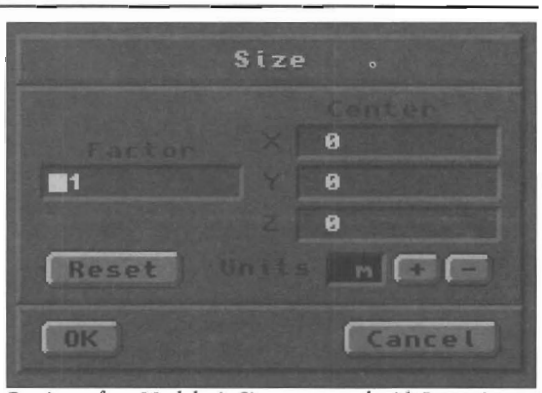
Center parameter
This is the coordinate location through which the axis of rotation runs.

Units parameter
Use the plus/minus buttons to select a unit of measurement.

Reset button
Click Reset to clear all fields to 0 and reset the Units setting.

Size

Size Shift + h



What Size does
Size changes the dimensions of the selected item equally on all three axes.

How to use Size
Select the item to manipulate. Click Size. Move the cursor to an edit window, and drag the mouse to resize the selected item. The size factor is displayed in the Coordinates window as you drag the mouse.

Notes and tips about Size
The selected item resizes equally in all dimensions, regardless of the pointer's location. If the pointer and/or object are off-center of the origin, the object will tend to move somewhat in the direction you drag (while resizing). Using the numeric menu, you can specify a coordinate location that is centered on the object, for exact sizing without movement.

The location of the pointer in relation to the object affects *how* the object will shrink or enlarge. Drag to the left to shrink the item, drag to the right to enlarge it.

Don't confuse Modeler's Size command with Layout's Size button. The Size command in Modeler affects the object's actual size. An object resized within Layout, then saved over its old file name, will 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 information within Layout is a part of the Scene file description, not the Object itself.

Numeric parameters for Size
The numeric menu allows you to operate the Size command with strict precision. Here you can enter the multiplication factor, the coordinate location around which the resizing is centered, and the unit of measurement.

Factor parameter
This is the multiple that is applied to the selected item. Values can be positive or negative (negative values simply flip the object upside down). A factor of 0 causes no change.

Center parameter
This is the coordinate location from which resizing occurs.

Units parameter
Use the plus/minus buttons to select a unit of measurement.

Reset button
Click Reset to clear all fields to 0 and reset the Units setting.

Stretch h

Stretch

What Stretch does
Stretch will stretch a polygon or an object.

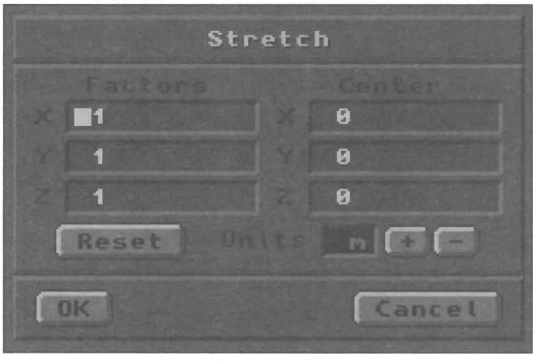
How to use Stretch
Select the item to manipulate. Click Stretch. Move the cursor to an edit window, and drag the mouse to stretch the selected item. The factor of stretching—for each axis—is displayed in the Coordinates window.

Modifiers for Stretch
Ctrl influences Stretch in two ways. First, if you move the mouse along one axis, stretching occurs along that axis only, with the other axis constrained. Second, if you move the mouse along the constrained axis to "force" it into activity, then both axes will be stretched equally. Watch the Coordinates window while you do this to see the effect numerically.

Notes and tips about Stretch
The View window determines the two axes used for stretching. Unlike size, Stretch does not affect all three axes equally. The location of the pointer in relation to the object determines how the object will stretch. As you drag, objects will stretch smaller toward the pointer, or stretch larger away from the pointer.

The selected item stretches equally in all dimensions, regardless of the pointer's location. If the pointer and/or object are off-center of the origin, the object will tend to move somewhat in the direction you drag (while stretching). Using the numeric menu, you can specify a coordinate location that is centered on the object, for exact stretching without movement.

The location of the pointer in relation to the object affects how the object will shrink or enlarge. Drag to the left to shrink the item, drag to the right to enlarge it.



Numeric parameters for Stretch
The numeric menu allows you to operate the Stretch command with strict precision. Here you can enter the multiplication factor for each axis, the coordinate location on which the resizing is centered, and the unit of measurement.

Factor parameter
This is the multiple that is applied to the selected item. Values can be positive or negative. A factor of 0 causes no change.

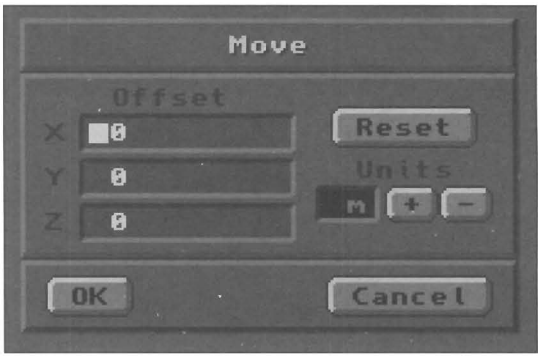
Center parameter
This is the coordinate location from which stretching takes place.

Units parameter
Use the plus/minus buttons to select a unit of measurement.

Reset button
Click Reset to clear all fields to 0 and reset the Units setting.



Drag



What Drag does

Drag allows you to move individual points around the screen without having to select them first.

How to use Drag

Click Drag. Move the cursor to an edit window and over any point. Click and hold the left mouse button, then drag the mouse to move the point. The cursor will disappear when you click so that you can see the point's location exactly, while you manipulate it. The distance of movement is displayed in the Coordinates window.

Modifiers for Drag

Ctrl influences Drag to adhere more closely to one of three axes: the two identified in the edit window you choose, and diagonally within that window. The constrained axis is that axis in which direction you first move the mouse.

Notes and tips about Drag

If no polygons are selected, then Drag will operate on the point(s) directly beneath the cursor. If any polygons are selected, then Drag may be used on any point of the selected polygons only. This is useful if you need to drag one point that lines up with another point. Select a polygon belonging only to the point you wish to edit, then select Drag and move that point to the desired location.

Remember that if any points are lined up along an axis, you may end up dragging more points than you expect. In such cases, you may need to select the specific point first.

Numeric parameters for Drag

Numerically, Drag is the same function as Move. It simply repositions points, one at a time. The numeric menu allows you to enter exact values for the Drag command, and the unit of measurement.. Values are stated in terms of distance along the X, Y, and Z axes in relation to the object's current position.

X parameter

Enter a value to move the object along the X axis. Values may be either positive or negative. A value of 0 indicates no movement along this axis.

Y parameter

Enter a value to move the object along the Y axis. Values may be either positive or negative. A value of 0 indicates no movement along this axis.

Z parameter

Enter a value to move the object along the Z axis. Values may be either positive or negative. A value of 0 indicates no movement along this axis.

Units parameter

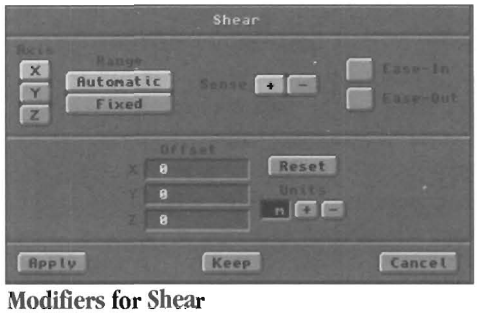
Use the plus/minus buttons to select a unit of measurement. For example, an X value of 5 with Units set to mm will move the object 5 millimeters toward the positive end of the X axis.

Reset button

Click Reset to clear all fields to 0 and reset the Units setting.



Shear



What Shear does

Use Shear to tilt or angle polygons and objects. An example of shearing is to convert standard Roman style text into italic text.

How to use Shear

Select the item to manipulate. Click Shear. Move the cursor to an edit window, then drag with the left mouse button. The object can be sheared on either of the two axes identified on the edges of the edit window you use. If you select the edit window that shows the X and Y axes, then shearing can occur on both of these two axes, depending upon how you move the mouse. The distance you move the cursor on each axis is displayed in the Coordinates Window.

Modifiers for Shear

Ctrl influences Shear to adhere more closely to one of three axes: the two identified in the edit window you choose, and diagonally within that window. The constrained axis is that axis in which direction you first move the mouse.

Numeric parameters for Shear

The numeric menu allows you to alter the characteristics of the Shear tool, whether you choose to operate it manually or numerically. When you enter values for X, Y, or Z axis,

exiting this menu will perform an automatic Shear operation with the settings you entered. If you wish to alter Shear's settings yet perform the shear manually, ignore the X, Y, and Z fields. Leave them set to 0. Change only the other settings, exit the menu, and manipulate the object with the mouse. The new parameters will be in effect.

Axis parameter
This is the axis which Shear will use as the basis for the shearing operation. It is equivalent to the edit window you would select for a manual shear.

Range parameter
Range selects how much of the object will be affected. Automatic affects the entire length of the object along the selected axis. Fixed affects the object between two coordinate points along the selected axis. When Fixed is selected, enter the Low and High points for the range.

Sense parameter
Sense selects which end of the object will be affected. Positive (+) means the end of the object that faces into the positive selected axis will be sheared. The negative end of the object remains fixed. Negative (-) means that the end of the object that faces into the negative selected axis will be sheared. The positive end of the object remains fixed.

Ease-in, Ease-out parameter
Normally, Shear will affect the entire object in a linear fashion. The ease controls alter the shearing of the segments to form a curve rather than a straight line. Ease-in curves from the fixed end of the object toward the sheared end. Ease-out curves from the sheared end of the object toward the fixed end.

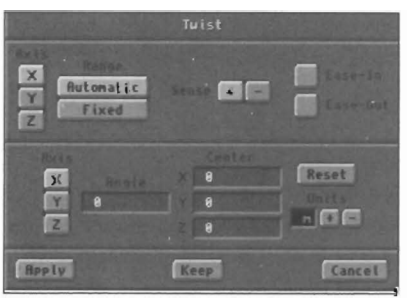
Shear Amount (X, Y, Z fields) parameter
Shear Amount is the distance that the object is sheared in any given direction. The default value, 0, causes no shearing to occur. A value of X 1m would cause the object to be sheared 1m on the X axis. Negative Shear values are acceptable.

Units parameter
Select a unit of measurement for the operation.

Reset button
Reset all menu values to their original settings.

Twist





What Twist does
Twist allows you to twist an object as if you could grab it and wrench it at one end.

How to use Twist
Select the item to manipulate. Click Twist Drag the mouse and the object will twist around the pointer's location as its center of rotation. As you drag the mouse, the degree of twisting shows in the Coordinates window.

Modifiers for Twist
The Ctrl key constrains the rotation of Twist to increments of 15°.

Notes and tips about Twist
The object will be twisted on the unidentified axis in the edit window you choose. If you select the edit window that shows the X and Y axes, then twisting will occur around the Z axis.

If you do not wish to twist manually, enter Factor and Center values in the numeric menu. When you exit the menu, the twist operation will be performed according to the settings you entered.

Objects consisting of 4-sided polygons should probably be converted to 3-sided triangles before twisting. Too much twisting can turn 4-sided polygons into non-planar polygons, which can cause rendering errors. This is especially true if the surface is to be smoothed. Use the Triple command in the Polygon menu to turn polygons in the object into triangles before twisting.

Numeric parameters for Twist
The numeric menu allows you to alter the characteristics of the Twist tool, whether you choose to operate it manually or numerically. When you enter values for Angle and Center, exiting this menu will perform an automatic twist operation with the settings you selected. If you wish to alter Twist's settings yet perform the twist manually, ignore the Angle and Center values. Change only the others. Exit the menu and manipulate the object with the mouse. The new settings will be in effect.

Axis parameter
This is the axis around which the twist operation will occur.

Range parameter
Range selects how much of the object will be affected. Automatic affects the entire length of the object along the selected axis. Fixed affects the object between two coordinate points along the selected axis. When Fixed is selected, enter the Low and High points for the range.

Sense parameter
Sense selects which end of the object will be affected.

Positive (+) means the end of the object that faces into the positive selected axis will be twisted. The negative end of the object remains fixed. Negative (-) means that the end of the object that faces into the negative selected axis will be twisted. The positive end of the object remains fixed.

Ease-in, Ease-out parameter
Normally, Twist will affect all polygons in the object equally, in a linear or straight-line fashion. The ease controls alter the twisting of the segments to form a curve rather than a straight line. Ease-in curves from the fixed end of the object toward the twisted end. Ease-out curves from the twisted end of the object toward the fixed end.

Angle parameter
Angle is a rotation value that determines how much twisting takes place. The default value, 0, causes no twisting to occur. A value of 180° would cause the object to be twisted 180° with regard to the Center value (below). Negative Twist values are acceptable.

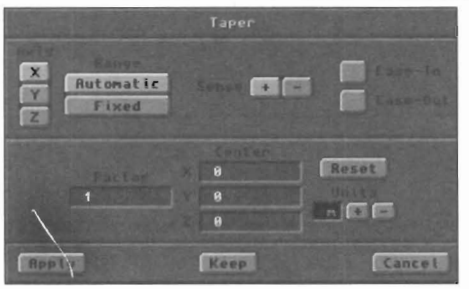
Center parameter
Center works in conjunction with Angle. This is the coordinate location through which the Twist axis runs, and around which the selected item will be twisted. Use a Factor and Center value when you wish Modeler to perform the twist operation automatically.

Units parameter
Select a unit of measurement for the operation.

Reset button
Reset all menu values to their original settings.

Taper 1

Taper 1 (uniform taper)



What Taper 1 does
Taper 1 will taper an object or polygon equally on two axes. Tapered objects include such shapes as a pyramid, a candle, a pedestal, and the nose of a jet airliner.

How to use Taper 1
Select the item to manipulate. Click Taper 1. Move the cursor to an edit window, then drag with the left mouse button. If the cursor starts at the object's center, then the object will taper symmetrically. If the cursor is off to one side of the object, it will taper in a skewed manner, tending to shear in the direction you drag at the same time. As you drag the mouse, the amount of tapering shows as the Factor amount in the Coordinates Window.

Notes and tips about Taper 1
The item will taper on the two axes identified at the sides of the edit window you choose for the operation. i.e., in the Face view (Z axis), the X and Y axes can be tapered. In the Left view (X axis), the Y and Z axes can be tapered. In the Top view (Y axis), the X and Z axes can be tapered.

If you do not wish to taper manually (by dragging with the mouse), enter Factor and Center values in the numeric menu. When you exit the menu, the taper operation will be performed according to those settings.

Numeric parameters for Taper 1
The numeric menu allows you to alter the characteristics of the Taper 1 tool, whether you choose to operate it manually or numerically. When you enter values for Factor and Center, exiting this menu will perform an automatic taper operation with the settings you selected. If you wish to alter Taper 1's settings yet perform the taper manually, ignore the Factor and Center values. Change only the others. Exit the menu and manipulate the object with the mouse. The new settings will be in effect.

Axis parameter
This is the axis along which the taper operation will occur.

Range parameter
Range selects how much of the object will be affected.

Automatic affects the entire length of the object along the selected axis. Fixed affects the object between two coordinate points along the selected axis. When Fixed is selected, enter the Low and High points for the range.

Sense parameter
Sense selects which end of the object will be affected. Positive (+) means the end of the object that faces into the positive selected axis will be tapered. The negative end of the object remains fixed. Negative (-) means that the end of the object that faces into the negative selected axis will be tapered. The positive end of the object remains fixed. Sense is not active with Fixed Range values.

Ease-in, Ease-out parameter
Normally, Taper will affect all polygons in straight-line fashion. The ease controls alter the tapering of the segments to form a curve rather than a straight line. Ease-in curves from the fixed end of the object toward the tapered end. Ease-out curves from the tapered end toward the fixed end. The Sense setting affects ease-in and ease-out, since it determines which end of the object is fixed.

Factor parameter
Factor is a multiplication value that determines how much tapering takes place. The default value, 1, causes no

tapering to occur. A value of 10 would cause one end of the object to be multiplied 10 times its current size, with the remainder of the object being tapered to meet it. Negative Taper values are acceptable.

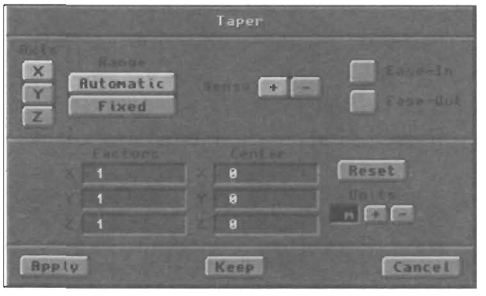
Center parameter
Center is the coordinate location through which the Taper 1 axis runs, and around which tapering takes place. It works in conjunction with Factor (above) when the Factor value is greater or lesser than 1. Use a Factor and a Center value when you wish Modeler to perform the Taper 1 operation automatically upon exiting this menu.

Units parameter
Select a unit of measurement for the operation.

Reset button
Reset all menu values to their original settings.

Taper 2 (general taper)

Taper 2



What Taper 2 does
Taper 2 will taper an object or polygon on any two axes independently.

How to use Taper 2
Select the item to manipulate. Click Taper 2. Move the cursor to an edit window, then drag with the left mouse button. The two axes may be tapered symmetrically or asymmetrically, depending whether you drag the mouse up and down, or left and right. The location of the cursor in relation to the object also determines how it may be tapered. If the cursor is off to one side of the object, it will taper in a skewed manner, tending to shear while tapering in the direction you drag at the same time. As you drag the mouse, the amount of tapering (the factor value) shows in the Coordinates Window.

Modifiers for Taper 2
Ctrl influences Taper 2 in two ways. First, if you move the mouse along one axis, tapering occurs on that axis only, with the other axis constrained. Second, if you move the mouse along the constrained axis to "force" it into activity, then both axes will be tapered equally.

Watch the Coordinates window while you do this to see the effect numerically.

Notes and tips about Taper 2
The object will be tapered on the axes identified at the edges of the edit window. If you select the Z axis window (the Bottom view) that shows the X and Y axes, then Taper 2 will affect only the X and Y axes.

Numeric parameters for Taper 2
The numeric menu allows you to alter the characteristics of the Taper 2 tool, whether you choose to operate it either manually or numerically. When you enter values for Factors and Center, exiting this menu will perform an automatic taper operation with the settings you selected. If you wish to alter Taper 2's settings yet perform the taper manually, ignore the Factors and Center values. Change only the others. Exit the menu and manipulate the object with the mouse. The new settings will be in effect.

Axis parameter
This is the axis along which the taper operation will occur.

Range parameter
Range selects how much of the object will be affected. Automatic affects the entire length of the object along the selected axis. Fixed affects the object between two coordinate points along the selected axis. When Fixed is selected, enter the Low and High points for the range.

Sense parameter
Sense selects which end of the object will be affected. Positive (+) means the end of the object that faces into the positive selected axis will be tapered. The negative end of the object remains fixed. Negative (-) means that the end of the object that faces into the negative selected axis will be tapered. The positive end of the object remains fixed.

Ease-in, Ease-out parameter
Normally, Taper will affect all polygons in straight-line fashion. The ease controls alter the tapering of the segments to form a curve rather than a straight line. Ease-in curves from the fixed end of the object toward the tapered end. Ease-out curves from the tapered end toward the fixed end. For the selected Axis, Ease-in and Ease-Out also affect how the item is tapered lengthwise.

Factor parameter
Factors are multiplication values that determine how much tapering takes place on each axis. The default value, 1, causes no tapering to occur. A value of 10 would cause one end of the object to be multiplied 10 times its current size for that axis, with the remainder of the object being adjusted to taper toward it. A unique feature of Taper 2's numeric menu is that you can taper the selected item on all three axes. In such a case, the object's length along that axis will also be tapered. Negative Taper values are acceptable.

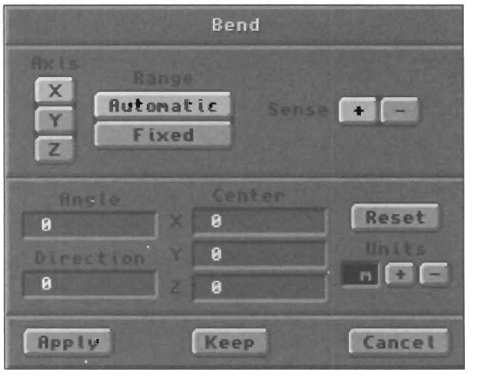
Center parameter
Center is the coordinate location through which the Taper 2 axis runs, and around which tapering takes place. It works in conjunction with Factors (above) when any Factors value is greater or lesser than 1. Use Factors and a Center value when you wish Modeler to perform the Taper 2 operation automatically upon exiting this menu.

Units parameter
Select a unit of measurement for the operation.

Reset button
Reset all menu values to their original settings.



Bend



What Bend does
Bend will bend an object, as if you took it into your hands and bent it. It will work on polygons, but may create non-planar polygons that will not render properly without tripling.

How to use Bend
Select the item to manipulate. Click Bend. Move the cursor to an edit window, then drag with the left mouse button. The degree of bending is displayed in the Coordinates window.

Notes and tips about Bend
The axis that you are "looking into" in the edit window is the axis on which the selected item will bend. Objects consisting of 4-sided polygons should probably be converted to 3-sided triangles before bending. Too much bending will turn 4-sided polygons into non-planar polygons, which can cause rendering errors. This is especially true if the surface is to be smoothed. Use the Triple command in the Polygon menu to turn polygons in the object into triangles before bending.

Modifiers for Bend
The Ctrl key constrains the rotation of Bend to increments of 15°.

Numeric parameters for Bend
Click Numeric after selecting Bend to alter the characterstics of the Bend tool, or to enter specific values for the Bend operation.

Axis parameter
This is the axis around which the rotate operation will occur.

Range parameter
Range selects how much of the object will be affected. Automatic affects the entire length of the object along the selected axis. Fixed affects the object between two coordinate points along the selected axis. When Fixed is selected, enter the Low and High points for the range.

Sense parameter
Sense selects which end of the object will be affected. Positive (+) means the end of the object that faces into the positive selected axis will be bent, while the negative end of the object remains fixed. Negative (-) means that the end of the object that faces into the negative selected axis will be bent, while the positive end of the object remains fixed.

Angle parameter
Angle is used to determine the facing angle of one end of the bent item. For example, if you chose to bend a 10-segment pole an angle of 90° from one end, then the starting end would remain in place while the other end would have angled by 90°. The segments in between these ends would be shifted to make a smooth transition between the two. The default value, 0, causes no bending to occur. Negative Bend values are acceptable.

Direction parameter
Direction serves to determine the direction in which the item should bend. Direction may be any value, and is determined on a heading-basis where 360° is a full circle. The rule for Bend direction is complex to explain when using numeric menu command, since it is based on the XYZ axes and the right-hand rule. As an example, if the bend is along the Z axis, with the +Z end bending, then direction 0 will bend toward the +X direction, 90 in the +Y direction, 180 is -X and 270 is -Y. Direction reverses if the sense of the bend is inverted. Unless you have an in-depth knowledge of 3D space, it is often easiest to experiment, since the Undo button is always handy!

Center parameter
Center works in conjunction with Angle. This is the coordinate location through which the Bend axis runs, and along which bending takes place. Use a Factor and Center value when you wish Modeler to perform the Bend operation automatically.

Units parameter
Select a unit of measurement for the operation.

Reset button
Reset all menu values to their original settings.

Magnet

What Magnet does

Magnet can push or pull points or polygons inward or outward from an object, as if attracting or repelling them.

How to use Magnet

Select the item to manipulate. Click Magnet. Move the cursor to an edit window, drag out a bounding box with the left mouse button. This defines a magnetic column that extends into the selected window. If you wish to limit magnetism to a defined box, move the pointer to another window and drag out specific limits to the bounding box. Drag the handle in the center of the box to position it further. Once the box is in place, drag with the right mouse button to push or pull points or polygons. The amount of movement is displayed in the Coordinates window.

Modifiers for Magnet

Ctrl influences Magnet to adhere more closely to one of three axes: the two identified in the edit window you choose, and diagonally within that window. The constrained axis is that axis in which direction you first move the mouse.

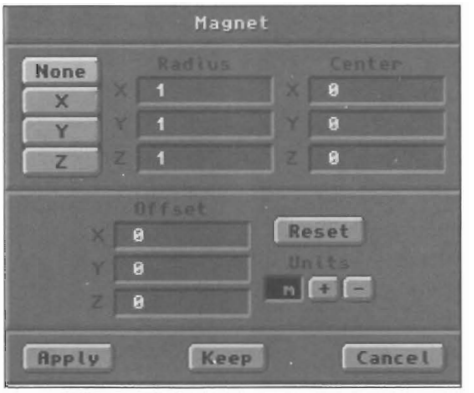
Notes and tips about Magnet

Points are pulled in the direction that you drag. The bounding box represents the sphere of influence for the Magnet tool's "pull." The amount of pull exerted by the magnet is stronger for those points that are closer to its center. A point near the center of the box will follow the mouse pointer exactly, while nearby points will move less under the lesser field of influence. Use the Numeric menu for Magnet to change the size of the bounding box and therefore Magnet's field of influence.

To pull a specific portion of an object, select the specific points/polygons/volume you wish to affect, then use the Magnet tool. Although the Magnet's radius may extend beyond the selected items, only the selected items will feel the Magnet's pull.

Numeric parameters for Magnet

The numeric menu allows you to define the extent of the Magnet tool's "pull," as well as its central location.



None, X, Y, Z Axis parameter

This option selects the "magnetic box" mode, or one of three "magnetic columns" along the major axes. None selects a defined bounding box. X, Y, or Z selects a box that extends along that axis and affects everything that falls within it.

Radius parameter

The value entered here is the radius for the Magnet tool's sphere of influence.

Center parameter

This is the coordinate location where Magnet's influence is centered.

Offset parameter

Enter a value here to engage the Magnet tool automatically upon exiting the numeric menu. This coordinate value indicates the distance you would have dragged the Magnet tool, had you operated it manually via the mouse. Use this when you need to engage the Magnet tool in a very specific direction and location.

Units parameter

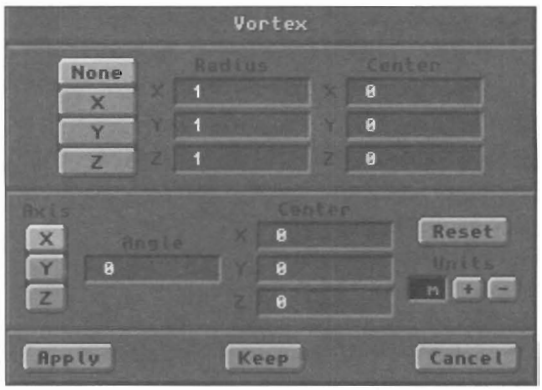
Use the plus/minus buttons to select a unit of measurement. For example, a radius value of 1 with Units set to 1 will create a magnetic sphere of influence that extends 1 meter outward from the crosshair in all direction).

Reset button

Click Reset to clear all fields to 0 and reset the Units setting.

Vortex

Vortex



What Vortex does

Vortex is a special kind of rotation tool. It spins the contents of a bounded area, more in the center than on the outer edges, resulting in an effect much like that of a spiral. An example of an object made by Vortex would be lines of points in the shape of wheel spokes, formed by Vortex into a spiral galaxy.

How to use Vortex

Vortex utilizes both the left and right mouse button. With the left button, you define the bounding area. Then, with the right button, you manipulate the rotation. The steps follow.

Select Vortex. Move the pointer to an edit window and drag out a square. At this point, you are defining a bounding column, with the column extending infinitely along the in-and-out axis of this window. (In the other edit windows, you will see the bounding edges extending off screen.) You may use this, or define a bounding box if you prefer. To do so, move to another edit window and drag. The column ends will jump to the pointer, allowing you to specify a bounding box shape.

Once you have defined the bounding area, position the pointer and drag with the right mouse button. The pointer's location is the center of rotation, and the pointer may be positioned in any edit window for this second half of the Vortex operation. As you drag the mouse, you will see the contents of the bounded area rotate or spin in a spiral manner.

Modifiers for Vortex

The Ctrl key constrains the rotation of Vortex to increments of 15°.

Notes and tips about Vortex

Once you define the bounding area, you can move from one edit window to the next, to affect the object with multiple rotations.

If after defining a bounding column, you unintentionally click the left mouse button in another edit window, causing the Vortex tool to define a bounding box, you must enter the numeric menu for Vortex and change the None button to the axis corresponding to the column you desire. Exit the menu by choosing OK, and the bounding column will return.

Numeric parameters for Vortex

Enter the numeric menu for Vortex to manipulate the tool with specific values rather than manually.

None, X, Y, Z Axis parameter
This option selects the "vortex bounding box" mode, or one of three "vortex bounding columns" along the major axes. None selects a bounding box. X, Y, or Z select a square column that extends infinitely along that axis and affects everything that falls within it.

Radius parameter
The value entered here is the radius for the Vortex tool's sphere of influence.

Center parameter
This is the coordinate location where Vortex's bounding influence is centered.

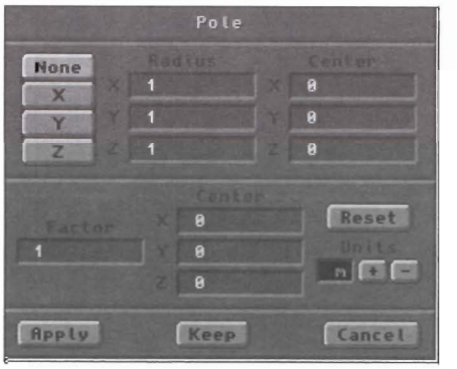
Axis parameter
This is the axis around which an automatic rotation takes place. This setting, along with the Angle parameter, is the equivalent of dragging with the right mouse button while the pointer is centered on the axis chosen here.

Angle parameter
This is the amount of rotation applied on the selected Axis parameter. If a value other than 0 is entered here, then exiting the menu with the OK button will cause an automatic operation of the Vortex tool on the bounded area. If 0 is entered here, then the Vortex settings will be in effect, and you may operate the tool manually after exiting the menu.

Units parameter
Use the plus/minus buttons to select a unit of measurement.

Reset button
Click Reset to clear all fields to 0 and reset the Units setting.

Pole 1



Pole 1

What Pole 1 does

Pole 1 is a special kind of size tool that affects a bounded area. Where Taper 1 acts on two axes of an object equally, so, too, does Pole 1. It pushes or pulls the contents of a bounded area like a repulsing magnet in unusual ways. Pole 1 is useful for forming more natural, organic shapes.

How to use Pole 1

Pole 1 utilizes both the left and right mouse button. With the left button, you define the bounding area. Then, with the right button, you manipulate the tool. The steps follow.

Select Pole 1. Move the pointer to an edit window and drag out a square. At this point, you are defining a bounding column, with the column extending infinitely along the in-and-out axis of this window. (In the other edit windows, you will see the bounding edges extending off screen.) You may use this, or define a bounding box if you prefer. To do so, move to another edit window and drag. The column ends will jump to the pointer, allowing you to specify a bounding box shape.

Once you have defined the bounding area, position the pointer and drag with the right mouse button. The pointer's location is the center of the effect, and the pointer may be positioned in any edit window for the second half of the Pole 1 operation. As you drag the mouse, you will see the object deform.

Notes and tips about Pole 1

If you create a bounding area exactly centered on the object, and position the mouse exactly at the object's center when you manipulate Pole 1, you will resize the object in perfect scale (as if you had simply Sized it). Once the mouse is slightly off-center, the Pole 1 tool acts as expected.

Two factors will affect the operation of Pole 1: the position of the pointer when you drag with the right mouse button, and the size of the bounding area. Pointer position alters the effect of the tool, as it does for many of Modeler's tools. And if the bounding area is off-center, so that there is greater surrounding space to one side of the object, then that side of the object will be affected more. With this knowledge you can cause the tool to influence different portions of an object in different amounts.

If you position the pointer to one side of the object, and right-drag away from it, the opposite side of the object will be affected. If you right-drag toward the object, the near side will be affected. With an off-center bounding box, you may experience different results, since the bounding area affects the tool's influence.

Numeric parameters for Pole 1
Enter the numeric menu for Pole 1 to manipulate the tool with specific values and settings.

None, X, Y, Z Axis parameter
This option selects the "box" mode, or one of three "column" modes along the major axes. None selects a bounding box. X, Y, or Z selects a square column that extends along that axis and affects everything that falls within it.

Radius parameter
The value entered here is the radius for the Pole 1 tool's sphere of influence.

Center parameter
This is the coordinate location where Pole 1's influence is centered.

Factor parameter
This parameter is applied to the object equally on two axes (or portion of the object) within the bounded area.

Units parameter
Use the plus/minus buttons to select a unit of measurement.

Reset button
Click Reset to clear all fields to 0 and reset Units

Pole 2

Pole 2

What Pole 2 does

Pole 2 is a special kind of stretch tool that affects a bounded area. Where Taper 2 acts on two axes of an object independently, so too does Pole 2. It pushes or pulls the contents of a bounded area like a repulsing magnet in unusual ways. Like Pole 1, Pole 2 is useful for forming more natural, organic shapes.

How to use Pole 2

Pole 2 utilizes both the left and right mouse button. With the left button, you define the bounding area. Then, with the right button, you manipulate the tool. The steps follow.

Select Pole 2. Move the pointer to an edit window and drag out a square. At this point, you are defining a bounding column, with the column extending infinitely along the in-

and-out axis of this window. (In the other edit windows, you will see the bounding edges extending off screen.) You may use this, or define a bounding box if you prefer. To do so, move to another edit window and drag. The column ends will jump to the pointer, allowing you to specify a bounding box shape.

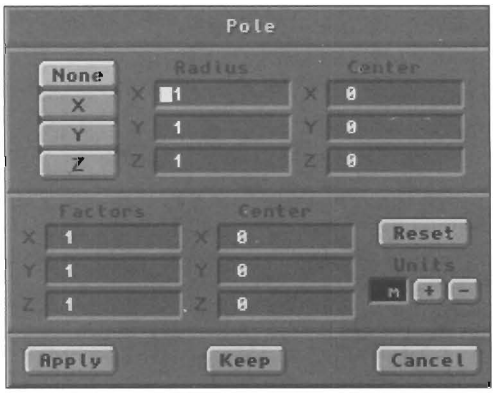
Once you have defined the bounding area, position the pointer and drag with the right mouse button. The pointer's location is the center of the effect, and the pointer may be positioned in any edit window for the second half of the Pole 2 operation. As you drag the mouse, you will see the object deform.

Notes and tips about Pole 2
If you create a bounding area exactly centered on the object, and position the mouse exactly at the object's center when you manipulate Pole 2, you will tend to resize (and somewhat reshape) the object (as if you had simply stretched it). Once the mouse is slightly off-center, the Pole 2 tool acts as expected.

Two factors will affect the operation of Pole 2: the position of the pointer when you drag with the right mouse button, and the size of the bounding area. Pointer position alters the effect of the tool, as it does for many of Modeler's tools. And if the bounding area is off-center, so that there is greater surrounding space to one side of the object, then that side of the object will be affected more. With this knowledge you can cause the tool to influence different portions of an object in different amounts.

If you position the pointer to one side of the object, and right-drag away from it, the opposite side of the object will be affected. If you right-drag toward the object, the near side will be affected. With an off-center bounding box, you may experience different results, since the bounding area affects the tool's influence.

Numeric parameters for Pole 2
Enter the numeric menu for Pole 2 to manipulate the tool with specific values and settings.



None, X, Y, Z Axis parameter
This option selects the "box" mode, or one of three "column" modes along the major axes. None selects a bounding box. X, Y, or Z selects a square column that extends along that axis and affects everything that falls within it.

Radius parameter
The value entered here is the radius for the Pole 2 tool's sphere of influence.

Center parameter
This is the coordinate location where Pole 2's influence is centered.

Factor parameter (X, Y, Z)
This parameter is applied to the object (or portion of the object) within the bounded area. You may enter any combination of factor values for the three axes.

Units parameter
Use the plus/minus buttons to select a unit of measurement.

Reset button
Click Reset to clear all fields to 0 and reset the Units setting.

Numeric

Numeric n

What Numeric does
Activates the Numeric Menu for the command previously selected. This enables you to change the way in which the tool functions, or to engage it using specific numeric values.

How to use Numeric
After selecting an operation or a tool, click Numeric or press n on the keyboard. Enter or change the values as needed.

Click OK or Apply to accept the values and perform the operation.

Click on Keep to accept the values, but not perform the operation, allowing you to interactively perform the operation.

The Multiply menu



The Multiply menu contains commands for working with 3D shapes. Each of the commands on the Multiply menu works with multiple copies of the original shape, hence the title Multiply.

- Extrude creates a copy of the original shape some distance away and connects the two as one.
- Lathe sweeps some number of copies of the original around an axis and connects them.
- Mirror creates an exact mirror-image copy of the selected item.
- Bevel creates beveled polygons out of any selected polygons.
- Smooth Shift shifts polygons out along their surface normals.
- Path Extrude extrudes items along motion paths saved from Layout.
- Rail Extrude extrudes items along a curve in the background layer.
- Patch creates surface patches, meshes of polygons that form complex curved shapes.
- Skin connects the outlines of the selected of polygons, forming an outer surface over them.
- Morph generates any number of intermediate steps between two starting polygon shapes.
- Clone creates any number of copies, offsets them in space and/or rotation.
- Array creates 2D and 3D grids made up of the selected item.
- Path Clone duplicates items along motion paths saved from Layout.
- Rail Clone duplicates items along a curve in the background layer.

Special note about Extrude, Lathe and Mirror
Certain Multiply tools make use of a movable edit axis that indicates the selected axis on which a given operation will take place. After you select the item to be multiplied, and after you choose a command, you have the option of performing the operation manually (via the mouse) or numerically (via the numeric menu). If you choose the mouse, left-Select in the edit window to display the edit axis and drag it to the location you desire. (As a shortcut to the Make button, you can simply Select the right mouse button when the axis is in proper position. This, too, completes the operation.)

If you're equally comfortable working "by the numbers" in 3D, you can also use the numeric menu to enter exact axis coordinates to use. Just select the Numeric button after selecting a command tool. Enter the parameters you desire, and select the axis for the operation. Upon exiting the numeric menu, you will see the screen axis in the edit windows, at the coordinate location entered in the numeric menu. Select Make to complete the operation with the parameters you set.

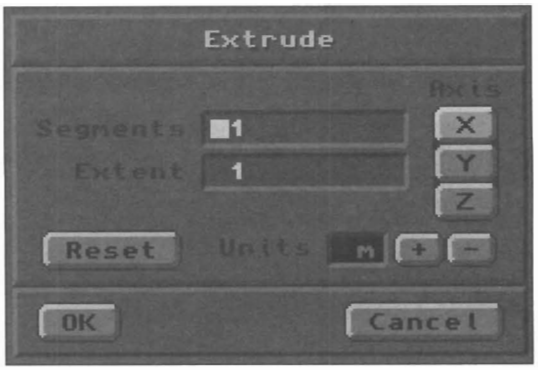
Following are a few examples, assuming you are using the Lathe tool on a square polygon.

To use the edit axis with the mouse
Create a simple polygon (place three or four points in an edit window and press p). Go to the Multiply menu, and select Lathe. Move the mouse into the view window and select the left button. A light gray plus sign will appear under the pointer—this indicates the axis around which this operation will take place. In the other two edit windows, a light gray bar will appear, extending across the window. These show the axis from its side view, while the plus sign shows it along its length. Drag with the left mouse button to move the edit axis about. Or, select in another window to change axes. When the edit axis is positioned correctly, select Make to confirm the operation.

To use the edit axis via the Numeric menu
Create a simple polygon (place three or four points in an edit window and press p). Go to the Multiply menu, select Lathe, and then select Numeric. With Numeric you can select the axis on which the operation will occur, and the location of that axis (which 3D coordinates it passes through along that axis). You can also set certain parameters of how the lathing operation will be performed. Select OK when everything is correct. You'll see the edit axis appear on screen, showing you it's current position. If this is correct, select Make to confirm the operation. If not, you can reposition it by using the mouse as described above, or by reentering the Numeric menu and changing the data there. select Make when ready.



Extrude



What Extrude does

Extrude will extend the selected polygon(s) along any axis, providing depth or thickness. Common uses include the conversion of 2D text polygons into 3D text objects.

How to use Extrude (with the mouse)

Select the item to manipulate. Select Extrude. Move the pointer to an edit window and left-click. A light gray plus sign appears under the pointer, and a dotted-line bounding box surrounds the object. In the other two windows, the bounding box indicates the current extent of the extrusion. You'll also see a T-shaped bar in those windows. Select directly on the "T" and drag it to increase or decrease the extrusion distance. When the distance is correct, select Make (or the right mouse button) to complete the operation. (Make sure you select the right mouse button while the pointer is in the correct edit window—the one where you first selected.)

How to use Extrude (with the numeric menu)

Select the item to manipulate. Select Extrude. Select Numeric. Enter the number of segments, the extent of the extrusion, then select the axis to extrude along. Select OK. When the menu disappears, you'll see a dotted-line bounding box surrounding the object. If its indications of the extrusion look correct, select Make to complete the operation.

Notes and tips about Extrude

If you extrude polygon curves, the curve will be deleted after the extrude operation (since it is no longer needed). If you wish to continue to use the original curve, save it as a separate object before engaging the extrusion.

Numeric parameters for Extrude

The numeric menu allows you to enter exact values for the Extrude command, the number of segments, extent of the extrusion, and the unit of measurement.

Segments

This is the number of sections that should be created. Negative values are not accepted.

Extent

This indicates how far to extrude the selected item. This value can be positive or negative.

Axis

This is the axis along which the extrude operation will occur.

Units

Use the plus/minus buttons to select a unit of measurement.

Reset

Select Reset to clear all fields to 0 and reset Units



Lathe



What Lathe does

Lathe will spin an item around an axis, creating duplicate cross-sections as it spins, then connecting them to form an outer surface. The term lathe comes from wood and metal working, where a beam of metal or wood is spun as a blade cuts into it to give it a pleasingly smooth, rounded shape. Commonly-made lathed objects include bottles, wine glasses, vases, rocket ships, and more.

How to use Lathe (with the mouse)

Select the item to manipulate (typically this is a polygon that forms a partial cross-section of the object). Select Lathe. Move the pointer to an edit window and left-click. A light gray plus sign appears under the pointer, indicating the axis around which the lathe operation will occur. In the other two edit windows, a light gray bar will appear, extending across the window. These show the axis from its side view, while the plus sign shows it along its length. When the edit axis is positioned correctly, select Make to confirm the operation.

How to use Lathe (with the numeric menu)

Select the item to manipulate. Typically this is a polygon that forms a partial cross-section of the object. Select Lathe. Select Numeric. Enter the appropriate information (described below), and select OK. Select Make to complete the operation.

Notes and tips about Lathe
If you lathe polygon curves, the curve will be deleted after the Lathe operation (since it is no longer needed). If you wish to continue to use the original curve, save it as a separate object before engaging the Lathe function.

The order of the points in a polygon used for a lathe operation is maintained by Modeler. This means that the objects created by lathing, if created out of the same original polygon, can be successfully morphed in Layout. It's possible to make multiple morph targets by lathing a polygon, saving the resulting object, undoing the lathe, dragging its points into new locations, lathing it again, saving this new object... etc. For example, if you use a round polygon as a template to create a donut, then move some of its points to create a different shaped template, and create another type of donut, you can morph from one donut shape to the other since the point-creation order remains constant.

Numeric parameters for Lathe
The numeric menu allows you to enter exact values for the Lathe command, the start and end angles for lathing, the number of sides, the axis to use, and the unit of measurement.

Start Angle
Although you are lathing the selected item around an axis, you may not want to lathe it in a full circle from 0-360°. Enter a start angle here to indicate a different starting position. Use values between 0-360° (greater or lesser values can be defined within this range).

End Angle
Although you are lathing the selected item around an axis, you may not want to lathe it in a full circle from 0-360°. Enter an end angle here to indicate a different ending position. Use values between 0-360° (greater or lesser values can be defined within this range).

Sides
This is the number of sides to create for the completed object. Think of them as sections in a pie to help you determine the number you need.

Offset
Enter an Offset value to shift the original shape by this amount as it is lathed. Offsets always occur along the axis selected for the Lathe operation. For example, lathing a disc 360° will form a donut. Lathing the same disc 360° with an offset of 1 meter will cause it to be a spring. The Offset value allows you to lathe in spirals.

Axis
This is the axis around which the Lathe operation will occur.

Center
This is the coordinate location through which the Lathe axis runs.

Units
Use the plus/minus buttons to select a unit of measurement.

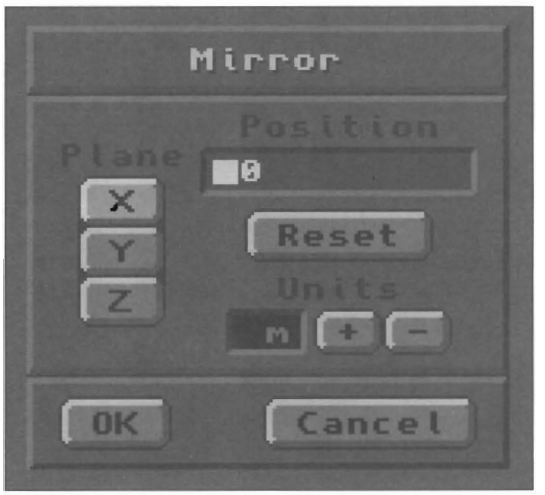
Reset
Select Reset to clear all fields to 0 and reset Units.

Mirror



What Mirror does
Mirror will make a mirror-image of the selected item. Mirror is extremely useful for complex objects that are symmetrical, such as the left and right halves of an automobile or airplane.

How to use Mirror (with the mouse)
Select the item to manipulate. Select Mirror. Move the pointer to an edit window and left-click to activate the edit axis. You will see a dividing line that follows the pointer and extends through two edit windows. This indicates the axis for the mirror function. It moves to a horizontal or vertical position as you near the origin of the edit window. Position this axis in relation to the object. On the opposite side of this axis a mirror copy of the object will be made. Select Make (or click the right mouse button) when the axis is positioned correctly.



How to use Mirror (with the numeric menu)
Select the item to manipulate. Select Mirror. Select Numeric. Enter the appropriate information, and select OK. When you exit, you will see the mirror axis displayed in the edit windows. If its position is correct, select Make to complete the operation.

Notes and tips about Mirror

We recommend when mirroring a shape with points against the axis that you always perform a Merge Points operation after using Mirror. Those points will be duplicated on that axis, which will lead to unnecessary points in your objects. The only time you may not wish to do this is when you do not want the edges of those adjacent polygons to be Smoothed by LightWave Layout.

Numeric parameters for Mirror

The numeric menu allows you to enter exact values for the Mirror command.

Plane

Use this to select the plane to mirror the object around. For example, the selected item is at X 0, Y 5, Z 0. If you choose the Y axis, with a position of 0, the selected item will be mirrored to another point opposite the original (on the other side of the Y axis). In this case, the mirrored copy will be placed at X 0, Y -5, Z 0.

Position

This is the coordinate location of the mirror axis. The distance between this axis and the selected item will also be mirrored so that the copy is the same distance away in the opposite direction.

Units

Use the plus/minus buttons to select a unit of measurement.

Reset

Select Reset to clear all fields to 0 and reset the Units setting.



Numeric n

What Numeric does

Numeric allows you to change the parameters of operation for the previously selected tool.

How to use Numeric

After selecting an operation or a tool, Select Numeric or press n on the keyboard. See the command button entry for the numeric options of a specific button.



Make Return or Enter

What Make does

The Make button completes the functions set up by the Extrude, Lathe, and Mirror command buttons on this menu. It will not affect command buttons from other menus.

How to use Make

For example, when extruding an object, use the numeric menu to set exact extrusion values, then press r or select Make to complete the operation.



Bevel b

What Bevel does

Bevel will add a beveled edge to selected polygons. Bevel will shift the selected polygon by the Shift value, move it inward by the Inset value, and connect the new edges with polygons. The shift is in the direction of the polygon's surface normal. (A Bevel with any Shift value and an Inset of 0 is just like an extrusion.)

How to use Bevel

Select one or more polygons, or an entire object. Press b on the keyboard, or click Bevel. After you select Bevel, enter values for the amount of Shift and Inset you desire.

Shift

Shift is the distance that the selected polygon will move along its surface normal. This value may be positive or negative.



Inset

Inset is the distance that the edges of the polygon will move inward. This value may be positive or negative.

Notes and tips about Bevel

Positive Inset and Shift values bevel fonts well, but letters with narrow edges may not bevel correctly. Try positive values of 10, 20 and 30mm on a few random fonts and you'll see. The beveled edges often end up cutting into one another along narrow parts of characters, making for clumsy objects.

Here's a great way to bevel fonts reliably:

• After generating a text object, copy it to another layer. Here, use a negative Inset value and a negative Shift value, and bevel it. This will cause the beveled edges to extrude outward and backward from the letter faces, avoiding the possible edge overlap problem. However, the original letter faces themselves will have been pushed back also, and are now facing you from the inside back of the letter.

• Then, copy the first layer into the second, which will replace the original face on the front of the beveled font. If you wish to smooth across the beveled edge in Layout for rounded character edges, do a Merge Points. Otherwise, that's it! (If you're really picky, you may also wish to remove that wrong-facing polygon from the inside back face, or flip it to face outward in case you'll be showing the back side of the lettering.)

If the Inset value is too large, the beveled edges will start to cross each other in front of the template polygon. If your beveled objects have inconsistencies, try using smaller bevel amounts. Polygons with crossed edges may not render properly. Use the tip above.

Bevel works on both single- and double-sided polygons. If you bevel a double-sided polygon it will be beveled on both sides, in the facing direction of each polygon. However, if the double-sided polygons form a closed 3D solid (such as a sphere) the interior polygons will not be beveled.
Bevel can also create additional detail and surfaces you never thought easily possible—try using bevel on a standard sphere, or some other shape in the LightWave collection of objects, the PhoneBook, for some creative and useful surprises.

Smooth Shift Shift+f





What Smooth Shift does
Smooth Shift adds a specific type of detail to a polygon object or mesh. It will create duplicates of the selected polygon(s) a certain distance from the original(s). The copies will replace the originals. The duplicate(s) will be shifted along an axis that corresponds to the original polygon's surface normal. Therefore, the shift will remain accurate for Phong shaded objects.

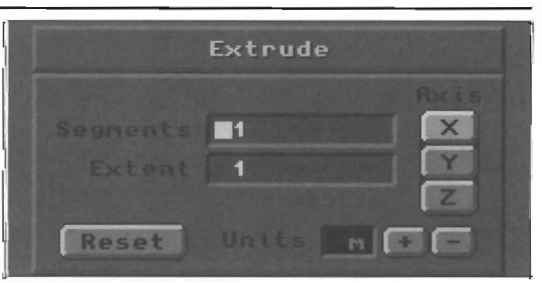
How to use Smooth Shift
Select some number of polygons. Select Smooth Shift or press Shift+f on the keyboard. Enter a shift value (positive to move forward along the polygon surface normals, negative to move backward). Change the Maximum Smoothing Value, if you desire. Press OK.

Maximum Smoothing Angle
Max Smoothing Angle is like the parameter of the same name on the Surfaces menu in Layout. The smoothing method in Smooth Shift requires a cutoff angle. The Max Smoothing Angle determines whether polygons will be smoothed over. Any two polygons with adjoining edges at angles greater than this value will be smoothed across.

Notes and tips about Smooth Shift
Due to the nature of Smooth Shift's operation on polygons, if you apply Smooth Shift to an entire letter object from a simple font such as the Common font, the front and back faces of the letter will be beveled.

An example of Smooth Shift: suppose you had a pipeline object in an animation. You could simulate alternating thin and thick sections of pipeline by selecting every other section, then using Smooth Shift. The result would be a solid pipeline, with every other section having a slightly wider diameter.

Path Extrude Shift+p





What Path Extrude does
Path Extrude will extrude and skin a polygon or curve along a motion path that was created and then saved from Layout. (This is different from Path Clone, described below.)

How to use Path Extrude
Select the item, then press Shift+p to access the file selector and the Motions directory (where Layout stores its motion path files). Select a motion path and select OK. A second menu will appear. Enter the first and last frames from the motion path to use, the frame step, and select OK.

The polygon(s) will be extruded along the path as specified.

Notes and tips about Path Extrude
The polygon or object must consist of single-sided

polygons in order to be extruded along the path. If the polygon or object is double-sided, only the points that comprise it will be used to create the extruded motion path.

Modeler will use the path as it was created in Layout exactly. Therefore, if the motion path traveled 300 meters on the Z axis, and rotated 360° while doing so, then the path extruded object will be 300 meters long with a 360° twist.

Here's a useful idea for Path Extrude: suppose you needed the Layout camera to follow a car through a twisting, turning tunnel. You could create the motion path for the camera (or the car) first, then save the motion path. In Modeler, design one section of the tunnel, then use Path Extrude and extrude the tunnel section into a long tunnel that matches the motion path of the car exactly.

Numeric Parameters for Motion Path Extrude
Motion path requires that you select a motion path from the Motions directory, and that you enter the following data.

First
The first frame of the motion path (where to begin the extrusion). This does not need to be the very first frame of the motion path. Modeler is requesting the first frame you wish for it to use.

Last
The last frame of the motion path (where to end the extrusion). This does not need to be the very last frame of the motion path. Modeler is requesting the last frame you wish for it to use.

Step
The step is used to determine the number of steps (or segments) Modeler should utilize for the entire length of the extrusion. The number you enter here will be divided into the total number of frames used for the path extrusion, and the result is the number of segments.

For example, a 30-frame motion path with a Step value of 1 results in 30 segments to the extrusion, a Step value of 2 would result in 15 segments to the extrusion, and a Step value of 3 results in 10 segments to the extrusion.

Rail Ext

Rail Ext (Rail Extrude) Ctrl + r

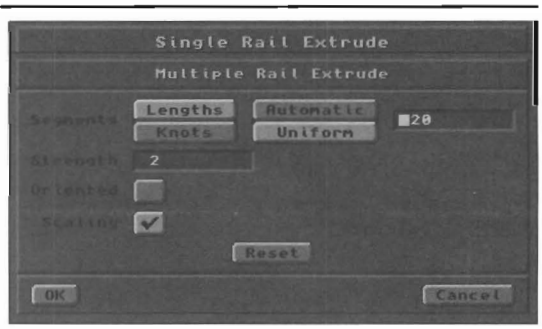
What Rail Extrude does
Rail Extrude will extrude polygons or curves along a curve path (single rail extrude), or along multiple paths (multiple rail extrude).

How to use Rail Extrude
Arrange the object(s) in a foreground layer, and the curve path(s) in a background layer. Click Rail Extrude. Select the proper options and enter the necessary values (as described below). Click OK.

Requirements and parameters for Single Rail Extrude
- Object to be extruded is in the foreground layer.
- The extrusion path must be a polygon curve located in the background layer.
- The object should be placed and oriented so that it is at the starting point of the extrusion path.

Segments
Segments is the number of connected slices that will be in the resulting extruded object.
Select Automatic to distribute a number of segments (based on the Curve Subdivision value in the Objects/Options menu) along the rail curve according to the knot spacing along the curve.

Select Uniform Lengths to distribute some number of segments (which you specify) evenly along the length of the entire curve. No matter what the knots spacing, the segments will remain evenly spaced.



Select Uniform Knots to distribute some number of segments (which you specify) evenly between the knots that make up the curve. Whether knots are close together or far apart, there will be the same number of segments between each.

Oriented
Oriented determines the orientation of the polygon template as it follows the curved path. Orientation on causes all segments to angle themselves automatically so that they are aligned with the rail curve as it turns. Orientation off causes all segments to remain in the same orientation as the template so that they face exactly the same way.

Requirements and parameters for Multiple Rail Extrude
- Object to be extruded is in the foreground layer.
- The extrusion path may be 2 or more curves in the background layer. If the rails diverge or meet, the resulting cloned objects will similarly stretch or shrink.
- The object should be placed and oriented so that it is at

the beginning of the extrusion path.

Segments
Segments is the number of connected slices that will be in the resulting extruded object. You can select segments to be calculated by lengths or by knots.

Select Automatic to distribute a number of segments (based on the Curve Subdivision value in the Objects/Options menu) along the rail curve according to the knot spacing or the length of the curve.

Select Uniform Lengths to distribute some number of segments (which you specify) evenly along the length of the entire curve. No matter what the knots spacing, the segments will remain evenly spaced.

Select Uniform Knots to distribute some number of segments (which you specify) evenly between the knots that make up the curve. Whether knot are close together or far apart, there will be the same number of segments between each.

Strength
Strength determines how strongly the rails vie for control of the point locations. You will not notice much of a difference unless you have Scaling (below) deselected. The higher the strength value, the closer the extrusion will "hug" the rails.

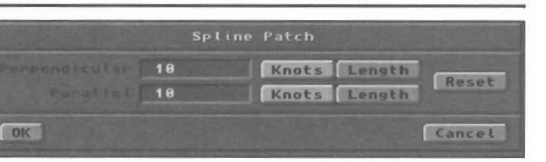
Oriented
Oriented determines the orientation of the polygon template as it follows the curved path. Orientation on causes all segments to angle themselves automatically so that they are aligned with the rail curve as it turns. Orientation off causes all segments to remain in the same orientation as the template so that they face exactly the same way.

Scaling
If the rails in the background layer spread apart along any axis or axes, then the clones will automatically stretch along those axes as well. If you wish to have the clones scale equally, rather than along those specific axes only, turn Scaling on. For example, with Scaling off, if you Rail Clone a polygon along the Z axis using two rails that spread further apart in the X axis, the clone copies will be stretched on the X axis to maintain their relationship to the guiderails. Scaling on causes this expansion to occur equally on both X and Y axes.

Notes and tips about Rail Extrude
When you first use Rail Extrude to extrude curves, be aware of these important pieces of information:

- The direction that the curve faces (which end is considered the beginning) will have bearing on both the shape and direction of the resulting extrusion. The direction affects in which direction the extrusion may go. If you do not receive the results you expect, you may wish to try flipping the curve's starting point with the Polygon menu's Flip command.
- The direction that the curve faces (which end is considered the beginning) will also affect the direction of the surface normals for the polygon mesh you create. You may need to use Flip after completing the extrusion.

Patch Ctrl+f





What Patch does
Patch will create a smooth mesh surface connecting either 3 or 4 curves.

Requirements for Patch
- You must have either 3 or 4 curves selected.
- The curves must form a closed area. (They do not have to be joined end to end, however they do need to be joined somewhere along their length. At the points where the curves overlap, those points must be merged.)
- The curves must be selected. (Unlike Point/Polygon/Volume selection, where all items are considered selected when no specific item is selected, Patch requires that the curves actually be selected. Use the select Polygon mode to select curves.)

How to use Patch
First, you must create a curve by placing 2 or more points in an edit window. Select them in any order, and press ∏+f. This creates a curve. Now create 2-3 more. Move the starting and/or ending points of each curve so that each curve's endpoint sits atop the next curve's startpoint. Merge Points. (You now have what appears to be a closed curve, although it is made up of individual open curves with overlapping points.) Press ∏+f on the keyboard. Enter values for the number of segments (the number of perpendicular and parallel divisions along each side) and select OK.

Notes and tips about Patch
This is a powerful command. With it you can create an endless supply of free-form mesh shapes. The curves that you use to create the mesh object can be manipulated in 3D—the points do not have to be planar! For example, two S-shaped curves at the top and bottom of an edit window, joined at the ends by two straight curves, will create a billowy window curtain when meshed.

Curves are not required to have their starting and ending points merged. As long as 3 or 4 curves are involved in creating a closed area, they may overlap at any of their points.

Numeric parameters for Patch
After creating and selecting the required number of curves, Make Patch needs the following data before it will create a surface polygon patch.

Perpendicular Segments
Enter a value for the number of segments (or divisions). This is the number of segments that will be perpendicular to the last-selected curve.

Parallel Segments
Enter a value for the number of segments (or divisions). This is the number of segments that will be parallel to the last-selected curve.

The numeric value for both the Knots and Length options indicates the number of polygons used to generate the mesh. The default value of 10 indicates that the mesh will consist of ten polygons along both the parallel and perpendicular sides of the mesh.

Knots
Select knots to direct Modeler to create an interpretive polygon mesh based on the proximity of the knots along the outline curves. Where knots are closer together, there will be more, smaller polygons; where knots are further apart, there will be fewer, larger polygons.

Length
Select Length to direct Modeler to create a more evenly-spaced polygon mesh, with each polygon within the mesh roughly the same size as its neighbor. This option generates a more orderly looking mesh, but may not give you the amount of smoothness you need near tightly rounded corners.



Skin

What Skin does
Skin allows you to cover a series of wireframe shapes with polygons. The shapes do not need to have the same number of points in common. This is also called lofting, or loafing (as if covering the slices of a loaf of bread).

How to use Skin (automatic function only)
Create or select a series of polygons or curves in the order that you want them connected. Select Skin to create an outer surface covering for them.

Requirements for Skin
Skin works best when you use single-sided polygons for the framework. Double-sided polygons can result in strangely skinned objects.

Notes and tips about Skin
If you Skin using polygon curves, the curves will remain in the Modeler workspace following the operation. You may save them separately, continue to use them, or delete them. They are no longer part of the skinned object that you created.

Skinning is different from Patching when curves are involved. Patching tends to follow smooth contours, maintaining a rounded surface. Skinning tends to connect curves with straight-line segments, making for less smooth profiles.

Here's an example. First, create an outline shape, such as a circle, and make it a polygon. You could use the Disc tool to do this step. Then copy it. Use Move to move it back a bit from its original location. Paste the original back in place. Use Size to enlarge it a bit. Use Move to move these two back a bit. Continue to Paste the original hoop into the workspace, reshape it, and move the group backward along one axis. 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, in order. Important: Select them in the order you want them connected. Then select Skin.

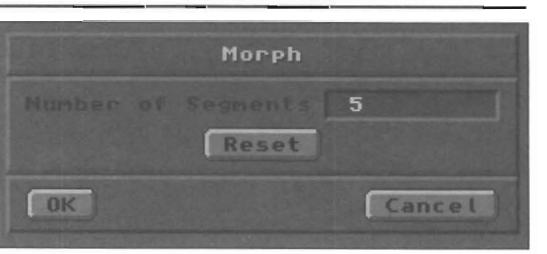
Skin does not require that the segments it connects have the same number of points.

There is no Numeric option for Skin, since skinning occurs the moment you select the Skin command.



Morph

What Morph does
Morph will create a number of connected intermediate polygons between two polygons that have the same number of points. They will have an outer surface, as if you also used the Skin command on them.



How to use Morph (automatic numeric menu only)

Select two polygons. Select Morph. Enter the number of segments to create, then click OK.

Requirements for Morph

- Morph works best when you Morph between single-sided polygons.
- The segments to be morphed must have the same number of points.

Notes and tips about Morph

If you Morph using polygon curves, there are two things you should be aware of:

- Morphing with curves does not utilize splines. What this means is that the curves will be treated as straight-edged polygons, and Modeler will morph in a linear fashion.
- The curves will remain in the Modeler workspace following the operation. You may save them separately, continue to use them, or delete them. They are no longer part of the morphed object that you created.

An example: Create a polygon. Select Copy (the copy will be held in a memory buffer). Now move the remaining polygon some distance away from its original location. Modify it into the shape you want to Morph to. Paste the copied polygon back into the window. Select on the Polygon selection tool, and select both polygons. Select Morph, and a menu appears. Set the number of intermediate steps, or segments to morph, and select OK.

Numeric parameters for Morph

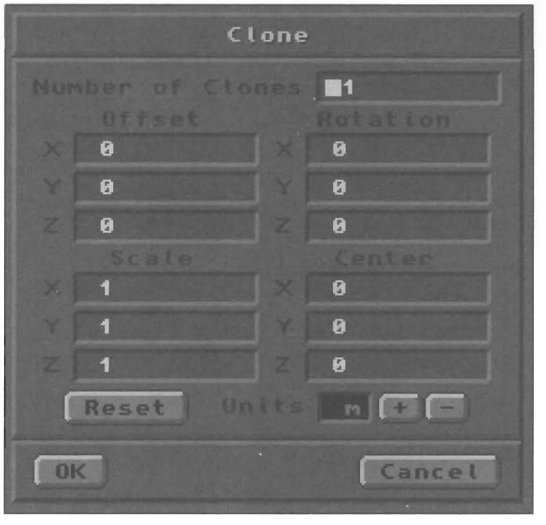
Morph requires numeric data in order to operate. Therefore, when you select Morph, an automatic numeric menu will appear. Exiting the menu enters the new data and Morphs between the selected items.

Number of Segments

Enter the number of segments, or morphed steps, you desire between the two selected polygons.

Clone





What Clone does

Clone duplicates an item one or more times using specific increments of distance, rotation, and scaling. This allows you to create a spiral staircase out of a single step, or a wood screw out of triangular polygon outline, for example.

How to use Clone (automatic numeric menu only)

Select the item to manipulate. Typically this is a polygon that forms a partial cross-section of the object, although it may be a solid object as well. Select Clone. Enter the appropriate information, and Select OK to exit the menu and clone the selected item.

Notes and tips about Clone

As an example, select New to reset the screen. Select the Box tool and create a stair step. It should be oriented so that you are looking down on it in the Top view. In that window, move it until it sits about two grid squares off the center (Y) axis, yet is still centered on the +X axis (the Face view will show a profile view that is similar to this). Select Clone, enter 36 for Number of Clones,.5 for Y Offset, and 36 for Y Rotation. Select OK to create a quick 36-step spiral staircase. Press a to fit this new object to the screen.

Here's how this works. There were 36 clones of the step to be made. We decided that there would be 10 steps per 360° spiral (this was an arbitrary choice). Since 360° divided by 10 equals 36, 36° was the value used for rotation. Each clone would be rotated by 36° from the prior clone. Now, for every 10 clones, the steps would go full circle. But spiral staircases need to go upward in addition to going around. Therefore, the offset value of 0.5 caused each clone to be shifted upward on the Y axis, causing each of the 36 clones to be rotated by 36° and raised by 0.5 meters from the clone before it.

Immediately after a clone operation involving a template polygon, you can use the Lasso to encircle (i.e., select) the entire group of newly cloned polygons. They will be selected in the order they were created. This means you can perform a Skin operation if you desire to place an outer surface around the framework just created. After the Skin operation, the framework polygons are no longer needed (since they are inside the skin and will not render anyway). They will still be selected, so you can delete them, leaving only the skinned object remaining. This technique is useful when you create objects like a wood screw, where you no longer need the internal (unseen) polygons after you have completed the outer surface.

Numeric parameters for Clone

Clone requires numeric data in order to operate. Therefore, when you select Clone, an automatic numeric menu will appear. Exiting the menu enters the new data and clones the selected item.

Number of Clones
Enter the number of copies of the original object to create.

Offset
Enter the distance between one clone and the next along the X, Y, or Z axes. Example: 1m in the Y axis would cause each copy to be created 1 meter away from the last copy.

Rotation
Enter the rotation between one clone and the next. Example: 20 in the Y axis would cause each copy to be rotated 20 degrees around the Y axis from the last copy.

Scale
Enter the amount of scaling for each copy. Example: 1.5 in the Y axis would cause each copy to be sized 1.5 times larger than the previous copy.

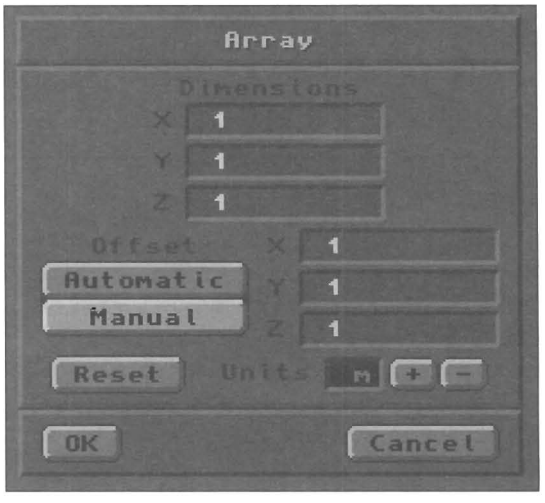
Center
Enter the coordinates to use as the center point, around which the clone operation takes place.

Reset
Resets all values to default settings.

Units
Selects the unit to use for the operation.

Array

Array



What Array does
Array duplicates the selected item any number of times using specific increments of distance. This allows you to create a grid out of this object, a matrix.

How to use Array (automatic numeric menu only)
Select the item to manipulate. Select Array. Enter the number of repetitions you desire for each axis, and select OK to complete the operation.

Notes and tips for Array
If you Array a flat polygon using Automatic Offset, the "flat dimension" of that polygon will not appear to have been arrayed. If a square flat polygon lay in the XY plane, having no Z depth, an Automatic Offset of 10 will create an array of 10 copies in X, 10 copies in Y, and 10 copies in Z. However, the Z copies will not extend into space, since flat polygons have no true depth per se. The result is that the polygons will have been stacked one atop another in the Z axis.

Numeric parameters for Array
Array requires numeric data in order to operate. Therefore, when you select Array, an automatic numeric menu will appear. Exiting the menu enters the new data and arrays the selected item.

Dimensions
Enter the number of repetitions of the original object. For example, an arrayed sphere with dimensions of 5, 6, 7 would result in a collection 5 spheres wide on the X axis, 6 spheres high on the Y axis, and 7 spheres deep on the Z axis. These values may be positive or negative.

Offset
There are two offset settings. Automatic will offset each copy of the original item so that all copies are side by side. The object's own dimensions are used as the spacing value. Manual enables you to determine your own user-specified spacing by entering your desired X, Y, and Z values.

Reset
Resets all values to default settings.

Units
Selects the unit to use for the operation.

Path Cln

Path Clone

What Path Clone does
Path Clone will clone a point, polygon, or object along a motion path that was created and then saved from Layout. (The difference between Path Extrude and Path Clone is that the clone operation simply creates a certain number of copies of the original polygon evenly spaced along the motion path, while the extrude operation connects those copies as one extended object.)

How to use Path Clone
Select the item, then select Path Clone to access the file selector and the Motions directory (where Layout stores its motion path files). Select a motion path and select OK. A second menu will appear. Enter the first and last frames

from the motion path to use, the frame step, and select OK. The object(s) will be cloned along the path as specified.

Notes and tips about Path Clone

Modeler will use the path as it was created in Layout exactly. Therefore, if the motion path traveled 300 meters on the Z axis, and rotated 360° while doing so, then the Path Cloned object may be up to 300 meters long with a 360° twist.

Numeric Parameters for Motion Path Clone

Motion path requires that you select a motion path from the Motions directory, and that you enter the following data.

First
The first frame of the motion path (where to begin the cloning). This does not need to be the very first frame of the motion path. Modeler is requesting the first frame you wish for it to use.

Last
The last frame of the motion path (where to end the cloning). This does not need to be the very last frame of the motion path. Modeler is requesting the last frame you wish for it to use.

Step
The Step is used to determine the number of steps (or segments) Modeler should utilize for the entire length of the clone. The number you enter here will be divided into the total number of frames used for the path cloning, and the result is the number of segments.
For example, a 30-frame motion path with a Step value of 1 results in 30 clones, a Step value of 2 would result in 15 clones, and a Step value of 3 results in 10 clones.

Rail Clone

Rail Cln

What Rail Clone does

Rail Clone will clone a point, polygon, or object along a curved path (single rail clone) or multiple paths (multiple rail clone). (The difference between Rail Extrude and Rail Clone is that clone creates a certain number of copies of the original object evenly spaced along the curve(s), while extrude connects those copies as one extended object.)

How to use Rail Clone

Arrange the object(s) in a foreground layer, and the curve path(s) in a background layer. Click Rail Clone. Select the proper options and enter the necessary values. Click OK.

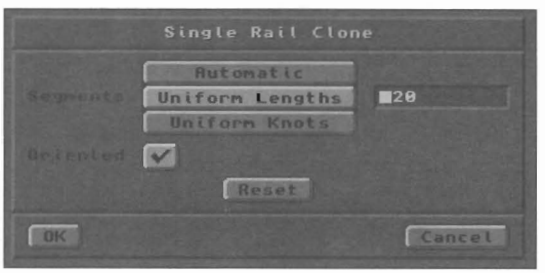
Requirements and parameters for Single Rail Clone

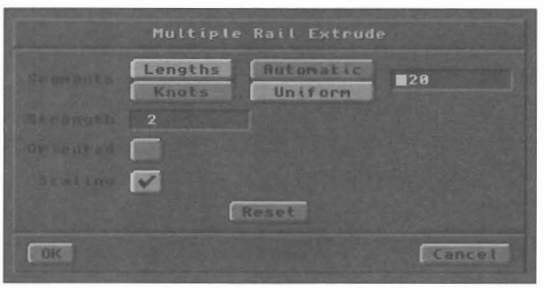
- Object to be cloned is in the foreground layer.
- The curve path must be a polygon curve located in the background layer.
- The object should be placed and oriented so that it is at the beginning of the clone path. Unexpected results may occur if not.

Segments
Segments is the number of clones in the resulting object. Choose the clone distribution method below.

Select Automatic to create a number of clones (based on the Curve Subdivision value in the Objects/Options menu) distributed along the rail curve according to the knot spacing along the curve.

Select Uniform Lengths to distribute some number of clones (which you specify) evenly along the length of the entire curve. No matter what the knots spacing, the clones will remain evenly spaced.





Select Uniform Knots to distribute some number of clones (which you specify) evenly between the knots that make up the curve. Whether knot are close together or far apart, there will be the same number of clones between each.

Oriented
Oriented determines the orientation of the polygon template as it follows the curved path. Orientation on causes all segments to angle themselves automatically so that they are aligned with the rail curve as it turns. Orientation off causes all segments to remain in the same orientation as the template so that they face exactly the same way.

Requirements and parameters for Multiple Rail Clone

- Object to be cloned is in the foreground layer.
- The curve path may consist of 2 or more curves in the background layer. If the rails diverge or meet, the resulting cloned objects will similarly stretch or shrink.

• The object should be placed and oriented so that it is at the beginning of the clone path. Unexpected results may occur if not.

Segments
Segments is the number of clones in the resulting object. Choose the clone distribution method below.

Select Automatic to create a number of clones (based on the Curve Subdivision value in the Objects/Options menu) distributed along the rail curve according to the knot spacing along the curve.

Select Uniform Lengths to distribute some number of clones (which you specify) evenly along the length of the entire curve. No matter what the knot spacing, the clones will remain evenly spaced.

Select Uniform Knots to distribute some number of clones (which you specify) evenly between the knots that make up the curve. Whether knots are close together or far apart, there will be the same number of clones between each.

Strength
Strength determines how strongly the rails vie for control of the point locations. You will not notice much of a difference unless you have Scaling (below) deselected. The higher the strength value, the closer the extrusion will "hug" the rails.

Oriented
Oriented determines the orientation of the polygon template as it follows the curved path. Orientation on causes all segments to angle themselves automatically so that they are aligned with the rail curve as it turns. Orientation off causes all segments to remain in the same orientation as the template so that they face exactly the same way.

Scaling
If the rails in the background layer spread apart along any axis or axes, then the clones will automatically stretch along those axes as well. If you wish to have the clones scale equally, rather than along those specific axes only, turn Scaling on. For example, with Scaling off, if you Rail Clone a polygon along the Z axis using two rails that spread further apart in the X axis, the clone copies will be stretched on the X axis to maintain their relationship to the guiderails. Scaling on causes this expansion to occur equally on both X and Y axes.

Notes and tips about Rail Clone
When you have a complex, curving path along which you need to create some number of objects, use Rail Clone. An excellent example of Rail Clone consists of making the stitches going around a baseball. Once you have created the two halves of the baseball, make a curve that follows the entire seam. Orient a single pair of stitches on the seam, then use Rail Clone to make duplicate stitches along the entire length of the seam. With Orientation on, click OK. The stitches will curve with the path to follow the outline of the sphere. If you need greater control over the curve, create a pair of rails for the stitch object to follow so that its orientation is constant.

The Polygon Menu

Polygon

The Polygon Menu contains a selection of tools that allows you to modify polygons in the following ways:

- The creation of points (Points)
- Inserting or deleting points from polygons (Add Point, Remove Point)
- Assigning surface names to polygons (Surface)
- Attaching or separating polygons (Attach, Detach)
- Working with surface normals (Align, Unify, Flip)
- Splitting and merging polygons (Split, Merge, Subdivide, Triple)
- Removing polygons without removing points (Remove)

There are two kinds of polygons employed by Modeler, face polygons and curve polygons. For simplicity's sake, face polygons are referred to as polygons and curve polygons as curves. Polygons are important for rendering, while curves are a modeling aid only. A curve alone will not render within Layout. Curves aid in modeling smooth-profile shapes, yet do not contain faces per se. When a curve is used to create an object, an operation is performed that creates a group of polygons that approximate the shape of the curve. The resulting shape is referred to as a polygon mesh, or simply a mesh object.

Technically, any object in Modeler is a mesh object since all objects consist of a mesh of polygons; however, where appropriate, it is easier to identify objects created from curves in this manner with this term. You should know that you can tailor how finely subdivided the patch will be by changing the Curve Subdivision setting (this option is found under the Options command in the Objects menu). Also, Curve Subdivision is adaptive. The nearness of points and the tightness of a curve may cause the creation of more segments at that portion of the curve, whereas curve points that are further apart require fewer points. In other words, where necessary, Modeler will place a few extra points to maintain smoothness.

Curves may be selected in the same manner as polygons, with the Polygon selection tool. Curves have a beginning point and an ending point. When a curve is selected, the starting point displays a white circle to indicate its status. The starting point may be switched with the ending point using the Flip command, just as you would flip a polygon surface normal with this command. In fact, the orientation of the starting point (at one end or the other) affects the direction of the surface normals in the resulting polygon mesh created by a curve operation.

Points

Points

What Points does

This button creates points within the Modeler workspace. (The Points command button does not perform the same function as the Point selection button, found on the lower edge of the screen, whose only function is to activate Point selection mode.) Immediately after creating a series of points, you may make them into a polygon.

How to use Points

Click the Points button. Move the cursor to an edit window to the location where you want to create a point. Press the left mouse button to display the point creation crosshair. Drag it to the location where you wish to create a point, and click the right mouse button. Move the crosshair elsewhere to create additional points. (Note: You can also select the Make button on screen, or press r on the keyboard, to place a point when the crosshair is in position.)

To create a polygon after placing points

Shortcut: Press p. This instantly converts selected points into a polygon. Otherwise, click the Points button to deselect it and escape the point-making mode), then click on the Make button in the Polygon menu.

To create a polygon out of pre-made or existing points Click the Point selection button, move the cursor to an edit window, hold down the left mouse button and drag the cursor over the points you want. (See the Selection modes for more information on how to select points.) When done, click the Make button on the Polygon menu. Make sure you drag counterclockwise for the resulting polygon to face "forward" in LightWave Layout, as clockwise will result in a backward-facing polygon).

Notes and tips about Points

The Make buttons from other menus will not work to create a polygon. If you're on another menu and you select some points with which to make a polygon, press p to do so.

Polygons created from hand-placed points will always be single-sided, regardless of the setting of the One Side and Two Sides buttons in the Options menu.

Numeric parameters for Points
Press n after selecting Points to enter specific X, Y, Z coordinates for a point. Afterward, press r to create a point at that location.



Make Return or Enter

What Make does
Use the Make button on the Polygon menu for two functions: to create new points, or to create polygons out of existing points.

When the Points creation button is selected, Make will create points
Click Make to create a point at the crosshair location on screen.

When there are selected points on screen, and no other tool is selected
The Make button will form the selected points into a polygon.

How to use Make (to create points)
Click the Points creation command. Move the cursor into a window. Click the left mouse button and position the crosshairs. When the crosshairs are correctly positioned, select Make to make a point at that coordinate. (You can also press r to create a point, or use the right mouse button.)

How to use Make (to create polygons)
Go to Point selection mode and select some number of points in clockwise order (as if going around a clock face in ascending order—this ensures that the polygon will face correctly). Press p. If you have just created a series of points using the Points creation tool, while still in this mode you can press p to make the polygon. The points that you just created will be connected in the order in which they were made. For this reason, it's always good to create and select points in clockwise order.

Note that in order to use the keyboard equivalent for Make, r, to create polygons, you must first exit Points creation mode. Do this by selecting the Points button again. Then you can safely select Make. Otherwise, Make is still tied to point creation and will simply add another point to the screen.

Notes and tips about Make
Points must be selected (highlighted) in order to be made into a polygon. Points you just created are automatically selected in the order they were created. This is a good reason for getting into the habit of always creating points in a clockwise manner.

As a shortcut, you can use the right mouse button to place and create points in one operation. Hold the right mouse button down and drag the crosshairs to where you want them, then let go. A point will be created where you let go of the mouse button.



Remove k

What Remove does
Remove allows you to delete a polygon(s) from the Modeler workspace without removing the points that make it up.

How to use Remove
Select one or more polygons. Select Remove or press k on the keyboard, and they will be removed. The points that comprised them will remain.

Add Pnt (Add Point)



What Add Point does
Add Pnt will add points to one or more selected polygons.

How to use Add Point
Use the Points creation command to add one or more points to the workspace. Add Point has two methods of operation: proximity and distant. If you wish to add points in the immediate vicinity of a polygon, simply select the polygon and add a point to any edge with each mouse click. If you wish to add points that may lie a distance away from the original polygon, you'll need to create them first, then add them to the selected polygon. The first method is fastest for adding to the polygon itself, while the second allows you to add extended points in one step.

To add a point anywhere along a polygon edge
First, select the polygon that needs one or more added points. You can select several polygons, if you wish. Next, select Add Pnt. The pointer becomes an arrow with the word "TO" beside it. Move the pointer to the edge of a polygon and click the left mouse button. A new point will be added to that edge. Continue adding points in the same manner.

To add a point that will lie some distance away from a polygon
First, select the polygon that needs a new point. Next, go to the Polygon menu and select the Points creation tool. Create the new point(s) in the desired location. Click Add Pnt. The pointer becomes 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 (or points). The polygon edge will expand to include the selected point(s).

Notes and tips about Add Point
If you intend to add several free-standing points to a polygon, you may select them (in counter-clockwise order) and then add them, in one step, without having to select and add each one at a time. You can add points to curves with both of the above methods as well.

Rem Pnt (Remove Point)



What Remove Point does
Rem Pnt will separate points from the polygons to which they belong. It will not remove the point from the Modeler screen (use the Cut or Delete command for this instead).

How to use Remove Point
In the Polygon selection mode, select a polygon. Change to Point selection mode, and select one or more points on that polygon.

Click Rem Pnt to separate the selected point(s).

Notes and tips about Remove Point
The two points on either side of the removed point will remained joined, as if the point between them never existed. Therefore, the original polygon will remain, minus a point.

You can remove points from curves as well.

Attach



What Attach does
Attach will add a polygon to the surface of another. Such polygons are known as detail polygons. (Unless you absolutely need to attach polygons, you may find it more useful to use the 2D or 3D drill operations to slice the shape of the smaller detail polygon into the larger one.)

How to use Attach
To attach a polygon: select the two polygons that are involved so that they are highlighted. Click Attach. The pointer will turn into the word "TO" with an arrow.

Modeler is requesting you to inform it which polygon is to be the "attache." Click on this polygon and the two will now be attached.

Notes and tips about Attach
An example of this would be attaching the polygons that form the word "Stop" to a six-sided polygon to form a stop sign.



Detach

What Detach does
Detach is used to remove polygons that were attached with the Attach function.

How to use Detach
Select the polygons that you wish to separate, then click Detach. They will become individual polygons again.



Split

What Split does
Split will divide a polygon into two smaller polygons.

How to use Split
In the Polygon selection mode, select a polygon. Change to Point selection mode, and select two points that do not share any edges. Click Split to subdivide the polygon along a line between those two points.

Notes and tips about Split
Split also works on curves. The procedure is similar to splitting a standard face polygon: select the curve, select a point on the curve, then select Split. The curve will be split into two distinct curves.



Merge Shift+z

What Merge does
Polygon Merge will join two polygons that share at least one common edge. (A common edge is one where two or more points belong to two or more polygons.)

How to use Merge
Select one or more polygons. Press Shift+z on the keyboard, or click Merge.

Notes and tips about Merge
After merging polygons, it's a good idea to check that the resulting polygon remains planar (flat, so there will not be rendering problems). Select the polygon and press i for information (better yet, press w and use Statistics to search for and highlight any non-planar polygons).

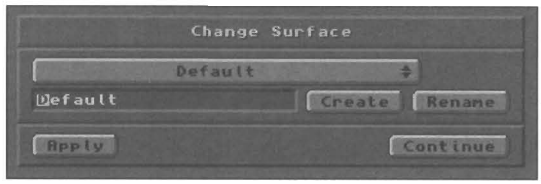
Merge also works on curves. The procedure is similar to merging a standard face polygon: select two adjacent curves that share a common endpoint (the points must be endpoints—you cannot use polygon merge on curves using their inner points), then select Merge. They will be merged into one continuous curve.

If you attempt to merge polygons but Modeler will not carry out the instruction, check that the polygons actually share one or more sides in common. The polygons may be overlapping in appearance only; they must share two points (comprising an edge, or a side) in common in order to merge properly.

If Modeler does not carry out the merge instruction, and you feel certain that the selected polygons share points, check that there are not duplicate points there. Perform a point merge operation. Sometimes the points of two polygons can overlap, making them appear to be a single shared point. In such cases, Modeler cannot merge the polygons until the points are merged first.

Merge will function on coplanar and non-coplanar polygons as well. However, the resulting surface normal may not render correctly at certain angles, and it is not likely to animate well since it will appear and disappear as the viewing angle changes. There may be other unwanted side effects as well.

Surface q



What Surface does
With the controls on the Change Surface Name pop-up menu you perform two important functions: you can create names and apply them to the currently selected item(s), and you can rename any previously created surfaces whose names you choose to alter.

Naming surfaces is an important step in modeling, one that allows you to identify portions of the object that will receive different color and texture qualities in Layout. These are the names that Layout uses to assign color and texture to objects when rendering.

How to use Surface
The Surface button is used to create and assign surface names in one step, or to change surface names. Each of these two functions will affect the selected polygon(s) or object(s) in the current layer, so you should spend some time getting familiar with this menu's operation.

To create a surface name and assign it to the currently selected polygons
Select Surface. Enter a name in the surface name field. Select the Apply button. This name will be created, added to the available surface names list, and applied to the currently selected item(s). (Note: To create a list of names without applying them to any objects, use the Options button found in the Objects menu.)

To rename an existing surface name
Select Surface. Drag the mouse over the pop-up surface name menu to select the name you desire to change. Click in the surface name field and enter a new name. Select Rename. This applies the new name to the polygons that were labeled with the previous name, and closes the menu.

To assign an existing surface name to the currently selected polygons
Select a number of polygons. (Remember, if you select no polygons, all are considered selected.) Select Surface. Drag the mouse over the pop-up surface name menu to select the name you desire. Click the Apply button. This applies the name to the selected items and closes the menu.

To assign a surface name to use for all newly created polygons
Go to the Objects Menu and select Options. Beside the Surface label, enter the name for Modeler to give to all newly made polygons. Select the Create button. From this point onward, all new polygons (created by the Object tools, the Modify tools, the Tools functions, and the Polygon tools) will be given the surface name you entered automatically as they are created.

Apply
Use the Apply button to (a) exit the menu, and (b) apply the current name on the pop-up surface button to the selected polygons in the current layer.

Rename
Use the Rename button to (a) exit the menu, and (b) change the name of the surface showing on the pop-up menu to the name showing in the text field.

Cancel
Use the Cancel button to (a) exit the menu, and (b) ignore any changes or text that you entered here.

Notes and tips about Surface
The surface controls may seem to be partially duplicated by the Options command found in the Objects menu. However, through the Surface pop-up menu you can also assign surface names to existing or previously created polygons. This feature is not available from Object Options. From Surface, you may also create surface names, rename surface names, and direct Modeler which surface name to use for newly created polygons.

The pop-up menu displays a list of all available surface names, including any that you create using the other surface controls found here. This is convenient for creating and assigning surface names as you build an object, since all new polygons created after you exit this menu will have this name as their surface name. The alternative, which is optional, is to design the object first, then select sections of it and assign surface names at that time. This approach can be more tedious, depending on the complexity of the object.

If you do not select a specific polygon (or group of polygons) prior to using this function, all polygons in the active layer(s) will be considered selected and the name will be assigned to them.



Triple Shift+t

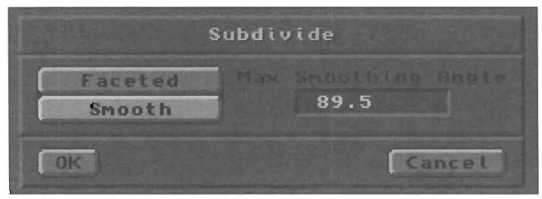
What Triple does
Triple converts the selected polygon(s) into triangular polygons. For example, a square polygon becomes two triangular polygons. This is useful for objects you wish to animate using Bones, or objects that have Displacement Maps.

How to use Triple
Select one or more polygons or objects. Press Shift+t on the keyboard, or click Triple.

Notes and tips about Triple
Triple can be crucial for character animation. If you plan to use Bones to animate text or other objects typically made of quadrangles, you should load them into Modeler and use Triple on them. The deformations that Bones can cause will likely push quadrangle polygons out of planarity so that they are no longer flat. Use Triple to triangulate those polygons for consistently correct rendering.



Subdiv (Subdivide) Shift+d



What Subdivide does
Subdivide divides any 3 or 4 sided polygon into a smaller set of triangles. It can do so in a few different manners

Requirements for Subdivide
The polygon(s) to be subdivided must be 3 or 4 sided before they can be affected.

When you select Subdiv (Subdivide), you have the option of a Faceted, Smooth or Metaform subdivision.

Faceted setting
Faceted subdivides polygons leaving the newly created polygons in the same plane as the original polygons.

Smooth setting
Choose Smooth to subdivide an object with smoothed or rounded edges when you wish to add detail and maintain the object's rounded appearance. Smooth has a further

control, Max Smoothing Angle. Adjoining polygons at angles greater than the Max Smoothing Angle will not be subdivided in a 'smoothed' manner.

Metaform setting
Using Metaform subdivision is akin to using Smooth. With Metaform, however, the newly created polygons are smoothly curved with the original polygons acting as sort of a "bounding box" for the shape of the new polygons. There is no need to worry about smoothing angles. Metaform automatically tries to smooth out all selected polygons forming them into more curved, rounded shapes.

Fractal option
All subdivide options allow you to enter a Fractal value that will randomly jitter newly created points. A value of 0 will not jitter points and higher values will jitter points greater.

The jitter radius is a fraction of the edge length times the fractal factor. A factor of 1 jitters the new points by at most 50% of the length of the edge that they will subdivide. A factor of.1 is 5% jitter and a factor of 2 will move points 100% of the edge length. Points added to the center of 4-point polygons are jittered a comperable amount, although the formula for them is more complicated.

How to use Subdivide
Select one or more 3 or 4 sided polygons. Press Shift+d, or select Subdiv. After you select Subdivide, choose whether you prefer Faceted, Smooth or Metaform subdivision.

Notes and tips about Subdivide
Subdivide is useful for adding detail to objects (also see the Jitter command). Any polygons that are not triangular need to be converted first, using the Triple command from the Polygon menu.

Subdivide can be used repeatedly, to make smaller and smaller polygons. This is highly useful for objects that are Displacement Mapped or animated with Bones.

For example, let's subdivide an object with two different Max Smoothing Angles to see the difference.

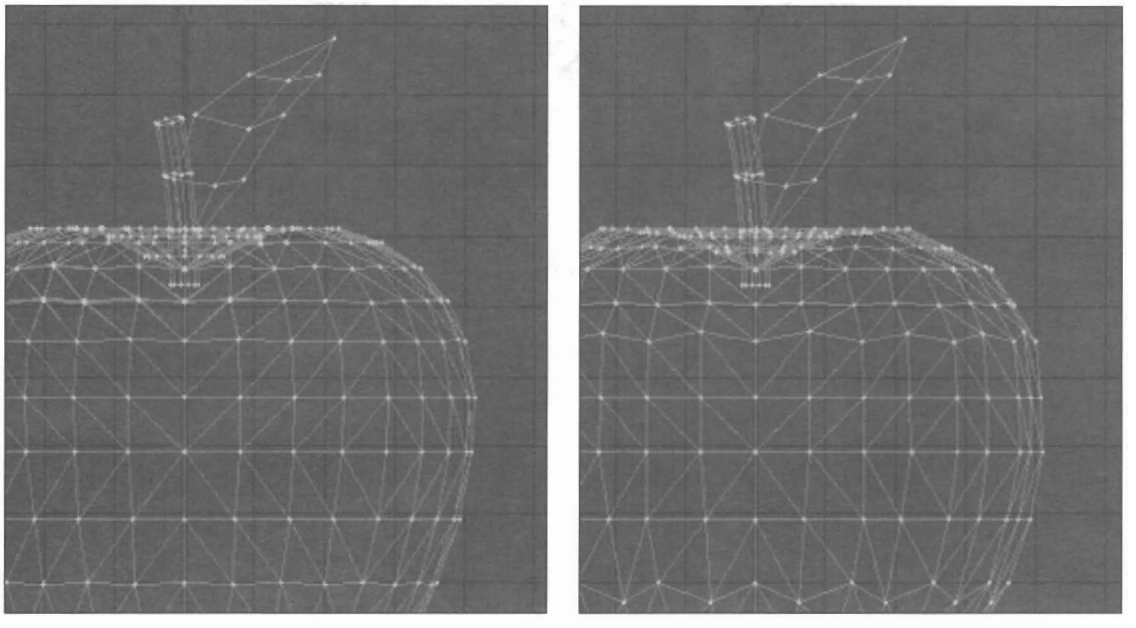
Step 1: Prepare the object
Load the Apple object (in the Food directory). Press a to change the view to fit the object. Choose the Polygon selection mode, and press w to display the statistics menu for it. Select the AppleSkin surface from the pop-up menu, and click on the + button next to the label with Surface:. The skin polygons will highlight. Go to the Polygon menu and select Triple to convert the polygons into triangles (SubDiv requires triangles to function).

Step 2: Make a copy of the object
For comparison's sake, let's copy this object before we subdivide it. Click on Copy at the bottom of the screen, then select the next layer from the layer buttons at the top of the screen. Click Paste to place this copy in the new layer.

Step 3: Subdivide the first object
Return to the original layer. Press w and once again locate and select the polygons making up the AppleSkin. Select Subdiv. Choose Smooth, and click on OK. Since all of the selected polygons were at angles less than 90° to one another, the new vertices were added so that they continued the rounded appearance of the apple. (See below left).

Step 4: Subdivide the second object
Go to the second layer with the copied object. Press w and once again locate and select the polygons making up the AppleSkin. Choose Smooth, enter 20 in the field beside Max Smoothing Angle, and click on OK. Only those polygons that were at angles less than 20° to one another received smoothed vertices. Since none were at that angle, new vertices were added, but the straight-edged appearance remained. (See below right.)

Step 5: Compare the two objects up close
To see this properly, drag out the Face window till it fills the screen. Select the original layer as a background layer, so that the second apple overlaps the first. Press Ctrl+a so that it fills the view. Notice how the apple that was smoothed with a greater angle has edges that appear around the other apple? Using the Max Smoothing Angle, Modeler was able to determine where new points should be placed to maintain and apple's rounded shape.



Two apples subdivided with different smoothing angles (from the exercise above). Notice how the apple on the left has a much more naturally rounded profile, while the apple on the left appears to be made up a longer straight segments. The higher the Maximum Smoothing Angle value, the more Modeler can maintain and even enhance the apparent roundedness of the object, as this example shows.



Align

What Align does
Align will attempt to turn all surface normals to face in one direction.

How to use Align
Select the entire object, or the general area where there are polygons that face in the wrong direction. Click Align. Align may actually align the polygons in the wrong direction, but they will all face that way together—if so, use the Flip command to turn them to the correct orientation.

Notes and tips about Align
The Align operation is complex and not foolproof. You may wish to attempt to select varying combinations of right-facing and wrong-facing polygons, to see if the results are what you desire. Sometimes there may be groups of polygons that will not align properly. You may need to Merge Point and Unify in that case, as the status of polygons is dependent upon the points they consist of.



Unify Shift+u

What Unify does
Unify will convert multiple polygons sharing the same points (such as double sided polygons)into a single polygon.

How to use Unify
Select some number of multiple polygons (if you select none, all will be considered active). Press Shift+u on the keyboard, or click Unify.

Notes and tips about Unify
Unify creates single-sided polygons with regard for the direction of their surface normals. However, unusual object shapes can occasionally fool its complex algorithms, resulting in single-sided polygons facing the incorrect direction. If so, you may need to use Align or Flip to correct the resulting direction of the normals.



Flip f

What Flip does
Flip changes direction of the surface normal on one or more single-sided polygons (it flips the direction from which the polygon can be seen when rendered). Flip can also swap the starting point on curves from one end to the other.

How to use Flip
Select one or more polygons or objects. Press f on the keyboard, or click Flip. The screen will redraw and the selected polygons will now face the opposite direction.

Notes and tips about Flip
Surface normals are small dotted lines that indicate in which direction a polygon is visible. They appear whenever a polygon is selected.

Tools menu



The Tools menu contains operations that function on objects, points, and curves.

Object functions include all 2D, 3D, and Boolean drill operations. Each of the drilling operations requires a combination of two layers—one foreground and one background. The foreground layer contains the object to be drilled, and the background layer contains the object to do the drilling. Point functions include operations that merge points, align them, and manipulate them in a variety of ways. Curve functions include the creation and manipulation of curves and surface paths.

Note: To speed up all drilling operations
You can speed up any drill operation (including Boolean functions) by selecting the polygons in the front layer that will be affected by the operation just before you engage the drill operation. This instructs Modeler to ignore the remaining unselected polygons in the foreground layer since they are not a part of the intended operation. With this information, Modeler can work more quickly.

Drill (Template Drill) Shift+r





What Template Drill does
Template Drill takes a 2D polygon (or set of polygons) in the background layer and slices the contents of the active layer with it. There are four types of Template Drill, described below. Template Drill will not create an inside surface along the cut edges.

Requirements for Template Drill
- Drilling object is a single-sided 2D polygon (it can be more than one polygon, as long as all are single-sided polygons.)
- Background layer contains the drilling object.
- Foreground layer contains the object to be drilled.
- When viewed along the drilling axis, objects overlap either partially or fully.

How to use Template Drill
Arrange objects and layers as described above. Press Shift+r on the keyboard. Select the axis along which to drill, and the type of operation (listed and pictured below). Click OK.

Core option
When you remove a core from an apple, you are left with the shape of the core itself. Core leaves behind only polygons that are within the shape of the template polygons that did the drilling.

Tunnel option
When you cut a tunnel into a shape, you make a hole inside it. Tunnel leaves behind the polygons that were outside the shape of the template polygons that did the drilling.

Stencil option
Stencil is a specialized form of the Slice option (below). Whereas Slice creates new polygons within the original object's polygons that still have their original surface name, Stencil gives the newly created polygons a new surface name, one that you may select (or create) directly within the Template Drill pop-up menu.

When you select Stencil, additional controls appear that allow you determine the name for the newly created polygons: select one from the Surface Name pop-up menu, create one by typing it in the Text field and selecting Create, or Rename one by typing a new name into the Text field and selecting Rename. (As a shortcut for the Create option, you can simply press r after entering the name—this will accept the new name and start the procedure automatically.)

Slice option
When you cut into an object, but do not remove any piece of it, you leave behind new edges where the two objects intersected. All polygons remain, but new polygons and edges have been created where they overlapped. Slice leaves both the polygons that are within the template polygons and the polygons that are outside the template polygons. All polygons retain their original surface names.

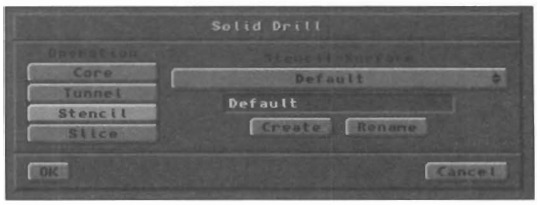
Notes and tips about Template Drill
Speed up any drill operation by selecting the polygons in the front layer that will be affected by the operation just before you engage drill. This instructs Modeler to ignore the remaining unselected polygons in the foreground layer since they are not a part of the intended operation. With this information, Modeler can work more quickly

If you attempt to invoke Template Drill using a 3D object as the drilling object, Template Drill will not function.

If you attempt to invoke Template Drill using a combination of single-sided and double-sided objects, or 2D and 3D objects, Template Drill will only drill the single-sided 2D polygons.

S Drill

S Drill (Solid Drill) Shift+c



What Solid Drill does

Solid Drill takes a 3D solid object in the background layer and slices the contents of the active layer with it. This is the same as Template Drill, except that the cutting edges belong to part of a 3D solid, not a 2D template projected into 3D. There are three types of Solid Drill, described below. Solid Drill will not create an inside surface along the cut edges.

Requirements for Solid Drill

- Background layer contains the drilling object.
- Foreground layer contains the object to be drilled.
- When viewed along the drilling axis, objects overlap either partially or fully. (They do not need to physically overlap, but they must appear to line up along the drilling axis.)
- Drilling object is a closed 3D solid (i.e., a sphere is a closed solid, but a sphere with a hole in it is not, and would not work).

How to use Solid Drill

Arrange objects and layers as described above in Requirements. Press Shift+c on the keyboard. Select the type of operation (listed and pictured below). Click OK.

Core option

When you remove a core from an apple, you are left with the shape of the core itself. Core leaves behind only polygons that are within the shape of the object that did the drilling.

Tunnel option

When you cut a tunnel into a shape, you make a hole inside it. Tunnel leaves behind the polygons that were outside the shape of the object that did the drilling.

Stencil option

Stencil is a specialized form of the Slice option (below). Whereas Slice creates new polygons within the original object's polygons that still have their original surface name, Stencil gives the newly created polygons a new surface name, one that you may select (or create) directly within the Solid Drill pop-up menu.

When you select Stencil, additional controls appear that allow you determine the name for the newly created polygons: select one from the Surface Name pop-up menu, create one by typing it in the Text field and selecting Create, or Rename one by typing a new name into the Text field and selecting Rename. (As a shortcut for the Create option, you can simply press r after entering the name—this will accept the new name and start the procedure automatically.)

Slice option

When you cut into an object, but do not remove any piece of it, you leave behind new edges where the two objects intersected. All polygons remain, but new polygons and edges have been created where they overlapped. It's like tracing the outlines of the cutting polygons into the polygons of the foreground layer object.

Notes and tips about Solid Drill

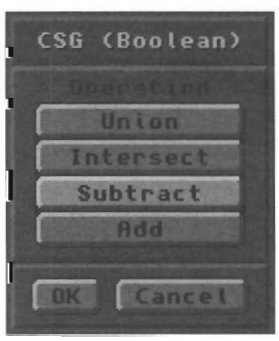
Speed up any drill operation by selecting the polygons in the front layer that will be affected by the operation just before you engage drill. This instructs Modeler to ignore the remaining unselected polygons in the foreground layer since they are not a part of the intended operation. With this information, Modeler can work more quickly

The amount of overlap between the drilling object and the drilled object is significant. If the overlap extends completely through the drilled object, then all polygons are involved. If only the "front" of the drilled object has any overlap, then only those "front" polygons will be affected.

If you attempt to invoke Solid Drill using a 2D object as the drilling object, Solid Drill will not function properly. Instead of getting connected polygons as a result, you will get only the points that made up the object. Click Undo and double check that your objects meet the requirements for Solid Drill.

Boolean

Boolean Shift+b



What Boolean operations do

Boolean operations will merge objects, split objects, carve objects, and join objects in a variety of ways. You can model difficult shapes easily with these simple operations.

Requirements for Boolean operations

- For the Add operation: Drilling object may be a 2D polygon or 3D object.
- For the Union/Intersect/Subtract operations: Drilling object must be a 3D solid.
- Background layer contains the drilling object.
- Foreground layer contains the object to be drilled.

• When viewed along the drilling axis, objects must physcially overlap either partially or fully. Unlike Template Drill, they cannot merely line up along one axis; they must overlap the same space, at least partially.

How to use Boolean

You will use two layers for this operation. Place the object to be cut in one layer. Place the object to do the cutting in one layer. Arrange the layers so that the cutting object is in the background layer. When the objects and layers are properly set, press Shift+b (or select Boolean from the Tools menu). Choose the type of operation (listed and shown below). Click OK.

Union

Union joins the background layer with the foreground layer, taking the solid objects and combining them into a single object. Interior faces are removed. No new polygons or surfaces are created; therefore all surfaces will retain their original names.

Intersect

Intersect takes the solid objects and leaves behind whatever portion was common between them. It leaves behind only those portions of the background layer and foreground layer that were overlapping. (This corresponds to the portion that the Union operation discards.) No new polygons or surfaces are created; therefore all surfaces will retain their original names.

Subtract

Subtract removes the background drilling template object from the foreground object, leaving a copy of itself embedded there. Essentially, it carves the background layer out of the foreground layer, leaving new inside surfaces in its wake. New surfaces will take on the names of surfaces that carved them. For example, you have a 3D letter A with three surfaces: Front, Back, and Sides; and an Apple with two surfaces: Skin, and Stem. If you subtract the letter A through the Apple, the inside surfaces created will have the name Sides, taken from the surface that carved the tunnel. The Apple will now have three surfaces associated with it: Skin, Stem, and Sides.

Add

Add joins the background layer with the foreground layer so that the overlapping shapes are fully combined as one. This is different from simply saving two overlapping objects from two different layers, since the polygons that physically overlap are merged in a form of mutual drill operation. No new surfaces are created, although some polygons may be subdivided; therefore all surfaces will retain their original names.

Notes and tips about Boolean operations

Speed up any drill operation by selecting the polygons in the front layer that will be affected by the operation just before you engage drill. This instructs Modeler to ignore the remaining unselected polygons in the foreground layer since they are not a part of the intended operation. With this information, Modeler can work more quickly

The results of the Boolean Subtract operation will vary depending whether the polygons being drilled consist of single-sided or double-sided polygons. A further explanation of this follows the description of the Boolean operations.

For the Union, Intersect, and Subtract operations, the amount of overlap between the drilling object and the drilled object is significant. If the overlap extends completely through the drilled object, then all polygons are involved. If the overlap is only on the "front" of the drilled object, then only those "front" polygons will be affected. If there is no overlap, then these operations will not function.

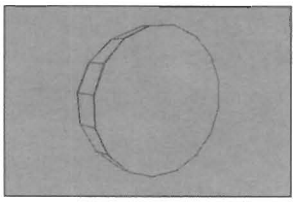
For the Union, Intersect, and Subtract operations to function properly, both objects must be closed 3D solids. These Boolean CSG functions will not operate on 2D polygons, only 3D solid objects. For the Add operation, any set of 2D and 3D objects is acceptable.

Using Boolean Functions - A Dissertation

Single-sided and double-sided polygons play a unique role in the Boolean Subtract operation. Depending on the design of the objects involved in the operation, and the specific Boolean function you choose, you may get results that are different from those you expect. This essay will help you understand how the Boolean functions think so that you can design objects accordingly.

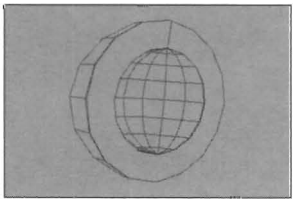
You should understand the difference between one- and two-sided polygons before you read this short essay. If you are uncertain about them, see the Introduction to 3D for further discussions of polygon types before going further.

Imagine that you are a knife blade, slicing through a 3D sphere. Every time you cut through a polygon layer, you pass from the outside of the sphere to the inside. If this were an apple instead of a 3D object, you would have passed from outside the apple into its core—from air to solid. Therefore, if you passed through only one polygon, you are now inside the 3D sphere. A Boolean knife blade being subtracted—i.e., slicing through—a one-sided sphere would leave two solid halves remaining.



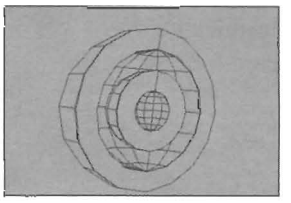
The figure at left shows one of those halves.

Now suppose this sphere actually consisted of two spheres, one inside the other. You pass through the first polygon—from air to solid—then through a second polygon—from solid back to air. You have entered a hole inside the sphere. If a worm had eaten a marble-sized pocket out of the center of an apple, this pocket is the hole you have now entered. You are within the inner sphere. A Boolean knife slicing through this sphere would leave two halves remaining, each with its own hollow core.



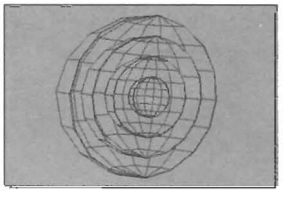
The figure at left shows one of these two halves. The single-sided polygons of the outer sphere faced outward, while the single-sided polygon of the inner sphere faced inward. This enhances the appearance of a solid interior with a hollow core.

Let's take this discussion to another level. Suppose you have four tiered spheres, each one slightly smaller than the next, each one inside the next. Each sphere consists of single-sided polygons. Slice into this group of objects with your Boolean knife.



The results will appear just like those pictured in Boolean.3. Again, alternate spheres had polygons facing inward or outward. For each polygon wall passed through, Modeler believes it has passed either from outside to inside, or inside to outside. From one state to the other.

If all four spheres consisted of double-sided polygons, then Modeler would have believed that each sphere was made of a paper-thin wall (since double-sided polygons are back-to-back polygons). Upon encountering a double-sided polygon, Modeler will think that it has passed through two polygons. In the paper-thin space between the front-facing and back-facing polygon, the Boolean knife blade sliced through air, then solid, then air again.



The results are shown in Boolean.4, four hollow spheres, each encased within the other, with no solid core.

Therefore, be aware that the results of Boolean CSG functions will vary depending on the polygons that are being cut. To Modeler, it does not actually matter which way the polygons face. However, to achieve the results you desire with Boolean functions, there may be times when you need to model with this in mind. If the results you achieve are not what you expect or desire, check for the possibility that the polygons are not facing the way they should. You may need to try again using the other type of polygon.

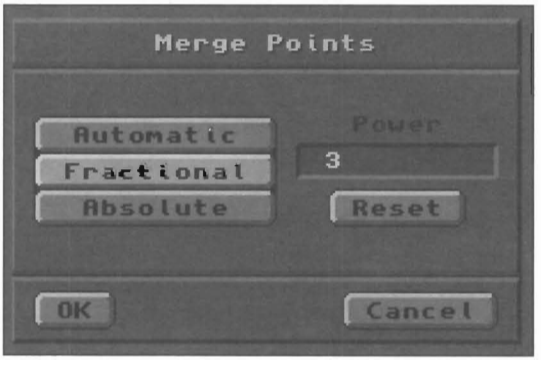
Merge

Merge m

What Merge does
Merge will merge points that overlap into a single point. The point that remains will belong to the same polygons as the original points.

How to use Merge
Move the necessary points/polygons so that points overlap, as closely as possible in all three windows. Make sure the necessary items are selected for the operation. Press m on the keyboard, or click Merge. Select a merging procedure, and enter any required values. Click OK when done.

Automatic option
Automatic will merge points that are sharing the same space. These points need to be overlapping in all three windows, to a close degree. For objects or portions of objects that you have cut from the main object with the intention of merging later (back into their original positions) use Automatic.



Fractional option
This setting takes the size of the object, then takes a fraction of that size as the merge distance. This value is a power of 10. The higher the value, the less points are merged.

Absolute option
Absolute requests an absolute distance to calculate overlapping points. Any points within this distance of one

another will be merged. When merging overlapping or nearby pairs of points, Merge will choose one point as the base point. The other point will be moved to the location of the base point and merged there. The polygon to which it belongs may be stretched as necessary. Merge will not average the distance between points to create a new point midway between them.

If you need to force two points to merge, and you are unsure of their distance, select them, then use the Absolute parameter with a value of 0. This will cause the two points to merge. Be careful of selecting more than two points, because all selected points will be merged by this option.

Notes and tips about Merge
Merge will not merge points between layers. Objects or polygons for which you wish to merge points must be in the same layer.
Merge will merge the points of the selected items only. This is useful if you have many overlapping points, yet wish to merge certain specific ones. If you attempt to merge points with the wrong points or polygons selected, merging may not occur unless the other points are overlapping. Make certain that the proper items are selected before you click Merge.

Weld

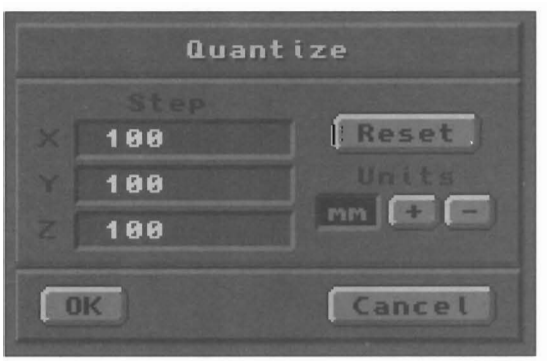


What Weld does
Weld will take a group of selected points and merge them into a single point. The point that is used as the "joining point" is the last point you select before choosing Weld. This is useful when you have a group of points in a small area, and you wish to have only one point there. All polygons will become tied to the remaining point that is welded.

How to use Weld
Select some number of points (at least two). Select Weld.

Quantiz





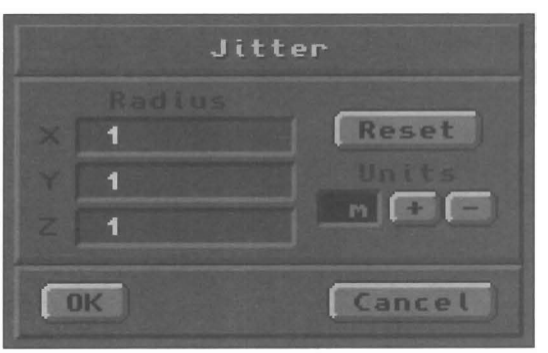
What Quantiz does
Quantize will snap points to the nearest X, Y, Z coordinate spacing you choose.

How to use Quantiz
Select some number of points. Select Quantiz. Enter the grid coordinates spacing to use. Example: X 1, Y 2, Z 3, meters, would cause every selected point to move to the nearest 1-meter X axis, 2-meter Y axis, and 3-meter Z axis point intersection.

Notes and tips about Quantiz
Quantizing is generally used to move points a small increment so that they form planar polygons, or to manipulate them in very small increments where precise placement is required. You may also find it useful for objects you intend to morph.

Jitter Shift+j





What Jitter does
Jitter randomly moves points within a specified radius, randomizing or roughing up the object.

How to use Jitter
Select a group of points, polygons, or an entire object. Press Shift+j on the keyboard. Select the type of Jitter to perform. Enter jitter parameters for any combination of X, Y, or Z axes. Select OK.

Notes and tips about Jitter
A jitter value of 0 is "no jitter," meaning no change will occur. Values above or below 0 will affect the object.

Uniform option
If you've used earlier versions of LightWave, this is the original jitter function. It performs a uniform jitter on every point within a rectangular region. A point may be shifted by as much as the value specificed for the Radius parameter.

Radius parameter
This value is used to determine just how far a point may be moved from its current location.

Gaussian option
This option results in a slightly less ragged jitter than the Uniform option, performing a normal distribution around the starting point's location in an elipsoid of the given radii.

Normal option
This option uses the local surface normal and randomly moves points plus or minus within a range along that surface normal.

Range parameter
This value is used to set the range within which a point may be moved from its current location.

Radial option
This option randomly distributes points inward or outward along a radial vector from a single point (the Center point parameter).

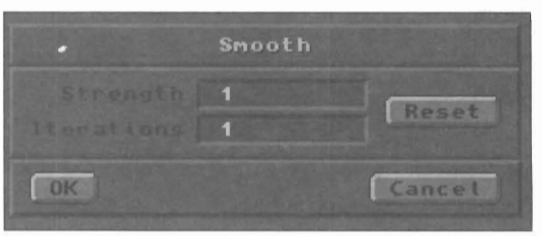
Range parameter
This value is used to set the range within which a point may move from its current location.

Center parameter
This parameter sets the center point, from which the radial effect of jitter is calculated.

Notes and tips about Jitter
Jitter is effective for "shaking up" a surface, adding a genuinely rough texture to it. For example, you could give a sheet of paper a crinkled appearance by applying a small jitter value to it (on the axis that represented the paper thickness only). You could also rough up a landscape, mountain range, or asteroid, using small amounts of Jitter, perhaps with Subdivide to add more detail.

Smooth

Smooth Shift+m



What Smooth does
Smooth will move the points in an object to reduce its jaggedness.

How to use Smooth
Select points, polygons, volume, or object. Press Shift+m on the keyboard. Enter the number of smoothing operations you desire, and the strength of each operation. Select OK.

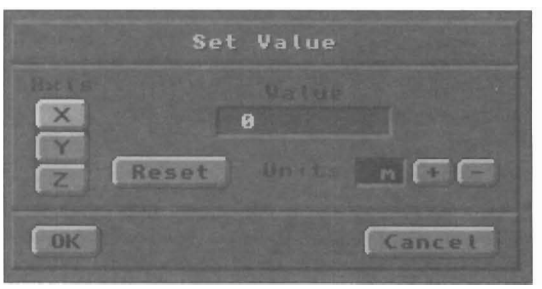
Strength parameter
The power of the smoothing force. High values affect the object more noticeably, while low values are more subtle.

Iterations parameter
Iterations are the number of Smooth operations you want to occur. Applying Smooth once with three iterations is the same as applying it three times with one iteration.

Notes and tips about Smooth
It is best to apply the Smooth function to a whole form, but it can be applied selectively to parts of objects by selecting a group of points, polygons, or a volume. Smoothing a rock repeatedly will ultimately round it off into a sphere, since that is the smoothest it can become. Smooth functions on 2D polygons as well as 3D objects.

Set Val

Set Val (Set Value)



What Set Value does
Set Value will move selected points to the coordinate value you specify for a specific axis only.

How to use Set Value
Select one or more points. Select Set Value. Enter a number on the axis to where you want these points moved. Select OK.

Axis parameter
This is the axis for the movement value.

Value Parameter
The value entered here will place all selected points at that value along the chosen axis.

Units parameter
Select a unit of measurement for the operation.

Reset parameter
Reset all menu values to their original settings.

Notes and tips about Set Value
Set Value is a modeling tool that is useful when you require the points of an object to be at an exact location or alignment. For example, after performing editing operations on half an object, you may wish to mirror it to form a perfect whole. Those points which form the axis basis for the mirror operation must be perfectly aligned so that the halves form a perfect match. You would select those points, select Set Value, then select the correct axis and enter the numeric value that would in effect snap those points into line. This would ensure clean rendering in Layout.

About Curves, Splines, and Surface Patches

A spline is a mathematical formula for calculating a smooth curve among a collection of points. Generally, the points within a spline curve are called knots, just as the points in a polygon are called vertices. Designate any group of points as a curve, connect several curves into a loose framework, and you can create smooth-surfaced patches of polygons to form free-flowing meshes of any shape and form. The creation of shapes such as sails, curtains, automobile panels, and much more is simple using Modeler's spline curves and surface patches.

Curves are considered polygons to Modeler. They are a specialized form of polygon. Curves may be selected in the same manner as polygons, with the Polygon selection tool, and acted upon in the same manner as polygons. Therefore, most of the tools in the Modify, Multiply, Tools, and Polygon menus will affect curves just as easily as they affect standard face polygons.

Curves have a starting point and an ending point (corresponding to the first and last points selected prior to creating the curve). When a curve is selected, the starting point displays a small white circle to indicate this. The starting point may be switched to the other the end using the Flip command, just as you would flip a polygon surface normal with this command.

In fact, the orientation of the starting point (at one end or the other) affects the direction of the surface normals in the resulting polygon mesh created by a curve operation. Therefore, the ablity to flip a curve's direction is valuable. It affects the direction that resulting surface normals face when the curve is used to create an object.

Curves are not objects themselves; rather, they are modeling tools that will enable you to create realistic objects much more easily. However, curves may be saved as objects. They will not render in LightWave Layout (the way 2-point polygons will). But you may wish to save particularly useful curve shapes for other objects you wish to create later on.

Modeler curves are Catmull-Rom interpolating splines. The curve passes through its own control points, rather than being affected by distant, unconnected control points.

Make (Make Curve) Ctrl+p

Make

What Make Curve does
Make Curve will create a spline curve, useful in the Multiply and Tools menus for object creation commands. Curves are treated much like polygons, and create smooth surface meshes.

How to use Make Curve
Create or select a number of points (two or more). Select Make or press ∏+p on the keyboard.

Notes and tips about Make Curve
The first point you create is the starting point for the curve. The final point is the ending point. You can flip the starting and ending points using the Flip command.

The more points you use in creating a curve, the more segments it will ultimately contain after a Multiply operation. Multiply operations are also affected by the curve division setting that is active under the Options command in the Objects menu.

Make Cl (Make Closed Curve) Ctrl+o

Make Cl

What Make Closed Curve does
Make Closed Curve will create a closed curve shape (the beginning and ending points will be connected).

How to use Make Closed Curve
Create a number of points (two or more). Select Make Cl or press ∏+o on the keyboard.



Start CP (Starting Control Point) Ctrl+b

What Start CP does
Start CP enables you to use the beginning point of a curve to control the continuity of the curve at the next point.

How to use Start CP
Select a curve. Press Ctrl+b on the keyboard. The leading segment of the curve, between the first point and the second, changes to a dotted line. This indicates that the end point is now a continuity control point. Go to the Move menu and select the Drag command. Drag the endpoint around to adjust the curvature of the polygon curve at the next point.

Notes and tips about Start CP
When you change endpoints into continuity control points, the endpoints are no longer part of the curve itself, they become curvature-adjustment controls only. For any Multiply or Tools commands that you use on the curve, the continuity segment will not create polygons.

Continuity controls are useful when you intend to Clone or Lathe a polygon curve in such a manner that you need a perfectly smooth and uninterrupted joint around the central axis. For example, if you use a curve to define the profile of a wine glass, you would use Start CP for the beginning of the curve, inside the bottom of the glass bowl. When lathed, this curve would create a perfectly smooth interior surface, without a visible dimple at the base of the bowl.



End CP (Ending Control Point) Ctrl+n

What End CP does
End CP enables you to use the final point in a curve to control the continuity of the curve at the next point.

How to use End CP
Select a curve. Press Ctrl+n on the keyboard. The ending segment of the curve, between the last point and the next-to-last point, changes to a dotted line. This indicates that the end point is now a continuity control point. Go to the Move menu and select the Drag command. Drag the endpoint around to adjust the curvature of the polygon curve at the next point.

Notes and tips about End CP
When you change endpoints into continuity control points, the endpoints are no longer part of the curve itself, they become curvature-adjustment controls only. For any Multiply or Tools commands that you use on the curve, the continuity segment will not create polygons.



Freeze Ctrl+d

What Freeze does
Selecting Freeze will instantly convert the currently selected curve(s) into polygons.

How to use Freeze
Select one or more curves, click Freeze or press Ctrl+d. All selected curves (whether open or closed) will become new polygons.



Smooth (Smooth Curve) Ctrl+s

What Smooth Curve does
When you move the points of two curves so that they overlap, then merge those points, there is not a natural curve passing through the resulting joined section. In fact, the two curves may form an angle. To smooth the angle out as if the two curves were originally one, use Smooth Curve.

How to use Smooth Curve
Move the points of the pertinent curves so that they overlap. Merge the points using the Merge points command (Modify menu). Select Smooth or press Ctrl+s on the keyboard. If the operation is successful, you will see the beginning and ending continuity control points appear, along with their dotted-line indicators.

The Display Menu



The Display menu contains controls that allow you to adjust the screen display in a variety of ways, and to get specific information and statistics about the current object.

- Screen adjustments include the ability to zoom in or out from objects, slide the entire display left or right (without shifting the object's position), or auto-scale the display so that the object fits the edit windows at its best size.

- Information allows you to study points or polygons more closely, while Statistics enables you to select and deselect points, polygons and surfaces.

- Display options gives you the ability to customize the Modeler screen display. Show any background image loaded into Layout as a dithered picture on the Modeler screen (great for making corporate logos from images you have framegrabbed). Toggle the visibility of points, polygons, surface normals, curves, even the grid itself, on and off. You can adjust Modeler's grid snap and grid increments also.

Magnify



What Magnify does
With Magnify you can zoom in closer to the current object, or zoom out further. Magnify does not resize the object, rather it alters your point of view so that you are either closer or further away.

How to use Magnify
Click Magnify. Move the cursor to any window. Place the cursor over the portion of the object you wish to zoom.

Drag the mouse left to zoom out, or right to zoom in.

Notes and tips about Magnify
The Magnify tool will zoom in toward that portion of the object directly under the cursor when you initiate the zoom. This is different from the In and Out buttons, which zoom inward to or outward from the center of the view windows only. Unlike them, Magnify can zoom to any portion of the view windows.

Pan Alt + Mouse Drag



What Pan does
Slides the edit window and its contents left, right, up or down.

How to use Pan
Click Pan. Move the cursor to any window. Drag the mouse. The entire edit window and its contents will slide in the direction you drag.

Notes and tips about Pan
As a shortcut to selecting Pan from the Display menu, at any time you can hold a on the keyboard and drag the mouse in any window. Holding a overrides any current tool, allowing you to pan the view.

Measure



What Measure does
Measure allows you to measure the distance between any two points on screen.

How to use Measure
Select Measure. Move the pointer into an edit window. Press and hold either mouse button, then drag the mouse to the destination point. A light gray crosshair will appear where you clicked, with a line extending from it as you drag the mouse away. The Coordinates window display shows the exact distance that you have moved as long as you hold down the button.

Notes and tips about Measure
Measure does not function in the Preview window. Only in the edit windows.

It may help you to measure more easily if you first select the two points that are the endpoints of the segment you wish to measure. Highlighting them makes them a little easier to see.



In . zoom in 1X

Shift +. zoom in 2X

What In does
Use In to magnify the object on screen in single-grid-square steps.

How to use In
Press . on the keyboard, or click In.

Notes and tips about In
Press Shift+. (also called >) to zoom in at twice the amount.



Out , zoom out 1X

Shift+, zoom out 2X

What Out does
Use Out to zoom out from the object on screen in single-grid-square steps.

How to use Out
Press , on the keyboard, or click Out.

Notes and tips about Out
Press Shift+, (also called <) to zoom out at twice the amount.



Fit All a

What Fit does
Fit will cause the windows on screen to be zoomed to the maximum display size that will fit the objects on screen in all three views. If there are no foreground or background objects present, Fit will center the X, Y, and Z axes is all three edit windows.

How to use Fit All
Press a on the keyboard, or click Fit All. The windows will zoom in or out to fit the item in all three views

Notes and tips about Fit
There is an "extended" or additional keyboard command for fit—Fit Window, Ctrl+a, which will fit the selected item to only the edit window where the pointer is currently located.



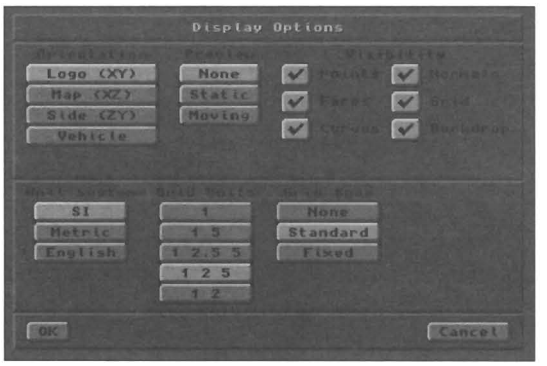
Fit Sel (Fit Selected)

Shift+a Fit Select—fit selected item to all edit windows (current layer only)

What Fit Selected does
Fit Selected will cause the windows on screen to be zoomed to the maximum display size that will fit the selected items on screen in all three views.

How to use Fit Selected
Press Shift+a on the keyboard, or select Fit Sel. The windows will zoom in or out to fit the selected items in all three views.

Options d



What Options does
Select Options to adjust the display features of the Modeler screen.

How to use Options
Press d on the keyboard, or click Options to bring up the menu.

Orientation parameters
Orientation governs how the three edit windows are displayed on screen. You will always have a four-window display, but sometimes the location and orientation of the four windows can help you visualize an object as you design it. To get a better idea of this, load various objects and try out the different view orientations on them.

Logo (XY)
Provides Top, Face, and Left views that correspond to Layout's XZ, XY, and ZY views.

Map (XZ)
Provides Map, Left, and Back views. For designing a map, the main view displays the object best.

Side (ZY)
Provides Top, Left, and Front views. The main view is a side view rather than the top.

Vehicle
Provides Top, Front, and Right views. 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.

Preview Window parameters
The preview appears within a circular outline that is a virtual trackball. Click outside this circle and drag the mouse around its circumference to rotate the object around the screen's Z axis, in the same manner that a clock's hands move around a clock face. Click and drag the mouse across the circle to rotate the object on the screen's Y axis. Click and drag the mouse up or down the circle to rotate the object on the screen's X axis.

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:
- To select points or polygons, click on them in the preview window.
- To rotate the object, hold Alt on the keyboard and drag the mouse in the preview window.

In Select Volume mode:
- You cannot select points or polygons with a volume in the preview window.
- To rotate the object, drag the mouse in the preview window.

Moving
Moving displays a rotating wireframe view of the object. Click Wire for a rotating wireframe view of the object. Click Solid for a rotating solid (or hidden line removal) view of the object. To rotate the object to another orientation, drag the mouse in the preview window.

Note:
Not all resolutions and screen modes can support a moving preview. If the buttons do not appear on the interface, it is not available in the currently selected resolution.

Visibility Parameters
Visibility turns on and off the visibility of various aspects of the Modeler interface. This option is fairly self-explanatory. A check in any box indicates that this option is active and visible.

Points
Toggles visibility of points.

Faces
Toggles visibility of faces (polygon outlines).

Curves
Toggles visibility of curves.

Normals
Toggles visibility of surface normals.

Grid
Toggles visibility of the grid and axis labels.

Backdrop
Toggles the visibility of the backdrop image (if any).

Unit System parameter
The Unit System determines what units of measurement are utilized and displayed by the Modeler screen.

SI
Select SI to use the International System of Units (SI is the abbreviation of the French "Le Système International d'Unites." Unit measurements in Modeler will now use a base system of meters. Grid sizes and distances can be measured in gigameters, megameters, kilometers, meters, millimeters, micrometers and nanometers.

Metric
Select Metric to use the Metric System. It is the same as SI with the addition of centimeters.

English
Select English to use the English System of Miles, feet and inches.

Note:
We recommend you use the SI or Metric systems to model objects, since a system based on 10 is much easier to use in Layout (for purposes of applying textures and adjusting object movement)

Grid Units Parameters
Grid Units affects several things: the Grid Size display, the graticule on screen (the dividing grid sections), and the zoom step amount. These settings have no effect on the actual size of the object, only the grid placement display. You will likely find that 1 2.5 5 and 1 2 5 are your most commonly used grid unit settings.

To see the difference in display, create a 1 meter box in the center of the edit window. Press a to fit the display. Notice how many subdivisions of the grid display there are within the box. You might also zoom in or out several steps, watching the Grid Size change. Now press d and select a new grid unit setting. Click OK and zoom again. Notice how the grid is a different size, and the zoom step rate has changed. This will give you an idea of how each grid unit is subdivided, and how this affects zooming in and out.

1
Each grid square represents 1 unit. For example, when grid size is set at 1 meter, grid lines fall at every meter. The Grid resizes in values that begin with 1, as in 10m,1m,100mm,10mm, etc.

1 5
Each grid square represents 1/2-unit. For example, when grid size is set at 1 meter, grid lines fall at every half-meter and at every meter. The Grid resizes in values that begin with 1 or 5, as in 1m, 500mm, 100mm, 50mm, 10mm, etc.

1 2.5 5
Each grid square represents 1/4-unit. For example, when grid size is set at 1 meter, grid lines fall at every quarter-meter, half-meter, and meter. The Grid resizes in values that begin with 1, 25 or 5, as in 1m, 500mm, 250mm, 100mm, 50mm, etc.

1 2 5
Each grid square represents 1/5-unit. For example, when grid size is set at 1 meter, grid lines fall at every fifth-meter and meter. The Grid resizes in values that begin with 1, 2 or 5, as in 1m, 500mm, 200mm, 100mm, 50mm, etc.

1 2
Each grid square represents 1/5-unit. For example, when grid size is set at 1 meter, grid lines fall at every fifth-meter and meter. The Grid resizes in values that begin with 1 or 2, as in 1m, 200mm, 100mm, 20mm, 10mm, etc.

Grid Snap Parameters
Grid Snap forces point creation and item movement to be limited to a specific increment. Setting a Fixed Grid Snap also fixes the grid's graticule on screen to be displayed at that increment.

None
No grid snap unlocks the grid snap so that it moves freely and is not constrained by any grid intersections.

Standard
Standard grid snap is set to 1/10 of the current grid size. For example, if the grid size is 1 meter, all movement occurs in increments of.1 meters or10cm (100mm).

Fixed
Fixed allows you to enter a value of your choice for increments of movement. The grid will resize itself to use the value you specify.

Notes and tips about Options
The settings you change on this panel will not be saved when you exit or quit Modeler with the exception of Unit System. The next time you start Modeler, you will default to using the last used units.

BG Image (Background Image)



What BG Image does
BG Image allows you to display a background image (that has been loaded into Layout) on the Modeler grid. Probably the most common use of this feature is to use it to display a framegrabbed company logo so that you can build a 3D object right over it on screen. You could also use it to give you an idea of how an image map might be sized by the Automatic Sizing function of Layout's texture mapping controls.

How to use BG Image
First, you must load one or more images from the Images menu in LightWave Layout. (Modeler takes its Current Image List from the list of those images loaded into Layout.) Go to the Display menu and select BG Image to bring up the pop-up menu. Make your selections of image and position, and exit the menu. The image will appear on screen.

Options and Controls for BG Image
Image Selector
Use this pop-up menu to select an image. Select a name on this menu to activate the BG Image display. (Backdrop Visibility must also be turned on.)

Axis of projection
Select an axis on which to display the image. If you are using Modeler's default Logo Display setting, X places the image in the Left view, Y places the image in the Top view, and Z places the image in the Face view.

Center parameter
If you wish to place the image at any specific coordinate location, enter the X, Y, Z values of that location here. The image will be centered on that point.

Size parameter
Use Size if you wish to resize or stretch the BG Image. If the image is a captured freeze frame of video (by the Switcher), or was created in a video resolution (by ToasterPaint, ToasterCG, or LightWave), to approximate the correct aspect ratio you should stretch the image horizontally by 1.3. For example, if you are in the default Logo display setting, and projecting the image along the Z axis so that it faces you in the Face window, you will want to enter 1.3 for the X Size parameter. (The reason for this is that television is displayed at a 4:3 aspect ratio—for every four units of width, the screen is three units high. This ratio can be reduced to 1.3:1—for every 1.3 units of width, there is 1 unit of height.)

If the image has been scanned or transferred from another system that utilizes square pixels (the Macintosh, for instance), you should change the size parameters to reflect the size of the image. For instance, if the image was scanned at 500 pixels wide by 100 pixels tall, the proper aspect ratio would be 5:1. A size of 5.0 meters wide (X) by 1 meter tall (Y).

Automatic Size button
Click Automatic Size to automatically size the image to fit to the selected items in the current layer. It measures the maximum size created by the selected items (points, polygons or volumes) and sets the image at exactly that size and position. This is analogous to the Automatic Sizing button in Layout's texture mapping controls, and can be used to give you an idea of how the image fits on the object when planar mapping.

Units parameter
Select a unit of measurement for the operation.

Reset button
Reset all menu values to their original settings.

Exposure Slider
Drag the slider gadget to brighten or darken the contrast of the BG Image.

Invert
Select Invert to invert the brightness values of the BG Image (make it negative). This may make it easier to see some details while modeling.

Notes and tips about BG Image
If after you exit the menu you do not see the BG Image appear, check that Backdrop Visibility has been turned on in the Display Options menu. Also check the grid size—images default to a specific size, and if you are zoomed too far out you may not be able to see the BG Image.



Stats (Statistics) w

What Statistics does
Stats is used to provide data about points, polygons, or the contents of a volume. It also provides a means for selecting and deselecting these items based upon different groupings. There are three Stats menus—for points, polygons, and volumes.

How to use Statistics
Click the appropriate selection button (point, polygon, volume), then press w on the keyboard (or click Stats). Since Statistics is highly useful as a form of selection, it is discussed in an earlier chapter. See "Selection and the Selection Tools" for more details on Statistics.

Notes and tips about Statistics
To get the Stats on points, polygons, or a volume, you must select that mode followed by the Stats function. To change display modes, you must exit the menu, chance selection modes, and reselect Stats.



Info (Information) i

What Information does
Info provides information about points and polygons. Also, it allows you to place points in specific locations, provides a method for checking polygon integrity, and provides a way to reduce double-sided polygons to single-sided polygons.

How to use Information (points)
Select one or more points. Press i on the keyboard, or click Info. The menu displays information for one point at a time. To change the location of this point, enter new values for X, Y, and Z, and click OK (if you are done) or Next or Previous (to go to another point). You do not need to click OK or press r after entering new data in any field in order for it to be accepted. Changing a value, then going to a new point, is the equivalent of pressing r, and has the added feature of not closing the menu before you are ready to do so.

How to use Information (polygons)
Select one or more polygons. Press i on the keyboard, or click Info. The menu displays the polygon number, number of points, type, flatness, and surface name for one polygon at a time. Click Next or Previous to change to the next or previously viewed point.

Notes and tips about Information
Polygons should be as flat as possible to ensure proper rendering. If you find a polygon that does not render correctly, load the object into Modeler and check its flatness with Info. The closer to 0% flat a polygon is, the better. If the polygon flatness reads "Degenerate," you may need to rebuild that polygon, or subdivide it.

Sel Conn (Select Connected)]



What Select Connected does
Select Connected automatically selects all points or polygons that are connected to the currently highlighted points or polygons.

How to use Select Connected
Using point or polygon selection, select one or more points or polygons. Press] on the keyboard, or click the Sel Conn button.

Notes and tips about Select Connected
This function is useful for the same reason that selecting items by surface name is useful. An object that is surrounded by others may not be easily selected using a volume, and may have several surface names (making name selection unwieldy). Select one point, or one polygon, then press] on the keyboard, to select all connected items.

Select Connected will select everything that is connected only, so overlapping points that have not been Merged will not be affected.

Invert Shift + '



What Invert does
Invert will reverse the status of selected and unselected items in the current layer. All previously selected items will be deselected, while all previously unselected items will become selected.

How to use Invert
Select one or more items. Select Invert.

Hide Sel (Hide Selected) -



What Hide Sel does
Hide Selected will "hide" the currently selected polygons, polygons with the current volume, or unconnected points, from view. The hidden portion remains a part of the object, and it remains within the current layer, but it is temporarily removed from view. This makes object editing much simpler, since you can hide portions of the object that make it difficult to see the part you wish to work on. Also, no editing operation will affect the hidden portion of the object, only the visible portion will be modified.

How to use Hide Sel
Select one or more polygons (use either the Polygon or the Volume selection modes). Select Hide Sel. When selecting points, only points not connected to polygons will be hidden from view (unless the polygon is hidden as well)

Notes about Hide Sel
All of the Hide/Unhide functions work independently among different layers. Therefore, when you use the hide and unhide commands, you are affecting only the currently active foreground layer(s). If several layers contain hidden portions of different objects, only the current front layer(s) will redisplay hidden contents.



Hide Unsel (Hide Unselected) =

What Hide Unsel does
Hide Unselected will "hide" the currently non-selected items from view. The hidden portion remains a part of the object, and it remains within the current layer, but it is temporarily removed from view.

How to use Hide Unsel
Select one or more polygons (use either the Polygon or the Volume selection modes). Select Hide Sel.



Unhide \

What Unhide does
Unhide will redisplay all previously hidden items in the current layer.

How to use Unhide
Select Unhide to see all the hidden portions of the current layer, if any.

Notes about Hidden items
Sometimes it is possible, by error, to hide everything in a layer. Remember that a small dot in a layer button indicates that there is something (hidden or not) in that layer.

Functions without an on-screen button

There are several functions within Modeler that do not have a specific button on screen to engage their operation. These are discussed below.

Ctrl (mouse movement modifier)

What Ctrl does
With Ctrl you can influence mouse movement to adhere to specific axes, or to move in specific increments. This is sometimes called constraint. Ctrl acts as a modifier, modifying the function of a given command. This makes moving along one axis (for example, Move) or in 15° units (such as Rotate) easy.

How to use Ctrl
Before you use any of the Modify tools, press and hold down Ctrl. This will constrain that tool's movement. Look up a tool's description in the manual for specific information on how constraint affects its operation.

Notes and tips about Ctrl
With certain commands, such as Move, the Ctrl modifier does not force 100% compliance to one axis. If you first move the selected item along the X axis, all movement along the X axis is natural. If you then attempt to move in the Y axis, you will have to move the mouse some distance before the item "jumps" along the Y axis. The increment of movement on Y will be awkward in this case, since it was not the favored axis of first movement.

Enter (keyboard equivalent of OK)

What Enter does
With e you can automatically OK out of message dialog boxes.

How to use Enter
When you wish to accept the values in a menu or message dialog, and close the menu, press e. This technique will not work when a text cursor is showing in a text entry field on the menu. In such cases, it will advance the cursor to the next text field. If there is only one text field on the menu, or you have reached the last text field on the menu, then pressing e will close the pop-up.

Notes and tips about Enter
You may use r as well as e for this command when a menu or requester is present.

Esc (keyboard equivalent of Cancel)

What Escape does
With Esc you can automatically Cancel out of message dialog boxes. Modeler will perform no action other than to return to the editing environment.

How to use Escape
When you wish to escape from a menu that has just popped up, or close a message dialog, press Esc. This technique will not work when a text cursor is showing in a text entry field on the menu. In such cases, click the mouse anywhere else on the pop-up menu to disable the text cursor, then press Esc.

Fit One View Ctrl+a (keyboard only)

What Fit One View does
Fit One View will cause only the current view window to be resized to contain the items in that window. (The current view is the edit window where the pointer is. Obivously, this may be any window at any time, so make sure the pointer is over the correct window when you press the command.

How to use Fit One View
Select an item (or items). Press Ctrl+a on the keyboard. The screen will be redrawn zoomed to the items in the current window.

Go To Center g (keyboard only)

What Go to Center does
Go to Center instantly centers the part of the screen that is currently beneath the pointer.

How to use Go to Center
Move the cursor to the location you wish to center. Press g on the keyboard. The portion of the edit window beneath the pointer will be centered in that window.

Notes and tips about Go to Center
Another useful function of g is to move to a part of the object that is off screen. Move the pointer to one edge of the view window, then press g. The window will center itself, with the mouse remaining off on one side. Press g again, and the process will repeat. In this way, you can move across the surfaces of objects quickly and easily, without a great deal of resizing and repositioning.

Jump j (keyboard only)

What Jump does
Jump causes the currently selected point(s) to "jump" to the coordinates of the mouse pointer.

How to use Jump
Select one or more points. Move the cursor to the desired location. Press j on the keyboard. The point(s) will jump to that location.

Notes and tips about Jump
It is best used as a shortcut when moving points around the screen. Instead of dragging them with the mouse, select them, then move the mouse to the new location and press j. Instantly the selected point(s) will jump to the mouse position.

If you select a solitary point, it will jump to the cursor. If you select multiple points, all points will jump equally. The last-selected point will go to the cursor while the others will move the same amount in relation to it. Any polygons connected to these points, or connected by these points, will move as well.

Rotate Left 90° e (keyboard only)

What Rotate Left 90° does
Rotate Left 90° causes the active items on screen to rotate 90° (counterclockwise, around to the left) with respect to the current position of the cursor.

How to use Rotate Left 90°
Move the cursor to the desired coordinate for the center of rotation, then press e on the keyboard.

Rotate Right 90° r (keyboard only)

What Rotate Right 90° does
Rotate Right 90° causes the active items on screen to rotate 90° (clockwise, around to the right) with respect to the current position of the cursor.

How to use Rotate Right 90°
Move the cursor to the desired coordinate for the center of rotation, then press r on the keyboard.

Swap Front and Back Layers ' (keyboard only)

What Swap Layers does
Swap Layers will switch the current foreground and backgound layers. Foreground layers become background layers, while background layers become foreground layers.

How to use Swap Layers
Press '. The layers will swap status.

Notes and tips about Swap Layers
Note that layers do not change position—i.e., if layer 1 is foreground and layers 2 and 3 are background, they will not shift location. The contents of the layers remain the same. Instead, layer 1 will be background and layers 2 and 3 will be foreground.

Swap Layers will swap the current status of the layers no matter how many are selected.

Modeler Keyboard Shortcuts (the Help key)

Once you become familiar with the Modeler's object creation tools, you may find that moving around the screen via the mouse is slower than you'd like. For this reason, keyboard shortcuts have been added to Modeler. To view the keyboard shortcut list while in Modeler, press Help. These single and combination key commands will help you get around the workspace more quickly.

The list below is organized alphabetically, by the command description in the second column, since it's easier to look up a command by its description.

Shift+x	ARexx Macro menu (direct entry)
Ctrl+b	Begin CCP (create Continuity Control Point at beginning of curve)
b	Bevel polygons
Shift+b	Boolean CSG (Union, Intersect, Subtract, Add)
Esc	Cancel
g	Center item beneath pointer
Ctrl while dragging	Constrain movement for current tool
c	Copy selected item(s) to memory buffer
x	Cut (remove current item, place copy in memory buffer)
z	Delete current item (do not copy to memory buffer)
d	Display Options
/	Drop all selected items
a	Fit all item(s) to edit windows
Shift+a	Fit selected item(s) to edit windows
Ctrl+a	Fit selected item(s) to pointer's active edit window
f	Flip polygon surface normals
Ctrl+d	Freeze Curve into Polygon
i	Information (display based on selection mode)
Shift+j	Jitter points
j	Jump point(s) to pointer location
Help	Keyboard shortcut list
Alt+(1 thru 0)	Layer to Back
Shift+Alt (1 thru 0)	Add Layer to Back Layer(s)
1 thru 0	Layer to Front
Shift+(1 thru 0)	Add Layer to Front Layer(s)
l	Load object into current and frontmost layer
Return or Enter	Make
Ctrl+	Make (Open-ended) Curve (out of selected points)
Ctrl+o	Make Closed Curve (out of selected points)
Ctrl+f	Make Patch out of selected curves
p	Make Polygon out of selected points
m	Merge Points
Shift+z	Merge Polygons
Shift+p	Motion Path Extrude (requires a motion path saved from Layout)
t	Move
Shift+n	New (clear all layers, reset units and grid display)
n	Numeric menu
Return or Enter	OK (and close) pop-up requester
Alt+mouse drag	Pan screen view (in direction of mouse when dragged)
v	Paste
Shift+q	Quit (exit Modeler to Layout)
Ctrl+r	Rail Extrude
k	Remove polygon(s) (leave points behind)
y	Rotate
e	Rotate left 90° (counterclockwise) around pointer position
r	Rotate right 90° (clockwise) around pointer position
Shift+s	Save As (save object under a new name)

s	Save front layer(s) (using object name most recently accessed)
h	Scale
Arrow keys	Scroll screen view by one grid square in direction pressed
]	Select all connected items (points or polygons)
Spacebar	Selection mode (cycle)
Shift+h	Size
Shift+m	Smooth
Ctrl+s	Smooth Curves (smooth overlapping continuity control points)
Shift+f	Smooth Shift
Shift+c	Solid Drill (Core, Tunnel, Slice)
w	Statistics (based on selection mode: points, polygon, volume)
Shift+d	Subdivide
q	Surface command
' (apostrophe)	Swap Layers (switch all foreground and background layers)
Shift+r	Template Drill (Core, Tunnel, Slice)
Shift+w	Text
Ctrl+n	Toggle CP (Control Point) at end of curve
Shift+t	Triple (subdivide non-triangular polygons into triangular ones)
u	Undo (up to three steps)
Shift+u	Unify (make single-sided polygons out of double-sided ones)
F1 thru F10	User defined Macros
. (period)	Zoom In
> (Shift+period)	Zoom In 2X
, (comma)	Zoom Out
< (Shift+comma)	Zoom Out 2X

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Appendices

Appendices

This section contains additional and extraneous material that is not required for Flyer operation, but that you may find useful.

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Appendix 1
TroubleShooting Tips

Startup Problems

Symptom: Amiga will not start. Check the following possibilities...

___ **Is it plugged in?**
Are all peripherals, drives, and external equipment plugged in and turned on? If not, turn them on and restart.

___ **Are all circuit cards inserted fully?**
If the Toaster, the Flyer, or another card is not fully pushed into its slot, the system may be unable to start. Press gently but firmly on all cards to make sure, then restart.

___ **Are all cables properly connected?**
Check that any cables you have handled are fully inserted into their proper connections, and that none are backward. Restart.

___ **Have you removed or changed any Flyer drives?**
If you have removed a Flyer drive, or changed its SCSI ID number, then your Amiga is having trouble starting because it is looking for a now-missing Flyer drive. The icon for this drive, in the Sys:devs/DOSDrivers drawer, is causing the problem. You will need to restart your Amiga with a bootable floppy disk, such as your Workbench disk, and remove the unnecessary icon. If you have added a new drive, or changed a drive's SCSI ID number, you will need to drag the correct device driver icon from the Sys:Storage/DOSDrivers drawer into the the Sys:devs/DOSDrivers drawer in order to be able to use the new drive with its new number.

Symptom: Toaster/Flyer software will not run. Check the following possibilities...

___ **Are all cables properly connected?**
Check that any cables you have handled are fully inserted into their proper connections, and that none are backward.

___ **Is the Toaster over-terminated?**
The Toaster's main output is designed to be connected directly to **one** device only (either a VCR, or a TV monitor, for example). If you have placed a T connector on the main output in order to run the video to two places (say, a VCR and a TV), you are weighting down the video signal. The Toaster will appear will "hang" while starting up, as if the Toaster software cannot run. Disconnect one of the two devices and use a *video distribution amplifier* to run the Toaster's one video out to a number of different devices.

Symptom: Video stutters on playback. Check the following possibilities...

___ **There are no "extra" device driver icons in the DOSDrivers drawer.**
If you have device driver icons in the main system DOSDrivers drawer, then the Amiga is spending time looking for these drives repeatedly after its has started up. This polling process is interrupting the Flyer's ability to play smooth video. It is especially noticeable when a CD-ROM device driver is present, but there is (a) no disc in your CD-ROM drive, or (b) your CD-ROM drive is not turned on, or (c) you do not have the CD-ROM drive hooked up at the moment. The problem may be related to more than just the CD-ROM device driver. Make sure there are no other unnecessary device drivers present.

___ **Unexpected additional split edits.**
It is possible to cause a split edit that you did not intend. If you adjust the video for a clip when in the Fine Tune control panel, **and** you do not adjust the audio, **and** audio is turned on for playback for that clip, you will have created a split edit. Assuming you wanted a split edit, this is ok. If not, the error may cause playback trouble elsewhere in the sequence because it makes for too many splits at one time (Flyer can only handle four split edits simultaneously). Make sure that you adjust video and audio correctly and that audio playback is set on (or off), for each clip in your project, if you experience stuttering playback.

Symptom: An error message says something about an audio device problem. Check the following possibilities...

___ **Do you have the DataFlyer SCSI+ hard drive controller (from Expansion Systems) in your Amiga?**
See Appendix 16 for the solution.

Amiga Startup Tips

Symptom: What to do when the Amiga will not start.
Try these tips...

___ **Turn off the power and try again.**
Sometimes the Amiga can be stubborn about starting up if it has just locked up. Turn the power off, wait at least 15 seconds, then start up again. If this does not work after two or three attempts, go to the next step.

___ **If you have a Workbench floppy disk handy, insert the Workbench disk and restart the machine.**
This should allow you to start the Amiga successfully. At this point, you should look at the most recent software that you installed, or the most recent file(s) that were changed, in order to find the thing that is preventing the hard drive from booting up on its own. After making the changes, restart without the disk and see if the Amiga comes up on its own. If it does not, you may have to try again and spend more time looking for the problem.

___ **If you do not have a Workbench disk handy, restart the machine and hold down both mouse buttons while it reboots.**
The Amiga is designed to display a special screen when both mouse buttons are held down while it powers up. This screen, Early Startup Control, allows you to choose among several options for startup. It's handy because it usually enables you to start the machine and fix the problem when you do not have a Workbench disk handy.

If you can get to the early startup screen, you can be reasonably sure that the problem is not the Amiga hardware, but some software command that occurs during the startup-sequence. Choose the option that allows the system to reboot without using the startup-sequence. After the machine resets, it will display a screen that looks like a Shell (there is a prompt, waiting for you to enter a command). Enter the command **loadwb** and press Return. The Workbench interface will load. It may appear in front of the Shell display, or it may open up behind the Shell window, in which case you will need to resize the window in order to get to the Workbench. Once you are at the Workbench, you can go about locating the problem that keeps the machine from starting.

___ **Worst case scenario: The Amiga will boot from the Workbench disk, but you can't find or fix the problem.**
Are you certain that you checked for errant device drivers in the correct DOSDrivers drawer? There are two DOSDrivers drawers, one in the sys:devs directory (containing active drivers) and one in the sys:storage directory (containing drivers that are in cold storage).

If you are certain you've done everything you can, our first recommendation is that you contact your dealer for assistance. If you do not have a local dealer, you might wish to try contacting an Amiga or Toaster user group in your area. There are always local experts around who will be willing to lend a hand. Also, you can give NewTek Technical Support a call.

However, if you need to get your machine running right away, and no expert is available, try the following. Start the machine with the Workbench floppy disk inserted. Once the system is up, locate and run the Shell program (it's in the System drawer). In the Shell type **copy df0:s/startup-sequence (drivename):s/startup-sequence** and press Return. In place of the (drivename):, you should use the name of your hard drive. For example, if your drive were named DH0:, you would have typed **copy df0:s/startup-sequence dh0:s/startup-sequence.** This copies the most important startup file to your hard drive.

Afterward, remove the disk and restart the Amiga. It may or may not start successfully. If it does not, you may need to replace more files. Follow these steps **only** if you feel confident that you know what you are doing. The simplest method is to start from the floppy disk, open a Shell, and type **copy df0: all dh0:** and press Return. This copies **all** of the needed startup files to your hard drive. In the process, it will also overwrite your user-startup file, which may contain commands for other programs you use. You should now be able to restart your Amiga from its own hard drive. You may also need to re-install certain software in order to have it rewrite your old user-startup file.

Appendix 2
Non-Standard Configurations

This appendix is for Flyer users who wish to use a different configuration than the basic configuration installed by the installation program.

The Basic Configuration

The basic Flyer configuration consists of three drives connected to the Flyer card: two video drives and one audio drive. The installation program installs the necessary control software for these drives only. After you've completed the installation, follow the steps below to set your system up correctly.

Using a Different Configuration

To utilize a different configuration, you will need to make some changes to your system via the Workbench software. The installer placed three device drivers in your Sys:devs/DOSDrivers drawer (the active devices drawer), called FA0, FB0, and FC0. These represent the drive with ID 0 on Flyer SCSI chain A, the drive with ID 0 on Flyer SCSI chain B, and the drive with ID 0 on Flyer SCSI chain C. If these drives are not actually present on your system, the next time you start your Amiga, it will probably not be able to come up. Therefore, you need to remove these device drivers from the Sys:devs/DOSDrivers and replace them with the the correct device drivers for the drives and ID numbers you are using.

All device drivers are stored in a drawer called Sys:Storage/DOSDrivers. This is a storage area, and it is ignored when the Amiga starts up. All of the device drivers here are effectively "in cold storage." Immediately upon completing the installation, you should go to the Workbench, then locate and open two drawers: Sys:devs/DOSDrivers and Sys:Storage/DOSDrivers. Place them on screen so that you can see the contents of each. Now drag the device drivers that you are *not* using from the active drawer Sys:devs/DOSDrivers to the storage drawer Sys:Storage/DOSDrivers. Then, drag the device drivers that you *are* using from the storage drawer Sys:Storage/DOSDrivers to the active drawer Sys:devs/DOSDrivers.

This sets up the proper notification for the Amiga to "look for" the actual hard drives that you have connected to the Flyer and to make them available whenever you start your Amiga.

Remember that if you change your drive configuration, you'll need to make the same changes to the device drivers in order to keep things straight. If you forget, you may find yourself unable to start the computer (if so, see below for tips on correcting the mistake).

About Device Drivers

A *device driver* is a piece of software that represents a hardware device such as a Flyer drive, a removable SyQuest or Bernoulli drive, CD-ROM drive, and others. It notifies the Amiga of the actual presence of such a drive. Without this notification, the Amiga would not know that anything else had been hooked up.

When the Amiga starts up, it checks the drawer Sys:devs/DOSDrivers for the presence of device drivers. If any are present, then the Amiga confirms their presence and displays the appropriate icon on the Workbench. You'll be able to access that device during that work session as well.

NewTek's install automatically program places three device drivers in the Sys:devs/DOSDrivers drawer, and then places 18 more in storage within your main hard drive's Sys:Storage/DOSDrivers drawer. (Seven device drivers, for each of seven possible drive ID numbers, 0-6, times the three drive chains A, B, C, equals 21 total device drivers.) If you were to hook up a new hard drive in the future, all you would need to do to notify the Amiga that it had been added is to move the appropriate device driver into the active device drawer and reboot. From that point onward, the drive would be available.

Device Driver Tricks and Tips

A nifty tip about device drivers is that, with AmigaDOS 2.1 and higher, you can activate a device driver and gain access to a newly added device even if it has not been dragged into the active device drawer first. Device drivers do not have to be inside the active device drawer in order to be activated (only to be activated automatically when the computer starts up). If you

double-click on a device driver, you tell the Amiga to "look for this drive and, if it's present, make it available" right away. After a moment, if the correct drive is in fact connected to the system, its icon will appear on the Workbench, and you can access it from within any program.

Therefore, if you forget to drag a device driver into the active devices drawer for DOSDrivers, you can simply double-click on the device driver to mount the drive and continue working. Just don't forget to drag the driver into the correct drawer so you won't have to do this every time!

Trouble Occurs—and How to Fix It

Trouble occurs when there are device drivers in the Sys:devs/DOSDrivers drawer for drives that are not actually hooked up to the Amiga. With hard drives, usually the Amiga will not be able to boot up when this is the case. With a CD-ROM drive, the system will usually boot, but the Flyer's video playback will stutter due to continued SCSI polling while the Amiga repeatedly searches for a CD-ROM drive that isn't there! For these reasons, it's best to keep aware of your active device drivers.

There are two solutions, based on your familiarity with the Amiga.

The easiest method is to insert the Workbench floppy disk in the computer and restart it. The system will use the floppy disk as its startup disk rather than your hard disk. Once the Workbench appears, go into the hard drive and drag the offending device driver(s) from the active device drawer (devs/DOSDrivers) back to cold storage (storage/DOSDrivers). Reboot and everything should work fine again.

The other method is to restart the Amiga and hold down both mouse buttons right away. In a moment, you will see the Amiga Early Startup Screen. This diagnostic screen gives you control over the machine's startup. Select the **Boot With No Startup-Sequence** option. (Note that this screen looks and functions differently on different releases of the Workbench software, so you may have to look around a bit in order to find the the correct option.) The Amiga will reboot and display a Shell window with a prompt. Enter **loadwb** and press Return. Resize the Shell window so that it is out of the way; behind it you will find the Workbench. Go into the hard drive and drag the offending device driver(s) from the active device drawer (devs/DOSDrivers) back to cold storage (storage/DOSDrivers). Reboot and everything should work fine again.

	SCSI Chain A	SCSI Chain B	SCSI Chain C
SCSI ID 0	FA0	FB0	FC0

Table A. The device drivers installed in Sys:devs/DOSDrivers by the installer. These are automatically installed for the basic system configuration. Other configurations may require changes.

	SCSI Chain A	SCSI Chain B	SCSI Chain C
SCSI ID 0	FA0	FB0	FC0
SCSI ID 1	FA1	FB1	FC1
SCSI ID 2	FA2	FB2	FC2
SCSI ID 3	FA3	FB3	FC3
SCSI ID 4	FA4	FB4	FC4
SCSI ID 5	FA5	FB5	FC5
SCSI ID 6	FA6	FB6	FC6

Table B. The device driver names for all of the possible hard drives that can be connected to the Flyer. These are placed in Sys:Storage/DOSDrivers by the installer.

	SCSI Chain C
SCSI ID 6	CD6

Table C. The device driver name for the CD-ROM driver placed in the Sys:Storage/DOSDrivers drawer by the installer.

Appendix 3
The Basic Flyer Configuration

What's This About?

The following dissertation is lengthy and technical and probably quite dull to most Flyer users. However, it contains important information about the installation of your system, SCSI hookups, and naming conventions used within the Flyer software. Although you do not **have** to read and understand this data, it will definitely prove beneficial to you as you grow comfortable with the system and add to it in the future.

Basic Flyer Configuration and Installation

The basic Flyer configuration consists of three drives connected to the Flyer card: two video drives and one audio drive. The installation program is preprogrammed to install the necessary control software for these drives only. If you wish to a different configuration, we have supplied all of the necessary device drivers in the Sys:Storage/DOSDrivers drawer on your Amiga. The install program sets up the three-drive configuration automatically; so you will have to go back after the installation, remove the incorrect drivers (for those drives you do not have), and insert the correct drivers (for those drives you do have).

Although the three SCSI ports on the Flyer are labeled SCSI 0, SCSI 1, and SCSI 2 on the card itself, NewTek has adopted the following conventions when configuring and referring to these ports. This is so drive installation and usage is as easy and consistent as possible from one system to the next. Although it sounds trite to employ the colloquialism, it's as simple as "A-B-C."

SCSI 0, SCSI 1, and SCSI 2 are referred to as A, B, and C. These three connections are often called "ports" or "chains" in hard drive terminology. As long as you refer to the correct letter, it does not matter whether you say you have "A drive on port A" or "A drive on SCSI chain A." The important concept here is that you understand why we use A, B, and C.

We felt like it.

Actually, it serves the purpose of allowing you to identify each SCSI chain and each drive on that chain individually. Each SCSI chain can support seven devices (numbered from 0-6). Therefore, the first drive connected to SCSI port A will receive the device name of FA0:. Pretty exciting, huh? The first drive on SCSI port B is called FB0:, while the first drive on C is called FC0:. Following is a chart to show you the device names possible with the Flyer. Note that these names are for *Flyer video drives or audio drives only*. (Other devices, such as a CD-ROM drive on SCSI chain C with ID 6, will have another name, such as CD6:)

	SCSI Port A	SCSI Port B	SCSI Port C
First Flyer drive device name	FA0:	FB0:	FC0:
Second Flyer drive device name	FA1:	FB1:	FC1:
Third Flyer drive device name	FA2:	FB2:	FC2:
Fourth Flyer drive device name	FA3:	FB3:	FC3:
Fifth Flyer drive device name	FA4:	FB4:	FC4:
Sixth Flyer drive device name	FA5:	FB5:	FC5:
Seventh Flyer drive device name	FA6:	FB6:	FC6:

The Amiga uses two different names for referring to a disk: a device name and a volume name. Whether you tell the system to look for device DH0: or volume "Workbench," the computer will consult its list and take you to the right place.

The FlyerFormat utility automatically takes care of providing device names. You may, from the Workbench, select a Flyer drive and provide any volume name you wish.

Important!

Do not rename volumes without being careful! You should know that whenever you save a video project from within the Flyer, the **volume** name where each of the parts of the project came from is recorded within the saved file. Video clips, audio clips, graphics and more may come from a number of different drives when you create a project. If you have saved a project, then renamed one of your drives from "Pete" to "Malcolm," then the next time you attempt to load the project, the Flyer will be unable to find some portions of the program since it will be looking for a drive named Pete. Once you've named a drive, it's best to keep it that way.

Appendix 4
About the Software Installation

When you perform a complete install of the Toaster Flyer software to an Amiga 4000 system, the following files are placed. (Note: These pathnames assume that you have two hard drives for the Amiga, and the basic three-drive setup for your Flyer. In this example, the boot drive was named DH0: and the Toaster drive was named VT1:.)

Appendix 5
CD-ROM Access

About Asimware's CD-ROM software

The Flyer includes the necessary CD-ROM drivers to read a CD-ROM drive. This capability has been provided as a courtesy from Asimware Innovations of Canada.

If you are interested in obtaining the full release of Asimware's CD software, with additional capabilities for using CD's and CD-ROM discs, contact them at the address and phone number below.

Asimware Innovations
101 Country Club Drive
Hamilton, Ontario
Canada L8K 5W4

905/578-4916
905/578-3966

Appendix 6
MegaChip 2000

Getting Extra Memory/Performance on an Amiga 2000

If you are running the Video Toaster (either the original card or the 4000 card) in an Amiga 2000, you may find your system has difficulty running some of the Toaster's video graphics applications due to lack of chip RAM. This is related to the original Agnus chip on the Amiga 2000 motherboard, which utilizes 1 MB of memory. You can install an adapter card called the MegaChip to double this to 2 MB of chip RAM. This will both improve the performance of your Amiga and alleviate the lack of chip memory for Toaster operations.

For more information about the MegaChip, contact its manufacturer at the address and phone number below.

DKB
50240 W. Pontiac Trail
Wixom, MI 48393

Tech Support	810-960-8750
Sales	810-960-8751
FAX	810-960-8752

Appendix 7
Y/C Plus Card

Compatibility with the Video Toaster Flyer

The Flyer is compatible with the Y/C Plus card in all Amiga configurations. However, if you have the original Video Toaster card installed in an Amiga 2000 (or in a modified A3000 or A3000T), you will need a new cable from the makers of the Y/C Plus card in order to continue to use it with the Flyer.

Contact Y/C Plus regarding a replacement cable for the Y/C Plus card configuration at the address and phone number below.

Y/C Plus, Inc.
310 SW 6th Avenue
Topeka, KS 66603-3109

Voice 913/235-5014
FAX 913/235-3485

Troubleshooting tip from Y/C Plus when using the Video Toaster 4000 card, Flyer, and the Y/C Plus card:
"If your system seems to have difficulty booting up, try removing the following jumpers from your Y/C Plus card—JP3 and JP4. This solves the problem, since the Flyer utilizes inputs 3 and 4 internally direct from the Toaster 4000 card."

Appendix 8
Installing a New Drive

If you want to use a different configuration than the basic three-drive configuration, or install additional drives, you must
(a) install and format those drives, then
(b) place the appropriate device driver in the Sys:devs/DOSDrivers

1 Install the drives per the manufacturer's instructions. Make sure that:
- Each drive on any single SCSI chain has a different ID number (anywhere from 0-6)
- Only the *last* drive on any SCSI chain is terminated (has its termination set to **on**).
- Each drive has power

2 Install the *device driver* whose name matches the SCSI port and the SCSI ID of the drive(s) you have just installed. Do this by dragging the device driver with the correct ID/name from the following directory—Sys:Storage/DOSDrivers—into the directory named Sys:Devs/DOSDrivers. Then restart the system.

This is how the system knows that a new drive is present when it starts up. The device driver notifies the Amiga of the presence of a drive on a specific SCSI chain and with a specific ID number. .

Example

Suppose you have installed a second drive to SCSI chain A, daisy-chained after the first drive. The new drive has a SCSI ID number of 4. When you install the new drive, make sure that termination is switched **off** for the first drive and that termination is **on** for the second drive. (The last drive in any chain is the one that is terminated.) Then, after installing the hardware, here's all you do:

1 Drag the *device driver* named **FA4** from the following directory—Sys:Storage/DOSDrivers—into the directory named Sys:Devs/DOSDrivers.

2 Double-click on the device driver to alert the Amiga to the new drive's presence immediately.

3 Turn to the appropriate Appendix for the kind of hard drive you installed, either **Formatting a Drive for Video Recording** or **Formatting a Drive for Audio Recording** and format the drive.

4 Start the Flyer and begin using your new drive.

Troubleshooting Tip

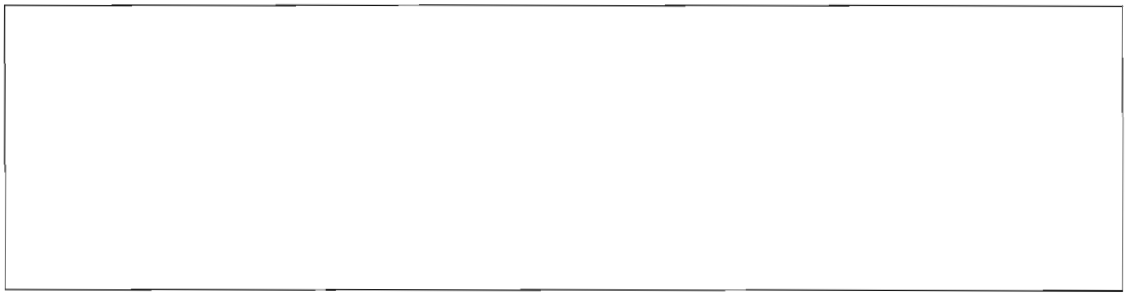
Whenever you add or remove device driver icons from the Sys:Devs/DOSDrivers drawer, make sure that there are no "false" icons there (icons for which you do not actually have a drive). These can cause trouble for the Amiga's startup, or problems with the video playback of Flyer drives (i.e., stuttering playback). Drag these icons back into the Sys:Storage/DOSDrivers drawer for safekeeping until you need them.

Appendix 9
Formatting a Drive for Video

Three built-in SCSI II ports allow you to connect up to 21 SCSI drives to the Flyer. In practical terms, this means that you can connect a maximum of 14 dedicated video drives and 7 dedicated audio drives to the Flyer card.

You will need to install the new Flyer hard drive as you would any normal hard drive (insert it into a case, provide it with power, hook it up to one of the Flyer's SCSI chains). The drive may be mounted inside the Amiga or in an external case with its own power supply. Make sure that you connect to the proper Flyer SCSI channel (channels A and B are for video, channel C is for audio), then set the drive's jumper(s) or switch(es) to a proper SCSI ID number (ID numbers for each SCSI chain range from 0-6). Once the drive is installed correctly, power on the system.

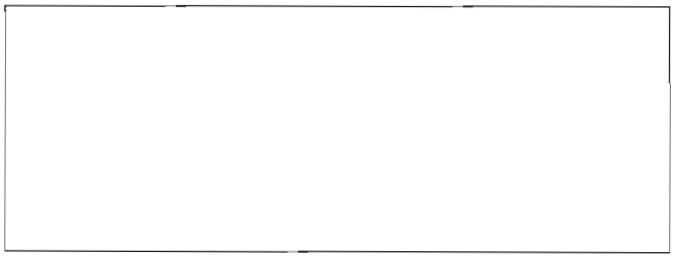
Locate the icon labeled **FlyerFormat** and double-click it to start the formatting procedure. When the format program appears, it will look something like this.



All of the drives connected to the Flyer will appear in the list window. (If a drive does not appear, double check that it has in fact powered up and that the SCSI cable is properly connected. You may need to restart the system and try again.) Follow the steps below to format a new drive.

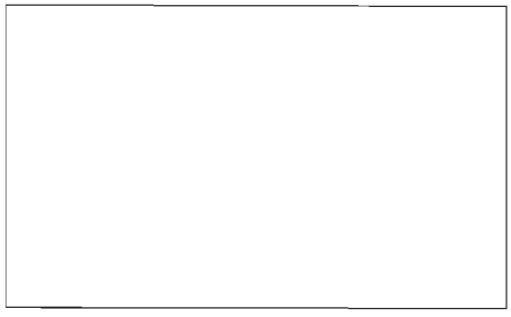
1 From the list of available drives you should see your newly added drive with the comment "Not Flyer-FS" on its status line. Select this drive by clicking on it. The entire line will highlight.

2 Click on the button labeled **Format Drive**. You should see the following message:



Click Cancel if for any reason you do not want to format this drive. Otherwise, click OK to proceed to the next step.

3 You should see the following message:



Here you must select which type of data you will put on this drive: audio only, or video clips (along with their accompanying audio). In this case, you want a drive that can record video with audio.

4 Click on the **Audio/Video** button.

After a few moments the process will be completed. The drive will have been formatted, and the cache settings updated. The list window will also be cleared and updated. (As an example, formatting a 2 gigabyte drive takes about 20 seconds.) You can be certain the process was successful by looking at the status line for the newly-formatted drive. It should say "Audio/Video" now.

5 Click the close box in the upper heft-hand corner of the FlyerFormat window to exit the program.

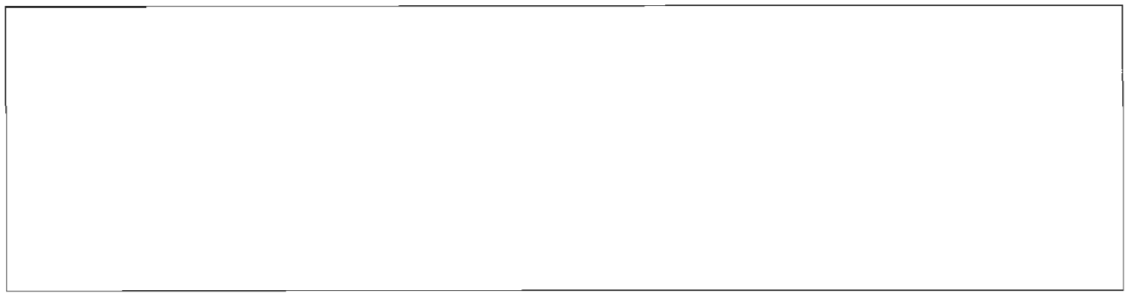
Your new drive is ready to use the next time you start the Toaster Flyer.

Appendix 10
Formatting a Drive for Audio

Three built-in SCSI II ports allow you to connect up to 21 SCSI drives to the Flyer. In practical terms, this means that you can connect a maximum of 14 dedicated video drives and 7 dedicated audio drives to the Flyer card.

You will need to install the new Flyer hard drive as you would any normal hard drive (insert it into a case, provide it with power, hook it up to one of the Flyer's SCSI chains). The drive may be mounted inside the Amiga or in an external case with its own power supply. Make sure that you connect to the proper Flyer SCSI channel (channels A and B are for video, channel C is for audio), then set the drive's jumper(s) or switch(es) to a proper SCSI ID number (ID numbers for each SCSI chain range from 0-6). Once the drive is installed correctly, power on the system.

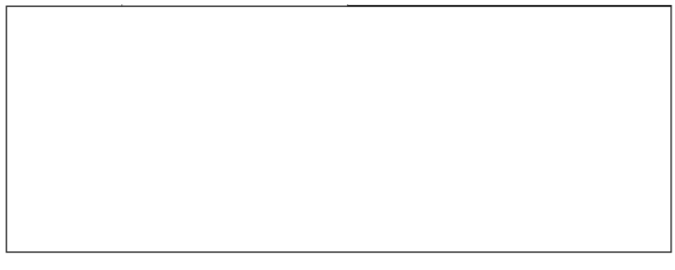
Locate the icon labeled **FlyerFormat** and double-click it to start the formatting procedure. When the format program appears, it will look something like this.



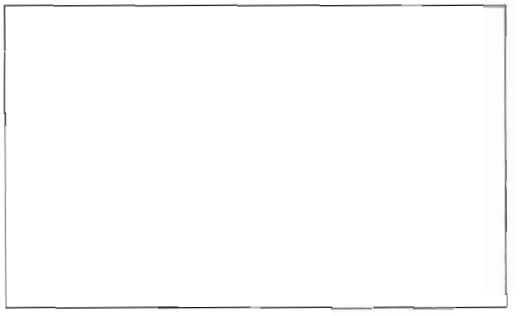
All of the drives connected to the Flyer will appear in the list window. (If a drive does not appear, double check that it has in fact powered up and that the SCSI cable is properly connected. You may need to restart the system and try again.) Follow the steps below to format a new drive.

1 From the list of available drives you should see your newly added drive with the comment "Not Flyer-FS" on its status line. Select this drive by clicking on it. The entire line will highlight.

2 Click on the button labeled **Format Drive**. You should see the following message:



3 Click Cancel if for any reason you do not want to format this drive. Otherwise, click OK to proceed to the next step. You should see the following message:



Here you must select the use you plan for this drive: as an audio-only drive, or as a drive that handles video clips (along with their accompanying audio). In this case, you want this drive to be an audio drive.

4 Click on the **Audio Only** button.

After a few moments the process will be completed and the list window will be updated. (As an example, formatting a 52 megabyte drive takes about 15 seconds.) You can be certain the process was successful by looking at the status line for the newly-formatted drive. It should say "Audio Only" now.

5 Click the close box in the upper heft-hand corner of the FlyerFormat window to exit the program.

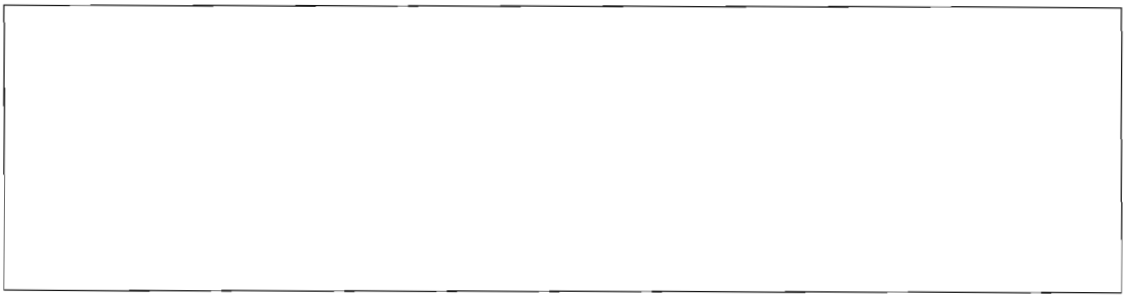
Your new drive is ready to use the next time you start the Toaster Flyer.

Appendix 11
Drive Cache Settings

Updating/Resetting a Drive's Cache Settings

If you find a drive is no longer reliable (i.e., it plays back with numerous errors, or refuses to accept new footage), you may need to (a) reset the drive cache, or (b) reformat the drive. Resetting the cache will not alter any audio or video currently on the drive, whereas reformatting will erase all data. We recommend resetting the drive's cache settings first, before attempting to recover a damaged drive, since this approach is nondestructive.

Locate the icon labeled **FlyerFormat** and double-click it to start the formatting procedure. When the format program appears, it will look something like this...



All of the drives connected to the Flyer will appear in the list window.

1 From the list of available drives select the drive to be updated by clicking on it. The entire line will highlight.

2 Click on the button labeled **Set Drive Cache**. The cache will be updated instantaneously.

3 Click the close box in the upper left-hand corner of the FlyerFormat window to exit the program.

Your drive is ready to use.

Appendix 12
Re-Formatting a Drive

Hard drives occasionally have problems. Today's hard drives are of very high quality and reliability, yet even they may succumb to rough treatment, power outages, or other improprieties. If you find a drive is no longer reliable (i.e., it plays back with numerous errors, or refuses to accept new footage), you may need to (a) reset the drive cache, or (b) reformat the drive. Resetting the cache will not alter any audio or video currently on the drive, whereas reformatting will erase all data. We recommend resetting the drive's cache settings first, before attempting to recover a damaged drive.

The procedure for re-formatting a Flyer drive is the same as the one you followed for formatting the drive originally. Simply start the FlyerFormat program, select the drive, choose the type of formatting, and start the process. If you are unsure of your steps, turn to the appropriate Appendix for help, either **Formatting a Drive for Video** or **Formatting a Drive for Audio,** depending on the type of usage you want for the drive.

Appendix 13
Using SMPTE Time Code

The Flyer supports the use of SMPTE time code. SMPTE time code is not a requirement for using the Flyer. However, for greater versatility and compatibility with video editing systems and operators, SMPTE time code support has been included. The Flyer accepts SMPTE time code while recording, and will output time code during playback. These input and output functions are accessed via the serial connections on the Flyer itself. (If you use NewTek's SCSI accessory cable, you will have these serial connections, labeled A and B, available on the back of your Amiga. Otherwise, you may need to obtain the necessary cabling from your dealer.)

Note that there are two forms of time code, *longitudinal* and *vertical interval*, known in the industry as LTC and VITC. The Flyer utilizes *only* longitudinal time code input via a serial cable. If your equipment is not capable of sending this form of signal to the Flyer, you will need to obtain an LTC-to-VITC translator than can make the necessary conversion to the format that the Flyer will accept. See your computer/video dealer, or consult the appendix on Horita Company, for a time code translator. (Other manufacturers may be added to the appendices as we learn of them.)

Appendix 14
Time Code Products

At the time of printing, the Flyer supported the SMPTE time code format generated by the Horita Company's time code equipment. NewTek thanks Horita for providing their TRG-50 time code generator and VLT-50 VITC-to-LTC translator for compatibility and testing purposes during the development of the Flyer.

Horita Company manufactures a variety of time code and computer/video-related products. Contact them at the address below for further information.

Horita Company
P.O. Box 393
Mission Viejo, CA 92690

Voice 714-489-0240

Appendix 15
Audio Peripherals

Brookline Technologies' Volume Stabilizer

If your camcorder or audio-recording equipment is unable to record consistent, good quality sound, and you wish to be able to maintain a more constant sound level, you may want to contact Brookline Technologies about their Volume Stabilizer line of products.

The Volume Stabilizers serve to bring up low-level audio while reducing sudden, high-level peaks, without sacrificing the dynamics of the overall soundtrack. The result is that you can hear more of the soundtrack without being assaulted by a wall of sound. This may be particularly helpful for footage recorded from a camcorder, or home footage.

Brookline Technologies
2035 Carriage Hill Road
Allison Park, PA 15101

Orders 1-800-366-9290
Voice 412-366-9290
FAX 412-366-0875

Appendix 16
SCSI Controller Compatibility

Expansion Systems' DataFlyer SCSI+ Controller

Expansion Systems markets a SCSI hard drive controller for the Amiga 4000 that does not require the use of a standard Amiga expansion slot, thus allowing you to add SCSI hard drives to your system without taking up valuable expansion card space.

However, *if* you use the DataFlyer SCSI+ *and* your Toaster/Flyer system is set to autoboot (automatically start the Toaster upon the computer's startup) a conflict can occur. You may see an error message referring to an "audio" problem. If so, follow the steps below to remedy the situation.

Summary of Remedy
You need to edit your startup-sequence file to change the **DFMount** command line so that it specifically names drives that are not present in your system.

Example
1. Suppose your main drive is named DH0:. Start your Amiga, then open a Shell (or CLI) window and type:
   ed s:startup-sequence and press Return. This will open a text editor with the startup file ready to be edited.
2. Locate the line that reads **DFMount >NIL: 2 3 4 5 6**. You should find it near the bottom of the file if the SCSI+ software was recently installed.
3. Edit the list of drive numbers to specify only those drives that actually exist. For example, if you have three SCSI drives connected to the SCSI+, numbered 2, 5, and 6, change this line to read **DFMount >NIL: 2 5 6**
4. Select the Save option from the pull down menu at the top of the screen, then quit the editor.
5. Restart your system. It should start without giving you the error message and everything should work normally.

If you need further assistance, please contact Expansion Systems at the address or phone number listed below.

Expansion Systems
44862 Osgood Road
Fremont, CA 94539

Voice 510-656-2890
8:00am-11:30, 12:30-5:00pm
Monday through Thursday

Appendix 17
ToasterCG ARexx Macros

Following is a short description of the ARexx macro shortcut scripts included with ToasterCG 4.0. (Due to the nature of printing schedules, there may actually be additional scripts not documented here.)

Some of these scripts are meant to be run by themselves, while others actually create additional self-running scripts. The SaveAttrib macro is one such "script generator." You use it to save the attribute settings of the currently selected item. SaveAttrib will ask you for a file name, and it will save these attributes as a script with that file name. Later, when you want to apply those attributes to other text, you simply run the script that the SaveAttrib macro created for you to do so.

The "child" script created by SaveAttrib is an example of a self-running script. When you run it, it performs an action. Other examples of this kind of script include SpellChecker, which checks the current page for typographical errors, and ChartFont, which outputs a list of all of the alternate characters within a font.

Most scripts are self-running in this manner. Only a few (most of the attribute-saving scripts and the box making script) are the "script generating" kind.

To run one of these self-running ARexx scripts:

Method 1: In ToasterCG, press Alt+F1. This calls up the RexxLauncher file requester. Locate the script you wish to run and double-click it to run it.

Method 2: If the script has been assigned to one of the function keys (either an Alt+Fkey combination or a Shift+Alt+Fkey combination) just press the appropriate keyboard shortcut.

AsciiIn.rexx

When you run this script, it asks you to enter an ASCII number. The number relates to the ASCII number of a character in the current font. Enter the number and press Return, and ToasterCG will place that character on screen.

AsciiOut.rexx

This script is the reverse of AsciiIn.rexx. Select a character on screen and then run this script, and ToasterCG will inform you of the ASCII value for that character.

BatchFonts.rexx

This script allows you to load a single font in a variety of sizes all in one operation (rather than having to reload the font each time). Run the script. The requester will ask you to enter a series of numbers that indicate font sizes. You can leave spaces between sizes, or commas, or just about any other character. The script will strip off unnecessary characters and simply use the numbers to load the selected font in all of the sizes entered.

Boxmaker.rexx

This is a script generator. It will study **all** of the boxes currently on screen, including their sizes, attributes, and locations, then create a file that can be used to recreate these boxes at any other time. This is useful for designing lower-third boxes or graphics that you use often. To reload a box that was saved by this script, simply run the ARexx Launcher (Alt+F1), enter the BoxMakerScripts directory, and double-click on a box file.

Bumplines.rexx

This script is most useful on scroll pages, where you will have many, many lines of information. This script will evenly space every line on the page. This spacing function is pretty useful, especially if you have been editing the file for a while, even more so if you use multiple font sizes on the page. BumpLines will ask you for a number, and will use that line value to evenly space all lines on the page.

CGHaiku.rexx
This is a variation on the Haiku macro originally created for LightWave Modeler. It's simply a fun example of using ARexx.

ChartFont.rexx
ChartFont will provide you with an on screen printout of all of the alternate characters in the font you select. These are the characters you get when you hold down the Alt key and type a letter. ChartFont will go to the next page, and if it is blank, convert it to a scroll page, then print out a lengthy list of the alternate characters (with keys to show which is which). If the next page is not blank, ChartFont asks if you wish to clear it, or cancel. It's best just to jump to a sequence of blank pages before running ChartFont.

CopyAttrib.rexx
"Copy" and "Paste" are two shortcut functions that ToasterCG lacks. The CopyAttrib and PasteAttrib scripts serve to fulfill these commands. CopyAttrib is a shortcut script that will save all attributes of the current font directly to the script named PasteAttrib. PasteAttrib will apply these saved attributes to the selected item. (Unlike the Save Attrib script, this saves you from having to specify a file name for the current attributes. They are immediately saved to the preset script.)

To apply these saved attributes, just select and run the PasteAttrib script.

Tip: The easiest and fastest way to use the copy and paste scripts is to use them via their keyboard shortcuts.

DeleteWord.rexx
This is a special script related to the spellChecker. It allows you to remove words from the dictionary file that the spellchecker uses.

DOS_Command.rexx
This script is primarily of use to programmers. It allows you to run an AmigaDOS command from within ToasterCG. However, unless you redirect the output of the command to a file, you will not have any indication within ToasterCG that the command has been implemented.

EPSLoad.ress
This late-addition script allows you to convert an EPS (Encapsulated PostScript) file to an IFF 24-bit brush and load it into ToasterCG. You *must* follow the steps in the proper order. First, create a box on screen (select Box from the pop-up menu, place it where you wish, and make it about the size that you want the brush to be). Second, run the EPSLoad script and select the EPS file you wish to load. After a moment, the box will be redrawn with the EPS artwork inside. Also, upon creation, the brush will be saved automatically as an IFF 24-bit brush in the brushes subdirectory with your Toaster software installation, so you can use it again and again, even in ToasterPaint or LightWave 3D.

Note: The converted EPS artwork will change the size of the box you draw somewhat. Because the EPS art has its own aspect ratio (height-to-width ratio), it will load into the box as tall as it can and as wide as it can until either the height or the width hits the border of the box you made. At that point, the other size is calculated the the box redrawn. So, if the box changes a little too much for you, create another that is slightly larger (or smaller, as needed) and load the EPS art again.

PasteAttrib.rexx
See the CopyAttrib script.

RandomAttrib.rexx
This script began as a joke. However, we quickly discovered that it came up with some useful results. RandomAttrib will create a set of random attributes for the selected item. (You have the option of randomizing the alpha channel as well. Usually, it's best not to randomize the alpha channel, since it tends to make the results look bad that might otherwise be good.)

RexxLauncher.rexx
This is a script that calls up a file requester that allows you to select an ARexx script to run. Since there are more scripts than there are shortcut keys, the RexxLauncher is handy. You'll probably use this most often to apply attribute settings or recall boxmaker scripts.

SaveAllPages.rexx
This script is invaluable for Toaster owners who have created many CG books over the years. The Sequencer/Switcher no longer uses loaded books in the CG to render the image you need when you select it. Rather, each page must be saved as a separate page file, and when double-clicked it will display. Use the SaveAllPages script to save all of the pages of the current book as individual page files. This saves you the work of doing it yourself manually. Pages will be saved with the name Page01, Page02, Page03, etc., so you will want to go back and name them appropriately.

SaveAttrib.rexx
This is a script generator. It will copy all of the attributes of the current selected item (text color, border size, border color, shadow size, shadow color, and shadow direction, along with all alpha channel values for these items) to a file. To reload an attribute file that was saved by this script, simply run the ARexx Launcher (Alt+F1), enter the AttribScripts directory, and double-click on the file you want.

SavePage.rexx
This is a shortcut to the Save Page button. Since you'll probably spend most of your time working on the main menu of ToasterCG, it can be a minor slowdown to have to go to the secondary controls menu just to save the current page. This script shortcuts the extra steps of going to that menu and choosing the Save Page button.

SaveState.rexx
This script is related directly to ToasterCG's startup. SaveState will save the current font list to a file called Startup.rexx (described below). Every time you start ToasterCG, the system looks at the startup script and sets up the fonts and attributes you saved. This saves you the time of loading your most-used fonts.

Note: Brushes and PS text brushes are not saved as part of the startup script.

SaveTextFile.rexx
SaveTextFile will save the current text on the page to a file (whose name you can specify).

SizeDown.rexx
Here's a great shortcut. After loading a font, you may find that the text you have entered is too large for the location on screen where you want to place it. Select the SizeDown command to (a) automatically load the same font in a size that is 5 lines shorter, and (b) automatically resize the selected item. Keep pressing this shortcut to keep sizing down.

To size up, use the SizeUp shortcut.

SizeUp.rexx
Here's a great shortcut. After loading a font, you may find that the text you have entered is too small for the location on screen where you want to place it. Select the SizeDown command to (a) automatically load the same font in a size that is 5 lines taller, and (b) automatically resize the selected item. Keep pressing this shortcut to keep sizing up.

To size down, use the SizeDown shortcut.

SpellCheck.rexx
This calls up the spell checking program. SpellChecker will run through the entire page, asking you about each possible error that it encounters. You have the option of accepting the word or entering the correct word. At the end of the check, spellchecker asks if you would like to add any of the unknown/corrected words to the dictionary.

Startup.rexx
This script is created by the SaveState macro. It contains a list of all of the fonts loaded in the system at the time it was saved, and it loads these fonts every time you start ToasterCG.