

User Manual



Grass Valley Krystal 4300 Digital Picture Manipulator Software Release 3.1

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Preface

About This Manual

This *Krystal 4300 User Manual* provides general operating information for the Grass Valley Model 4300 Krystal Digital Picture Manipulator (DPM). This manual is useful to both the beginning and advanced user.

Documentation Set

The standard Krystal DPM user documentation set consists of:

- User Manual
- Reference Manual
- Installation and Service Manual
- Software Release Notes

The *Krystal User Manual* contains background information about the Krystal DPM system, and describes procedures for some commonly encountered operating tasks. This manual can be used when first learning about the Krystal system, and for enhancing your basic knowledge of the system.

The *Krystal 4300 User Manual Manual* lists and briefly describes all the Krystal Control Panel functions and menu selections. Use this manual for reference if you have questions about system operation.

The *Krystal Installation and Service Manual* contains information about installing, configuring, and maintaining the Krystal system.

The *Krystal Release Notes* contain information about new features and system enhancements for a specific software version, and also includes software installation procedures. Always check the release notes for your current system software before you begin operating your Krystal system.

Conventions Used In This Manual

The following graphical and typestyle conventions are used throughout this manual.

Button References



Control Panel buttons are illustrated as shown.

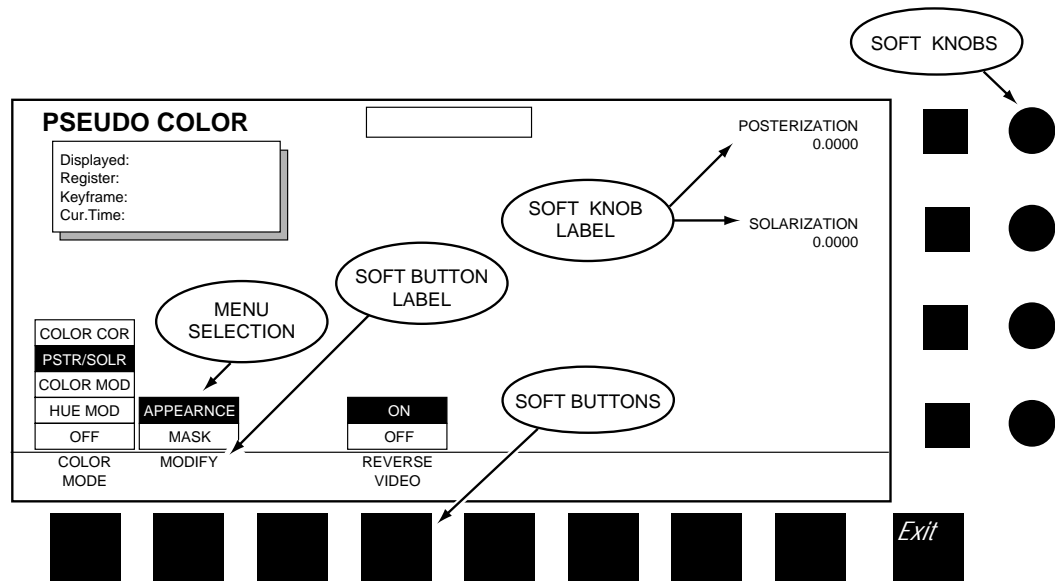
In the text, Control Panel buttons are shown in the following type:

- The System Setup top menu button.

Menu Display References

Many Krystal features may be accessed via the menu display and its associated “soft” buttons and “soft” knobs. The term “soft” merely means that the function of the button or knob is temporary, being assigned via the menu display.

When a function is assigned to a soft button or soft knob, it appears in the menu display area (as shown on the illustration below).



Menu selections and the use of soft buttons and soft knobs are shown in text in the following type:

- Select the APPEARANCE menu item with the MODIFY soft button, then adjust the image with the POSTERIZATION and SOLARIZATION soft knobs.

System Overview

General Description

The Krystal DPM is an advanced technology digital video effects system. Ten-bit serial digital inputs and outputs, frame-based digital signal processing techniques, independent function timeline key framing, and refined control architecture deliver unparalleled video quality. The ergonomic control panel draws on Grass Valley's tradition of user-friendly, logically intuitive design.

The Krystal DPM is available in single and multiple channel systems to meet a wide variety of facility requirements. Krystal systems support a "pooled" architecture, where one user can acquire and use more than one channel, or more than one user can acquire separate channels for concurrent use. The Krystal system is also designed for tight integration with peripherals such as production switchers, video editors, and routing switchers.

Standard Option Package Features

- Support for multi-user, multi-channel configurations
- 10-bit image processing, using RISC technology and bicubic interpolation
- Frame-Based Picture Translation, Scaling, Variable Perspective 3D Rotation, and Adaptive Motion Detection
- 525 or 625 line, 4:3 or 16:9 Aspect Ratio at 13.5 MHz (switchable on a session-by-session basis)
- Keypad, Joystick or Panel Knob interfaces
- Independent Function Timeline Keyframing
- Macro capability for automation of frequently used sequences
- Two Global Channels and a Camera Channel
- Input and Output Recursive

- Defocus with Glow in either video, key
- Graphics display for wire-frame channel representation with axis and source indicators
- Image manipulation in Source or Target space
- Separate Crop and Mask pattern with mix capability
- Mixed internal and external key processing
- Emboss, Blur and Modulated Mattes
- Wipe Pattern Multipliers
- Perspective Fade, Blur, and Dim
- Multiple, independently variable Motion Paths
- Posterization, Solarization, and Color Modification
- Drop Shadow with Variable Opacity
- Corner Pinning
- Enhanced Image Fidelity
- Internal Front/Back source selection, A/B Input Routing source selection, or separate video, key, and mask inputs
- Key Output With Embedded Depth Information
- Serial Editor, Switcher and Router Control, General Purpose Interface (GPI) Inputs, and Tally Inputs and Outputs
- Floppy Disk Drive for Effect, Macro, and Configuration file storage, and software updates
- Qwerty keyboard for data entry file management

Fully Optioned Channel Packages

Single and multi-channel Krystal packages are available, loaded with all channel options. This includes all features of the Standard Option Package above plus the following:

- Kurl with Splash non-linear effects
- Light source provides two independent light sources per channel, positionable in 3D space

Optional Features

- Kurl with Splash, plus dual light source for upgrades from standard to full option packages
- 4x1 combiner for four channels over a background video, with secondary combiner output
- Simultaneous control and combiner outputs for up to four users
- Up to eight channels pooled for control by up to four simultaneous users combining up to four channels
- Additional Krystal Control Panels and Video Processor Channels can be added to existing systems.

Feature Packaging Changes

The following features that were previously available as Krystal options have been re-packaged:

Table 1-1. Repackaged Features

Optional Features Now Standard	Optional Features in Full Option Upgrade
Enhanced Image Fidelity	Kurl
Effect Manager Memory Expansion	Splash
Input Recursive Memory	Light Sources
Output Recursive Memory	
Defocus	
Graphics Display	
Qwerty Keyboard	

Physical Description

Major Components

The major components of a Krystal system are the Video Processor frame, Control Panel, and — in multi-channel applications — a Small or Large System Controller frame.

Krystal systems can be supplied in a wide variety of configurations, several of which are shown in the following illustrations.

Section 1 — System Overview

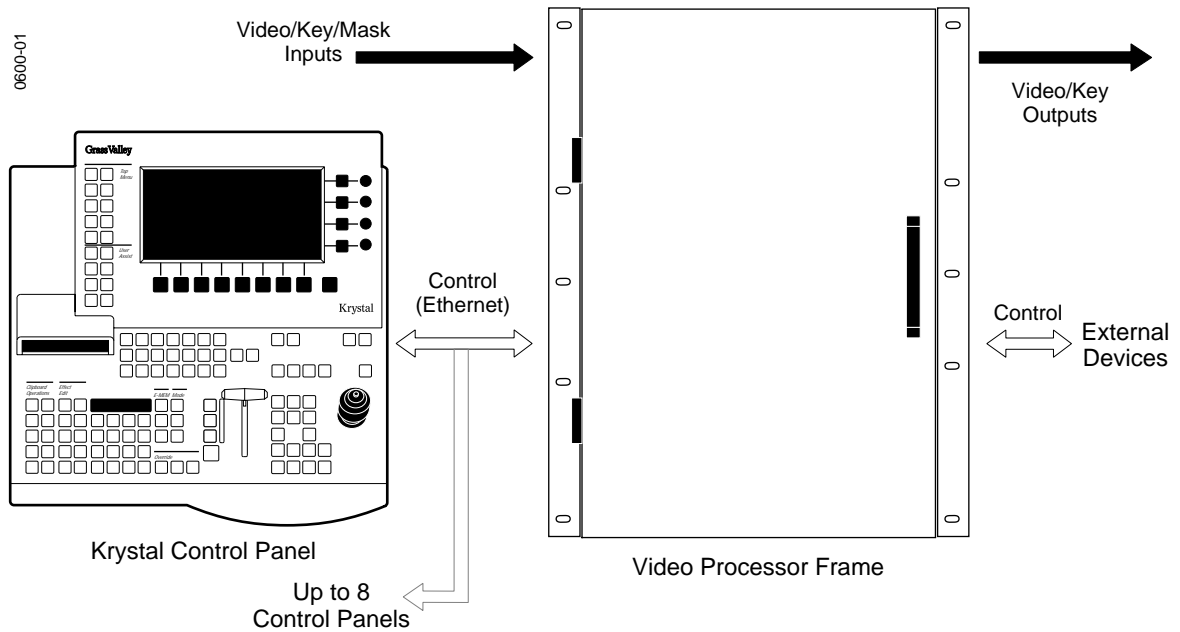


Figure 1-1. Krystal Single Channel System

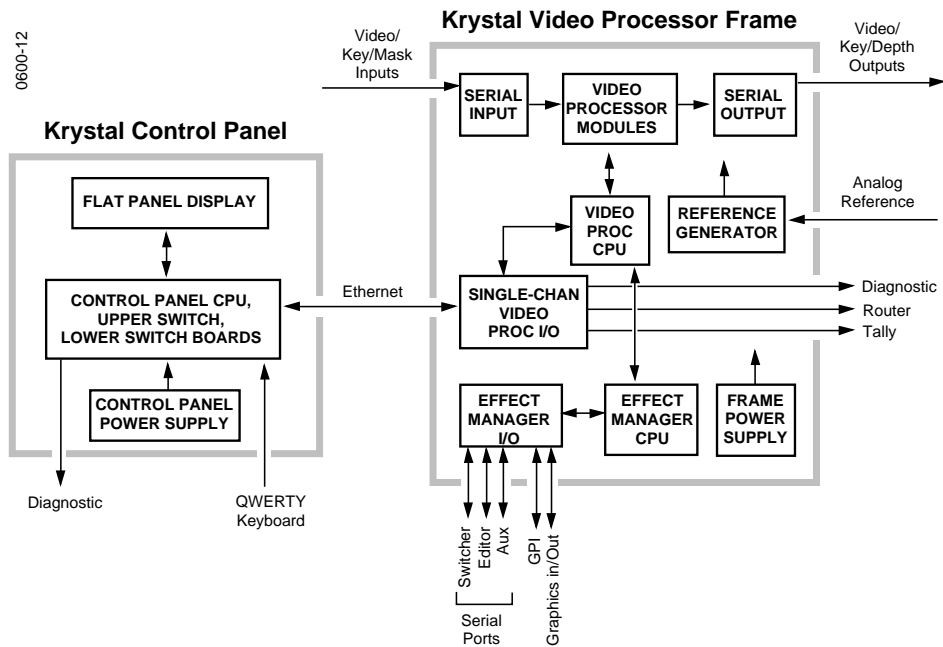


Figure 1-2. Krystal Single Channel System Simplified Block Diagram

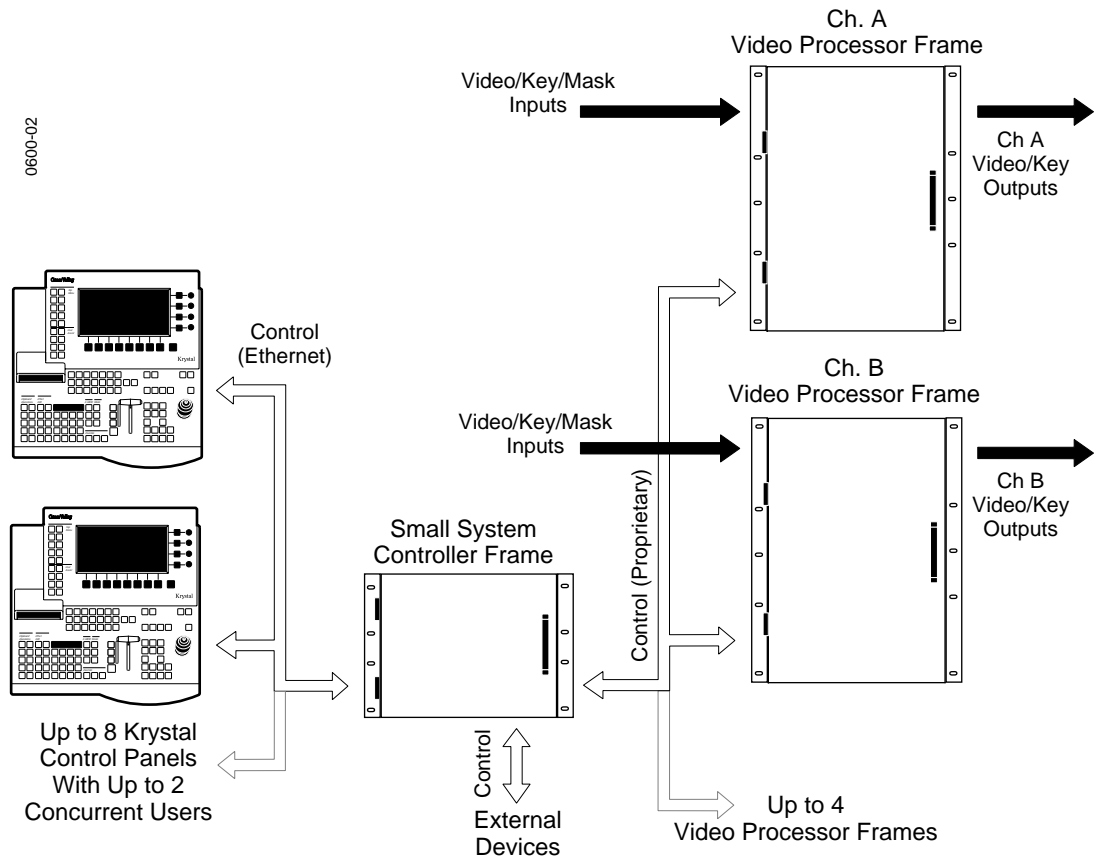


Figure 1-3. Krystal Multi-Channel System, Small System Controller

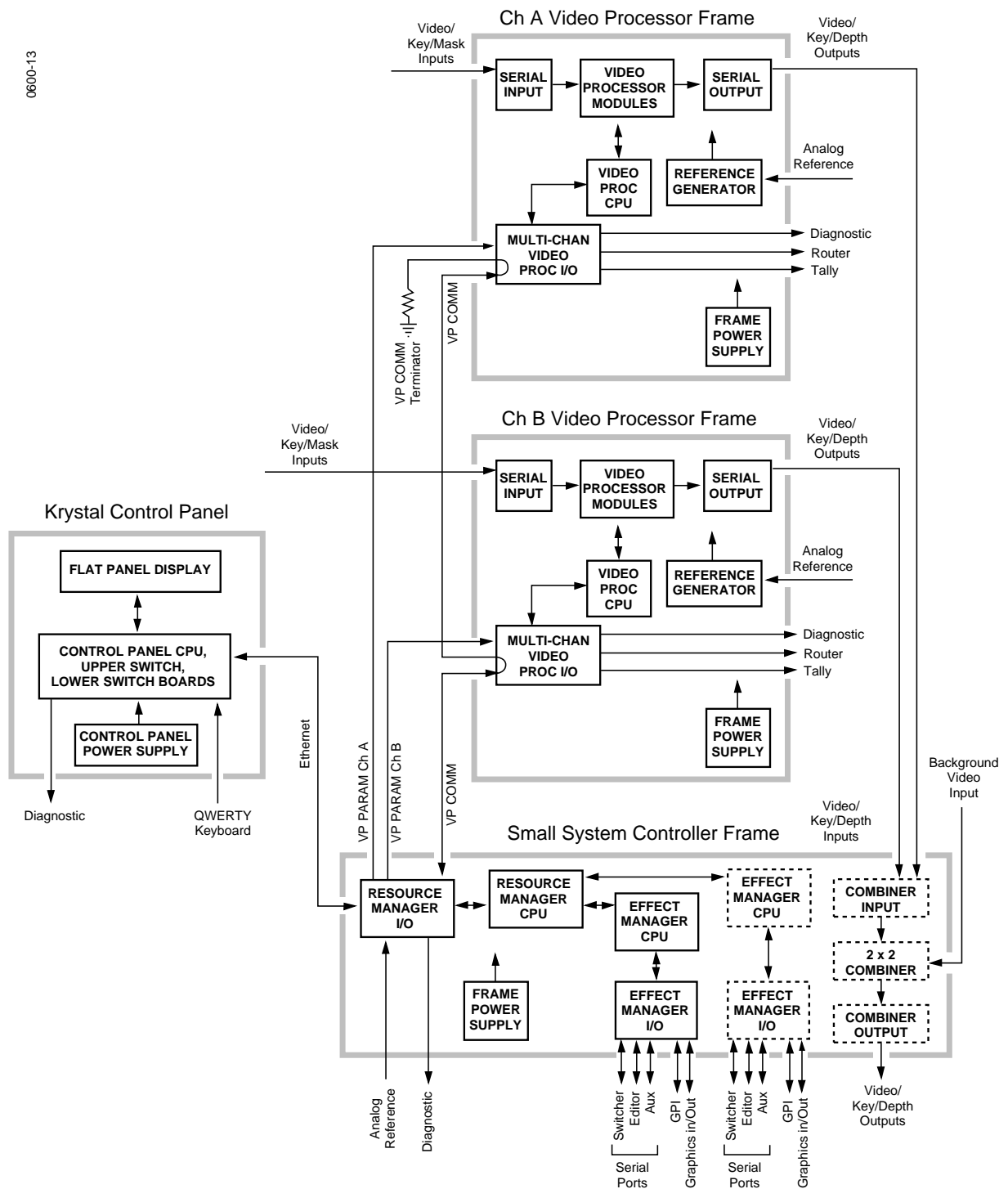


Figure 1-4. Krystal Dual Channel System Simplified Block Diagram

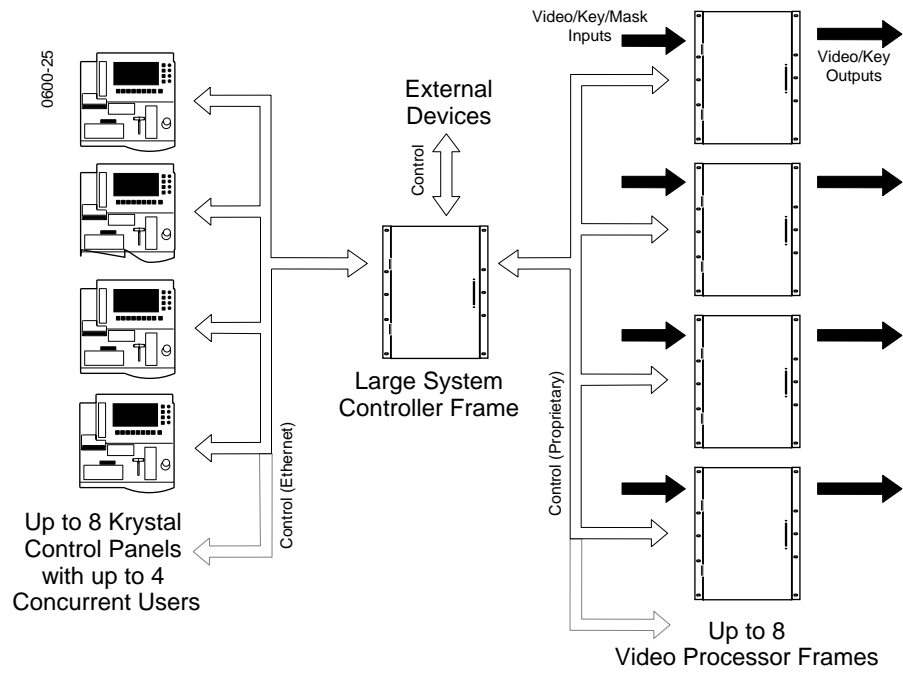


Figure 1-5. Krystal Multi-Channel System, Large System Controller

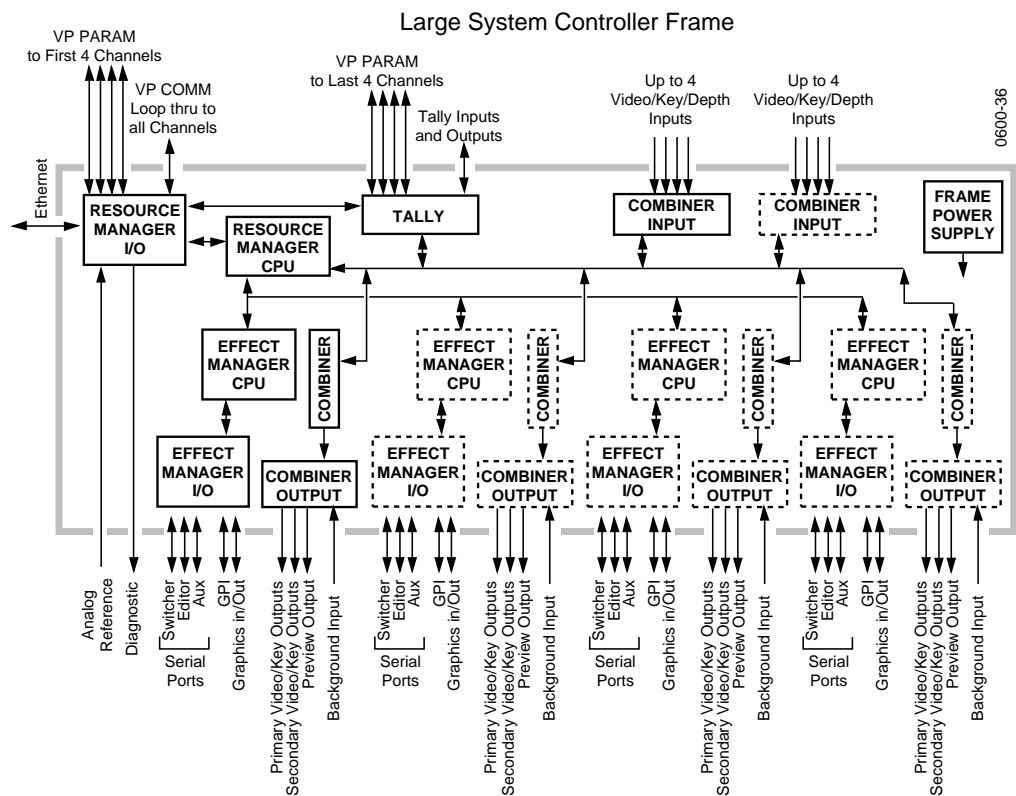


Figure 1-6. Large System Controller Simplified Block Diagram

System Control

In all Krystal systems, each operator uses a Control Panel to acquire an Effect Manager. The Effect Manager, in turn, acquires the Video Processor channel(s) it will use to create and run digital video effects. When the operator acquires an Effect Manager in a single channel system, it automatically acquires the single channel, if available. In a multi-channel system, each operator acquires a different Effect Manager, and each operator selects which of the available Video Processor channels to use. A Resource Manager module is included in multi-channel systems to handle internal system communications between the Krystal components.

Control Panel

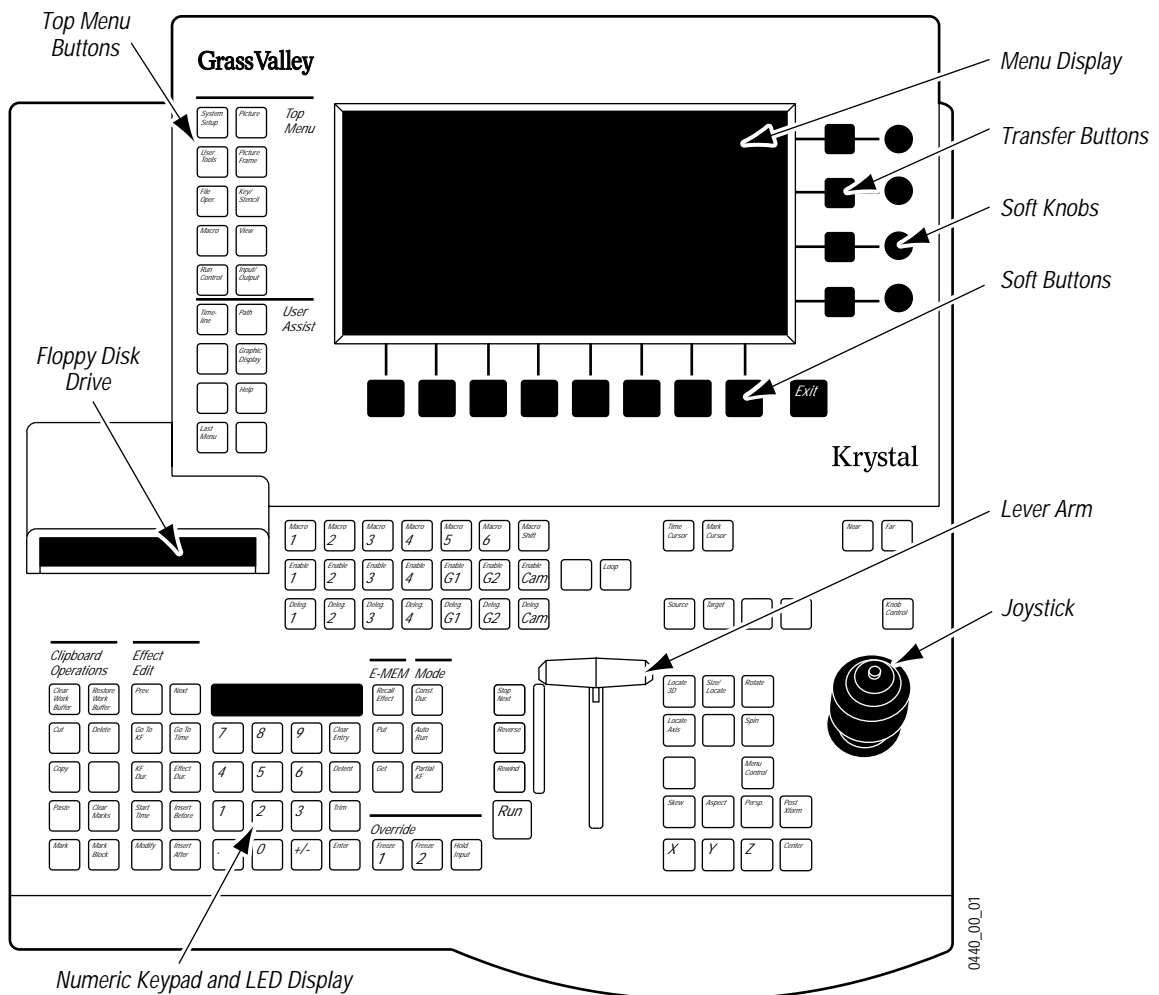


Figure 1-7. Krystal Control Panel

The Krystal Control Panel is easy to learn and provides a comprehensive artistic tool kit for effects generation. Each panel includes a floppy disk drive for loading and storing effects, system configuration files, and user preferences.

Krystal Control Panels communicate with the Video Processor frame (single channel system) or the System Controller frame (multi-channel system) via a dedicated Local Area Network (LAN). The LAN cable may be a customer supplied 50Ω coax, or an optional LAN Cable Kit may be ordered from Tektronix/Grass Valley Products. Up to eight Control Panels may be connected to the network.

The Krystal Control Panel is divided into upper and lower panel areas (Figure 1-7). The upper panel contains the flat panel menu display and various knobs and buttons for making menu selections and adjusting video parameters. The lower panel contains the controls for picture transformation, effect editing and running, and has a keypad, joystick, and lever arm.

A diagnostic port, a connector for an optional QWERTY keyboard, the CP COMM Ethernet connector, and the AC power connector are located on the rear of the panel (Figure 1-8).

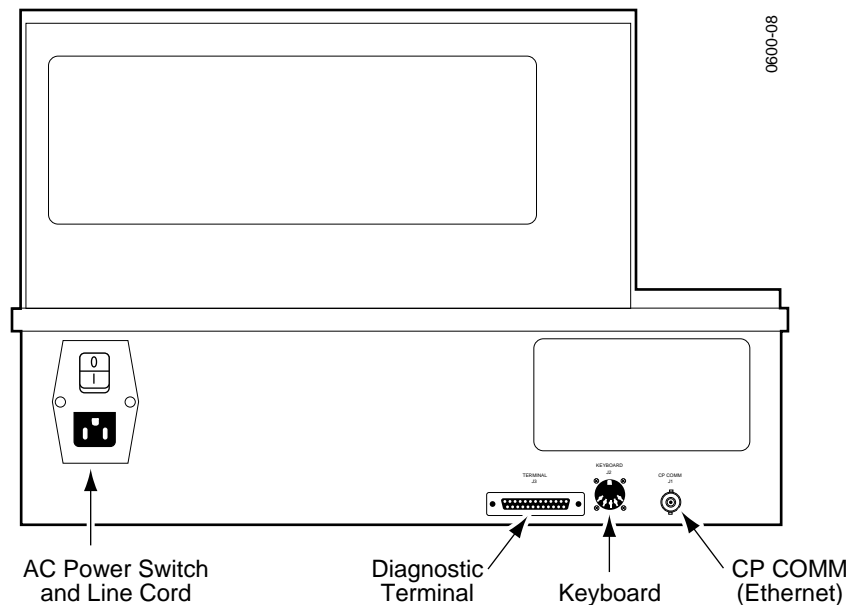


Figure 1-8. Krystal Control Panel, Rear View

Video Processor Frame

The Krystal Video Processor frame contains modules that receive the incoming video and key signals, performs the actual video manipulations, and outputs the processed video. On single channel Krystal systems the Video Processor frame also holds the Effect Manager modules that communicate with the Control Panel and direct the video processing activity. On multi-channel systems some of these communications and control modules are located in the System Controller frame.

The Video Processor frame is a 13 rack unit frame that mounts in a standard 19-inch equipment rack. The frame holds large modules installed from the front (Figure 1-9), and smaller I/O modules installed from the back (Figure 1-10). Some of the front loaded modules are options, and some modules may have standard or optional mezzanines (daughter boards).

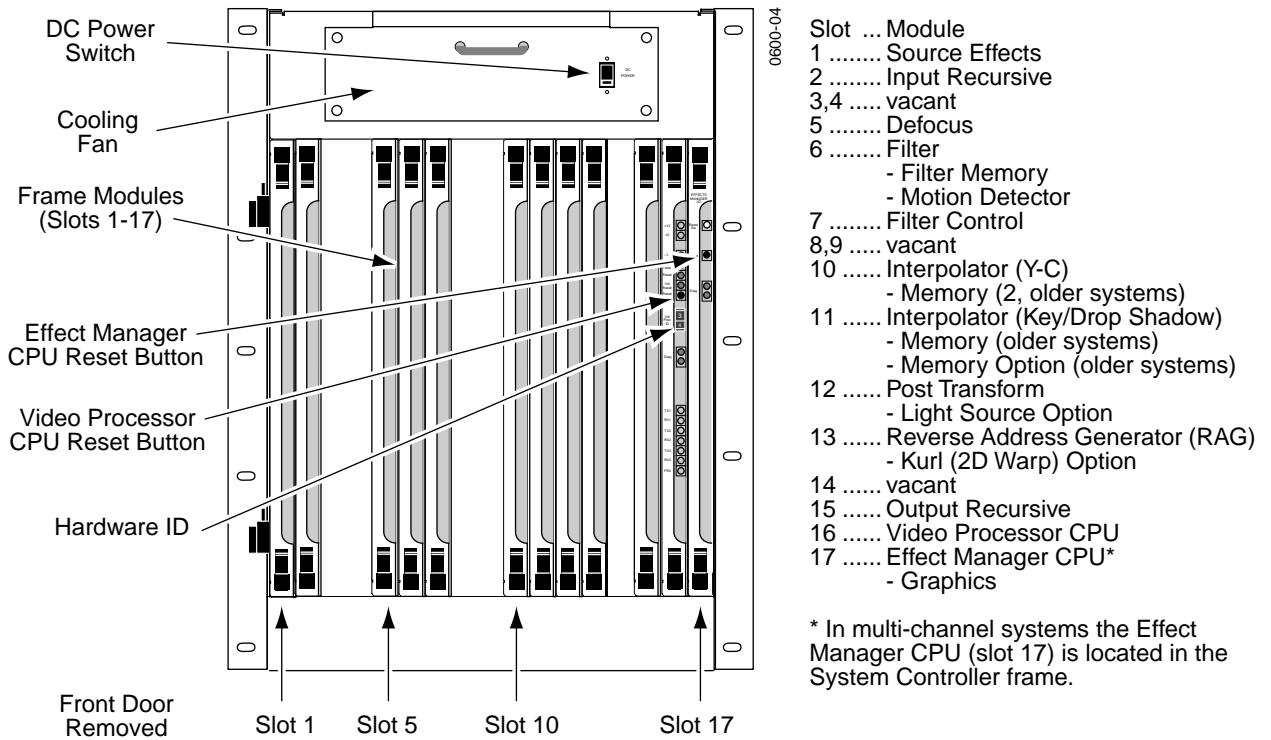


Figure 1-9. Video Processor Frame, Front View

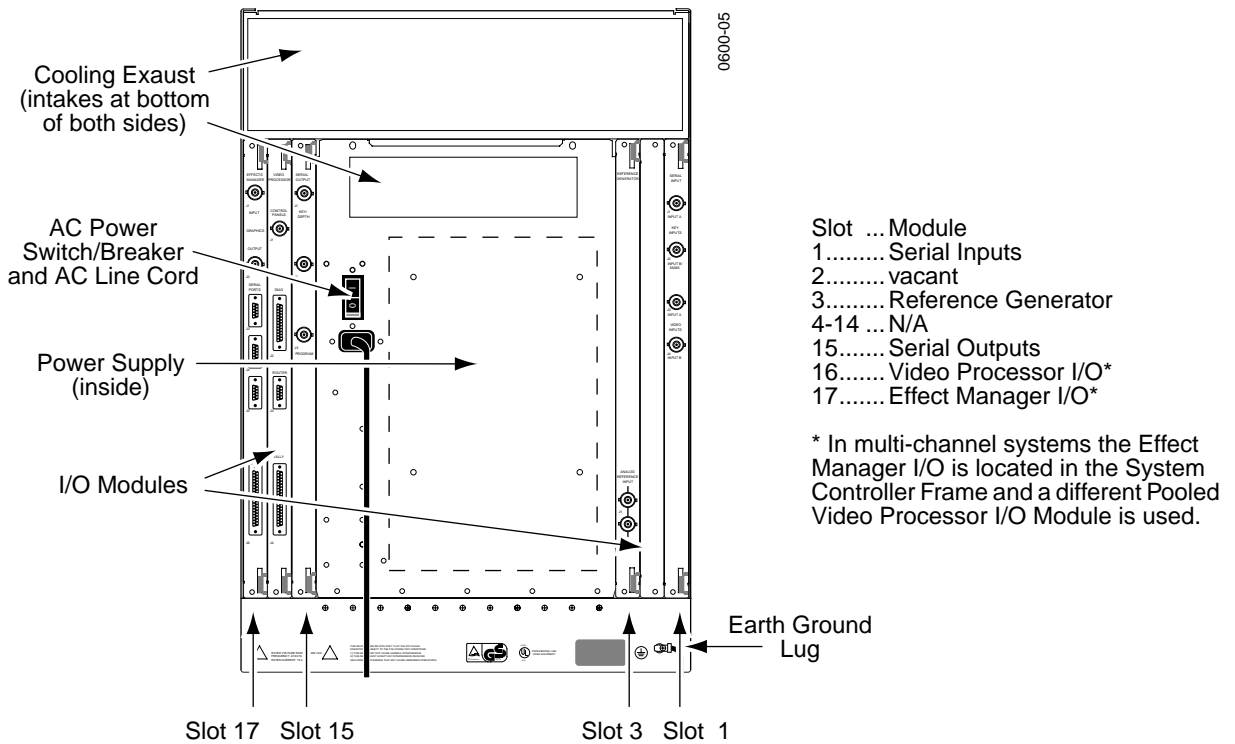


Figure 1-10. Video Processor Frame, Rear View

System Controller Frame

Large System Controller

The Krystal Large System Controller frame is available for larger multi-channel Krystal systems of up to eight channels and up to four users. The Large System Controller frame contains control modules used to manage the resources in the pool, and can contain optional combiner modules used to join four channels of processed video into combined video/key output streams.

On Large System Controllers with combining capabilities, any Krystal Channel can be used by any single user at any time. These sources can be combined by any user in a variety of ways. Complete input source routing is incorporated into the unit. On these systems each Combiner Output module is dedicated to a specific Effect Manager.

The Large System Controller frame is a 13 rack unit frame that mounts in a standard 19-inch equipment rack ([Figure 1-11](#) and [Figure 1-12](#)).

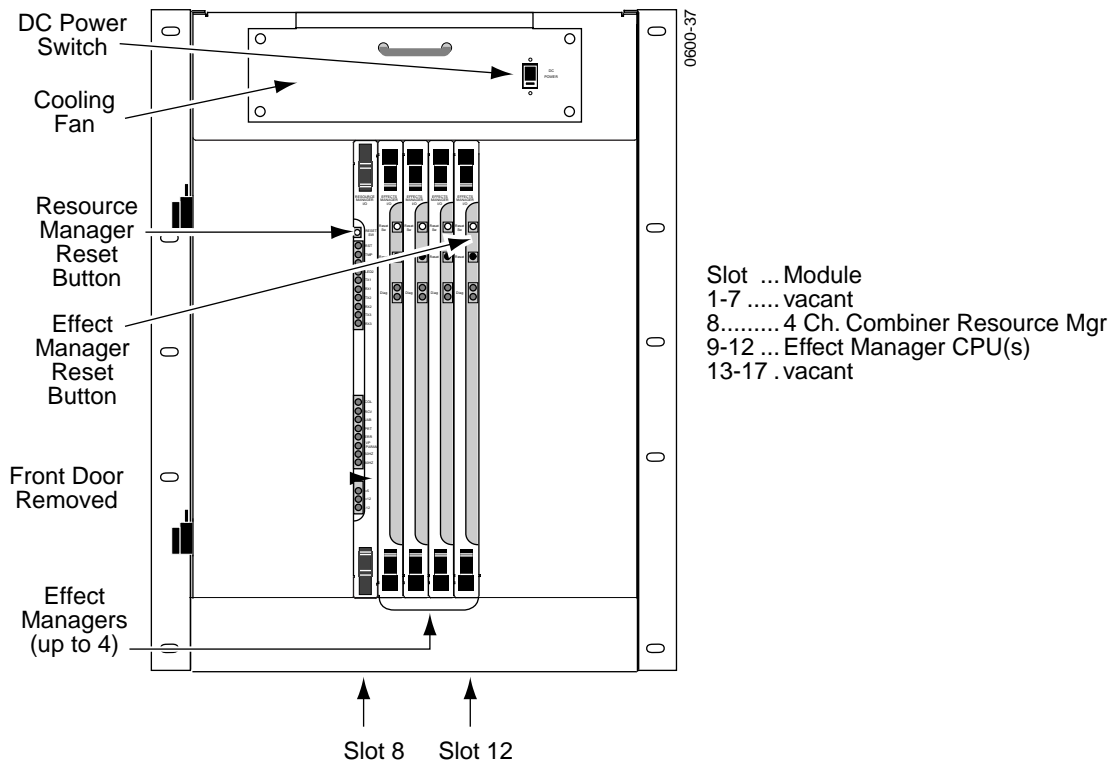


Figure 1-11. Large System Controller Frame, Front View

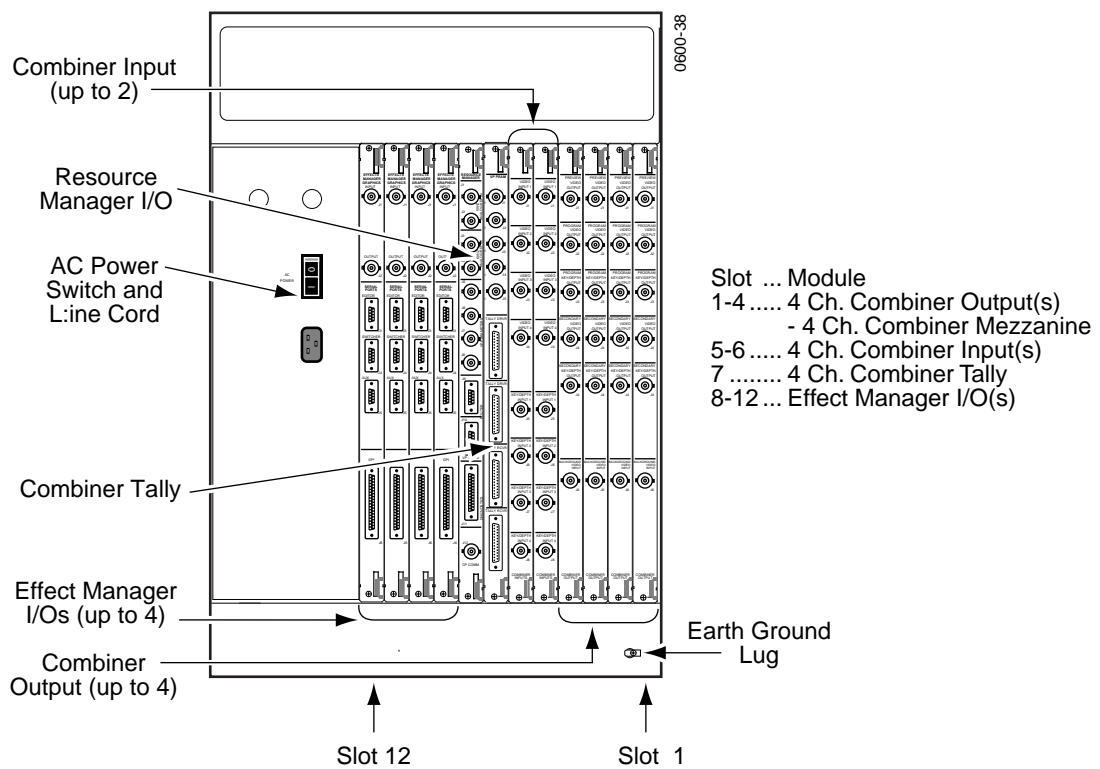


Figure 1-12. Large System Controller Frame, Rear View

Small System Controller

Older Krystal systems may have been configured with a Small System Controller frame.

The Krystal Small System Controller frame is for multi-channel Krystal systems of up to four channels. The Small System Controller frame contains control modules used to manage the resources in the pool, and can contain optional combiner modules used to join two channels of processed video into a single video/key output stream.

The Small System Controller is a seven rack unit frame intended to be mounted in a standard 19 inch equipment rack. The frame holds large modules installed horizontally from the front (Figure 1-14), and smaller I/O modules installed horizontally from the back (Figure 1-13).

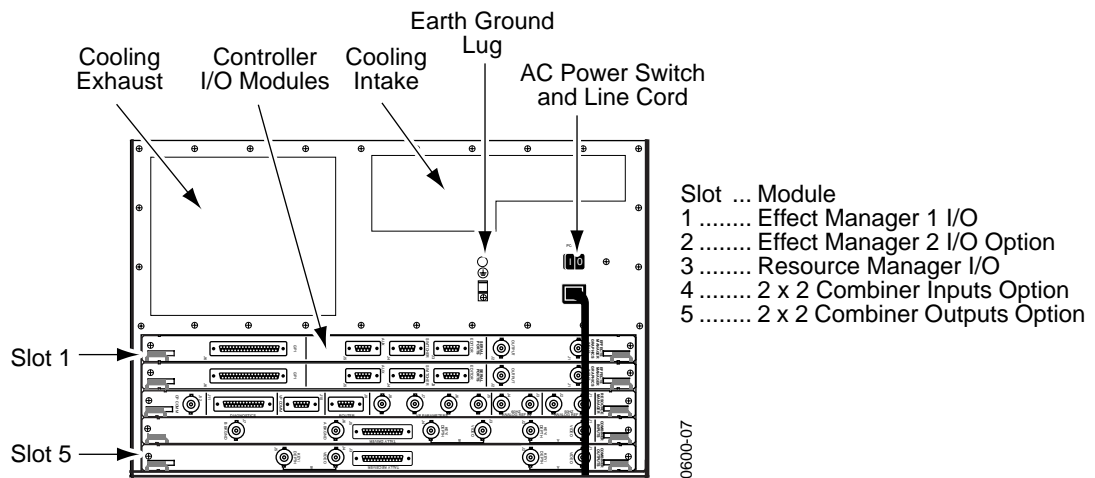


Figure 1-13. Small System Controller Frame, Rear View

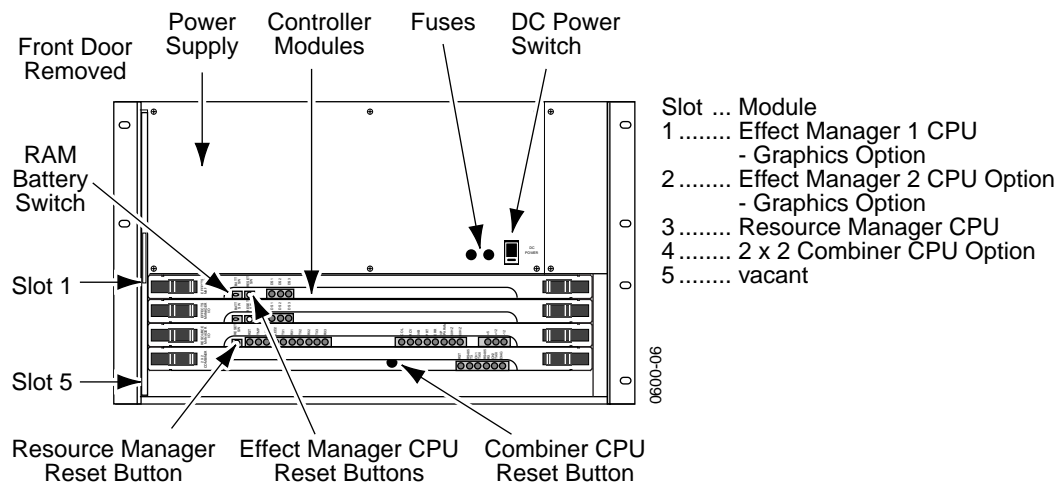


Figure 1-14. Small System Controller Frame, Front View

Module Descriptions

CAUTION *Modules in Krystal systems cannot be hot-swapped safely. Always power down Krystal frames before removing or inserting Krystal modules.*

- **Serial Input and Output I/O modules** — Serial Input modules convert incoming serial digital component video signals to parallel format for internal processing by the Video Processor frame. The Serial Output modules convert parallel video back to serial digital format.
- **Effect Manager CPU and I/O modules** — The Effect Manager module calculates the parameters required, and stores these effects parameters. It passes these parameters to the Video Processor CPU which uses them to control the video processing electronics. Multi-channel systems use a different type of Effect Manager, and in these systems the Effect Managers are located in the System Controller frame.
- **Video Processor CPU and I/O modules** — Each Video Processor CPU module controls the operation of the modules and options installed in a single Video Processor frame. It receives the parameters to produce an effect from the Effect Manager and passes them to the video modules in that frame. Two different Video Processor I/O modules are available, one for single channel Krystal systems and one for pooled Krystal systems.
- **Reverse Address Generator (RAG) module** — This module continually calculates the source pixel address for each output pixel in the transformed video.
- **Post Transform module** — Using addresses from the RAG module, this module generates offset addresses for key and video drop shadows. It also generates perspective fade, blur, and dim effects.
- **Interpolator modules** — Using addresses generated by the RAG and Post Transform modules, these modules look at the source video and determine the pixel values to be used in the transformed video output.
- **Filter Control module** — This module uses transform information to set up filter control factors (for each input pixel) to control the Filter module.
- **Filter module** — This module provides anti-aliasing filtering for effects. It also provides motion detect functions, an embossed video function, and a key processor for mixing video with defocused video and/or mattes.
- **Source Effects module** — This module provides a number of functions, including external mask processing, mask pattern generation, self and external key processing, rectangular and pattern crops, coring, video bitmap, hue rotation, and picture border generation.
- **Reference Generator module** — This module generates internal syncs and clocks from the facility reference (color black).

- Resource Manager CPU and I/O modules — The Resource Manager CPU module is the center of systems communication between the Control Panel, Video Processors, and System Controller frame in multi-channel systems. Two different types of Resource Manager CPUs exist, one used for the Small System Controller and one for the Large System Controller. The Resource Manager I/O module interfaces between the Resource Manager CPU module and the rest of the Krystal system.
- Input Recursive module — This module allows the processing of incoming video for freeze, mosaic, and motion decay effects that appear within the incoming video raster.
- Output Recursive module — This module allows the processing of output (post transform) video for freeze, motion decay, montage, and trail effects that can appear outside and inside the raster of the incoming video.
- Defocus module — This module permits altering the sharpness of video and key signals, for defocus and glow effects.
- 2 x 2 Combiner module — This module provides mixing and keying circuitry for combining two foreground video and key inputs and a background matte or video input in various ways.
- 2 x 2 Combiner Input and Output modules — The 2 x 2 Combiner Input module convert incoming serial digital component video signals to parallel format and routes them to the Combiner for processing. The 2 x 2 Combiner Output module receives the processed signals from the Combiner, converts the parallel video back to serial digital format, and routes the video to its output connectors.
- Four Channel Combiner Input and Output modules — The Four Channel Combiner groups four sets of serial digital inputs on each input module. Each Effect Manager has a single dedicated Four Channel Combiner Output module, which produces a set of serial digital combined output signals. Each Output module also has a background video input.
- Four Channel Combiner Tally — This module has tally input and output connectors and system control ports for Krystal Channels 5-8.

Additional options are available that consist of mezzanine boards that are installed onto some of the Krystal modules.

Module and Mezzanine Part Numbers

Table 1-2. Krystal Module and Mezzanine Part Numbers

Module Name	P/N	Location, Mezzanines (M), Notes
Source Effects	066211-00	(VP front) Located in Video Processor front bay
Input Recursive	066212-00	(VP front)
Defocus	066216-00 - 066242-00	(VP front) (M) Filter Memory (required)
Filter	066215-00 - 066242-00 - 066243-00	(VP front) (M) Filter Memory (required) (M) Motion Detector (required)
Filter Control	066217-00	(VP front)
Y/C K/DS Interpolator (Newer Systems)	966250-50	(VP front)
Y/C Interpolator (Older Systems)	066213-00 - 066235-00	(VP front) (M) Interpolator Memory (2) (required)
K/DS Interpolator (Older Systems)	066261-00 - 066235-00	(VP front) (M) Interpolator Memory (2) (1 required, 1 optional)
Post Transform	066222-01 - 066236-00	(VP front) (M) Light Source (optional)
Reverse Address Generator (RAG)	066220-01 - 066221-10	(VP front) (M) Kurl (2-D Warp) - Splash PLD 152169-00 (optional)
Output Recursive	066258-00	(VP front)
Video Processor CPU	066223-00	(VP front)
Effect Manager CPU	066224-00 - 066239-00	(VP front) Single Channel Systems (SC front) Multi-Channel Systems (M) Graphics (optional)
Serial Inputs	066229-00	(VP back)
Serial Outputs (Older Systems)	066227-00	(VP back) Single Output Connectors
Serial Outputs (Newer Systems)	066227-01	(VP back) Dual Output Connectors
Video Processor I/O (single)	066226-00	(VP back) Single Channel systems only
Video Processor I/O (pooled)	066237-00	(SC back) Multi-Channel systems only
Effect Manager I/O	066225-00	(VP back) Single Channel Systems (SC back) Multi-Channel Systems
Resource Manager I/O	066231-00	(SC back) Large and Small System Controllers
4 Ch. Comb. Resource Manager	066295-00	(SC front) Large System Controller only
4 Ch. Comb. Input	066293-00	(SC back) Large System Controller only
4 Ch. Comb. Output	066294-00 - 066297-00	(SC back) Large System Controller only (M) 4 Ch. Combiner (required)
4 Ch. Comb. Tally	066298-00	(SC back) Large System Controller only
Resource Manager	066230-00	(SC front) Small System Controller only
2 x 2 Combiner CPU	066240-00	(SC front) Small System Controller only
2 x 2 Combiner Input	066204-00	(SC rear) Small System Controller only
2 x 2 Combiner Output	066205-00	(SC rear) Small System Controller only

Facility Examples

Examples of some typical facilities are included here to give you a sense of the variety of configurations possible. More detailed information about system installation and configuration is presented later in this manual.

Single Channel Krystal Facility

Figure 1-15 and Figure 1-16 depict how a single channel Krystal system may be incorporated into a post-production editing suite.

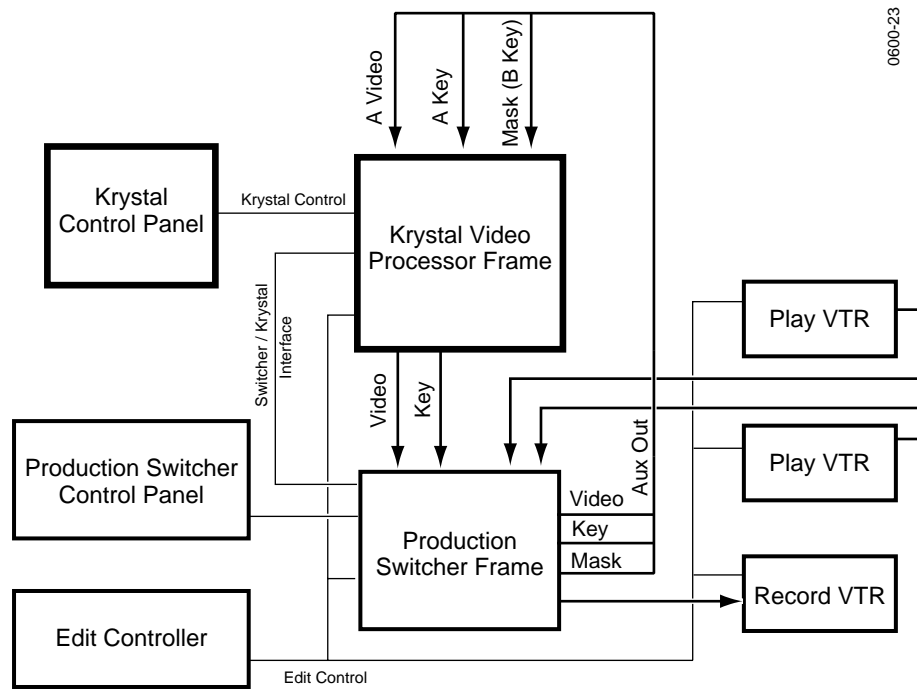


Figure 1-15. Single Channel Krystal Edit Facility, External Routing

Figure 1-15 illustrates a system in which the Krystal system is configured to control the Switcher as a source selector. The Krystal DPM is configured for separate Video, Key, and external Mask inputs. Both the Switcher and Krystal systems are also under editing system control.

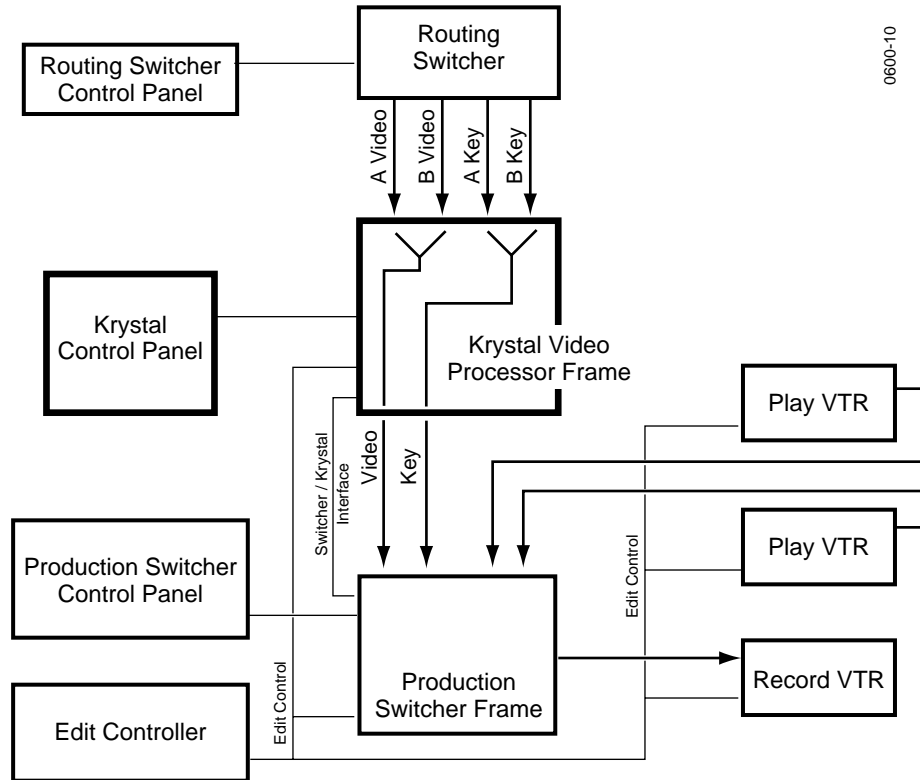


Figure 1-16. Single Channel Krystal Edit Facility, Internal Switching

Figure 1-16 illustrates internal source switching, with the A and B Krystal inputs fed via an external routing switcher. The routing switcher is controlled manually. The Krystal system in this example does *not* control the routing or production switchers. One set of router outputs feeds the Krystal A channel inputs, and the other the B inputs. This Krystal system can automatically switch between the currently selected router inputs when the manipulated image rotates edge on within an effect. Both the Switcher and Krystal systems are also under editing system control.

Two Channel, Two User Krystal Facility

In [Figure 1-17](#) two Krystal Video Processor channels and two Krystal Control Panels are incorporated into a facility that has separate editing and control rooms. The Krystal system is configured to use the auxiliary busses on the switchers as input source selectors. This lets the Krystal system to command the switcher to select different Aux bus crosspoints during an effect.

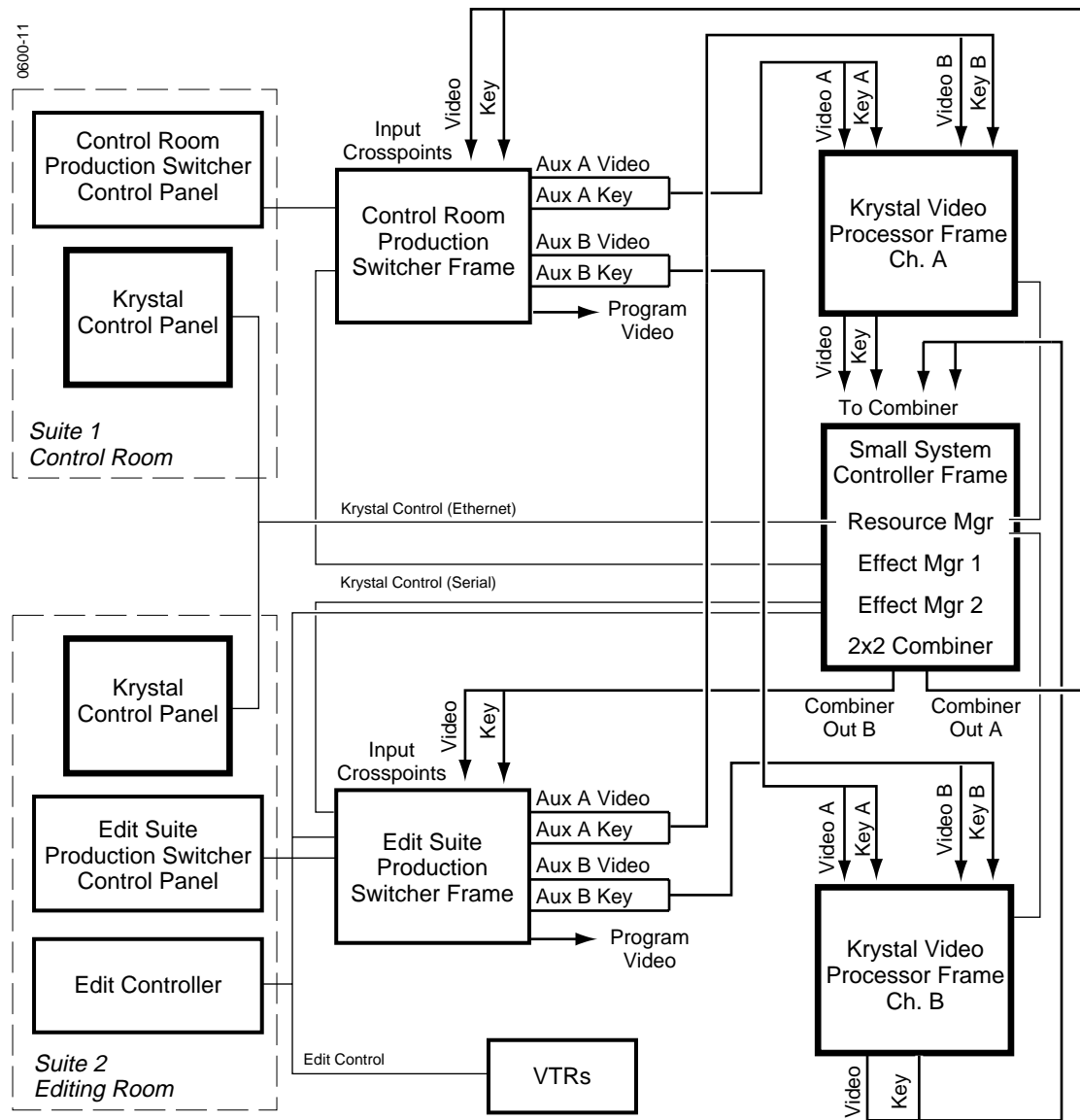


Figure 1-17. Two User Dual-Channel Krystal Facility Example

This installation allows a user in either location to acquire one or both Krystal channels. The Krystal channels in both rooms are configured for A/B Input routing. When suite 1 is controlling both Krystal channels, the A video and key inputs on those channels are automatically selected for use.

When suite 2 is controlling the channels the B video and key inputs on those channels are selected. The operator in each suite must acquire the correct Effect Manager to control that suite's Switcher Aux bus selections.

This facility is also equipped with a 2 x 2 Combiner that allows the user to combine both Krystal channels, and have the combined video and key return to crosspoints on the switchers.

Eight Channel Four User Krystal Facility

In [Figure 1-18](#) eight Krystal Video Processor channels and four Krystal Control Panels are incorporated into a large facility.

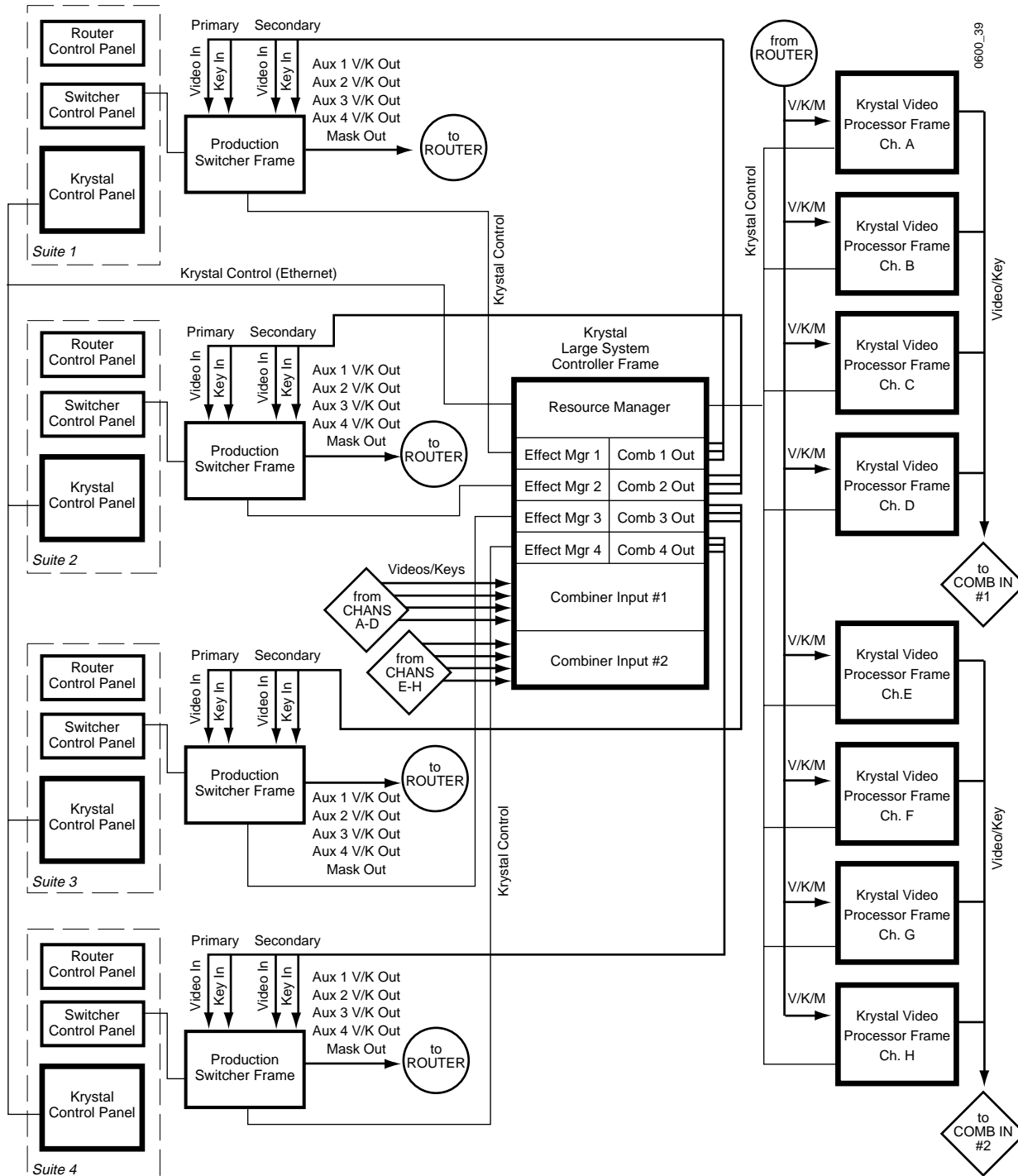


Figure 1-18. Eight Channel, Four User Krystal Facility Example

In this example the Krystal system is configured to allow four users to use any of the eight Krystal channels, and for each user to combine any four of these channels from their suite location. Each suite uses the auxiliary busses on the switchers as input source selectors. These outputs are connected to a routing system, which permits the operator to manually select which aux bus output goes to which Krystal channel. This makes any Krystal channel in the facility instantly available for use by any operator, with full Krystal system control of switcher crosspoint selection.

Integrated Model 2200-2i Switcher

The Model 2200-2i Switcher from Tektronix/Grass Valley Products is a component digital switcher that supports integrated 1 or 2 channel Krystal DPM operation. Incorporated into the Switcher control panel are Krystal controls allowing the creation, running, and editing of digital effects from the Switcher panel, without the need for a stand-alone Krystal Control Panel.

See the Model 2200-2i documentation set more information.

Concepts

Introduction

This section describes some of the basic concepts involved in operating the Krystal DPM system. Understanding these basic concepts should help you create simple effects quickly, and allow you to build more complicated and subtle effects efficiently.

Basic Terms

Appearance — the look of the picture image itself, independent of any picture transformation.

Current Effect — When a new or existing effect is loaded into Krystal memory to be run or edited it becomes the current effect.

Effect — A series of keyframes describing a single or multiple channel digital video effect. Data for the effect resides in a Krystal effect register. This data can also be saved as a file to floppy disk.

Event — An indicator on a channel or master timeline that reports the presence of function keyframes at that point in time. This term can be used to clearly differentiate master keyframes and channel keyframes from function keyframes. For simplicity and consistency with other documentation, events may be referred to as keyframes.

Function — A controllable attribute of a channel in an effect (Rotate, Border, etc.). A single function can use several related parameters to specify various aspects of that function.

Interpolation — Creation of intermediate values for functions between keyframes. Also known as inbetweening.

Keyframe (Function, Channel, Master) — A point in time during an effect where the placement and appearance of the manipulated picture is completely defined. A function keyframe has data values (or on/off status) for a par-

ticular function. Keyframe data from one or more functions make up a channel keyframe, and one or more channel keyframes generate a master keyframe.

Parameter — A numerical value used by a function.

Path — A mechanism that permits fine control of how function values are interpolated between keyframes.

Picture — the video image displayed on the monitor. When an image has been transformed the picture may not fill the entire monitor screen, or only a portion of the picture may fill the screen.

Register, Effect Register — A portion of Krystal effect memory (EMEM) where effects are stored.

Screen — the surface of the monitor on which manipulated images are viewed.

Timeline (Function, Channel, Master) — A series of keyframes ordered in time. The master timeline contains master keyframes, each channel timeline contains channel keyframes, and each function timeline contains function keyframes for an individual function of the effect.

Translate — movement of the picture along the X, Y, or Z axis.

Transform — includes translation, and may also include rotation, spin, size, aspect, skew, and perspective changes.

Work Buffer — The values for all the active functions that appear on the monitor screen for each channel of the current effect.

Channels

The term “channel” can be applied to different entities, which may cause confusion. In this manual these channels are defined as follows.

Physical Channels

Video Processor Frames

A physical channel consists of a Video Processor frame connected to the Krystal DPM system. Each physical channel has a pair of outputs for program (Video and Key/Depth), and a preview video output. The program video output contains the manipulated picture information. The associated program key output is a monochromatic signal identifying the transformed picture area, which may not fill the entire screen.

Up to four physical channels can be controlled simultaneously by a multi-channel Krystal system operator. Physical Video Processor frame channels may be identified by letter (i.e. default names are A, B, C, D).

Wireframe Channels

A wireframe is a graphical representation of a physical channel that can be used to aid in effects editing. Wireframe channels can be used when the actual Video Processor channels are unavailable. The Graphic Display option is required and an Effect Manager must be acquired for wireframe channel operation.

Control Channels

The Krystal DPM system has seven control channels, consisting of four logical channels (1, 2, 3, 4), two global channels (G1, G2), and a camera channel (Cam). These channels are used to control how the physical channels process and transform their source inputs to create the final effects output.

Logical Channels

Logical channels control the physical channels. Up to four Video Processor frame channels (identified by letter) and/or wireframe channels can be mapped to the four logical control channels (1, 2, 3, 4) on a multi-channel Krystal system. This mapping is determined by how the physical channel resources are acquired for an operating session. The use of logical channels instead of hard wired inputs adds system operation flexibility, especially in facilities using pooled resources.

Logical channels perform transform functions, and can also manipulate the appearance of the picture itself. Elements can be added or removed (borders, mattes, crops, etc.), the picture can be modified (freeze, color adjustments, etc.), and additional image processing (kurl, defocus, etc.) may also be available depending on the hardware options installed in the Video Processor channel being controlled.

Global Channels

The global channels (G1, G2) mathematically manipulate pictures from one or more logical channels. You can select which logical channels will be controlled by which global channel. Global channels perform transform functions only, and do not change the appearance of the pictures themselves.

Using global channels you can easily make pictures from multiple physical channels move in a coordinated manner. With two global channels available, it is possible to have one global channel control the other. This allows hierarchal control of complex motions that would be difficult to manage using independent control channels.

Camera Channel

The camera channel is a unique control channel that mathematically manipulates the viewer's viewpoint of the pictures making up the total effect. All of the logical channels are always assigned to the camera channel. The camera channel performs transform functions only, and cannot change the appearance of the pictures themselves. This is the final level of transformation currently available.

In general, logical channels can be transformed by the global channels, and the global channels in turn can be transformed by the camera channel. These transformation levels are related to the Krystal system's frames of reference, discussed later in this section.

Control Panel Delegate and Channel Enable

You select which channels will be controlled for effects editing by the Krystal Control Panel with the Deleg. buttons located in the center of the panel. This delegates the panel to control the selected channel(s). Pressing a Deleg. button also automatically enables that channel for running (see below). Channels must have been selected for Control Panel delegation and must be enabled before they can be edited from the Control Panel.

Selecting and editing a global channel that controls a logical channel can affect the screen behavior of that logical channel's picture. The logical channel parameters will not change, but the modified global channel's influence on that channel will be applied. If a logical channel and a global channel that controls that logical channel are both selected, transforms will be applied twice, once for each selected channel layer. Generally, selecting two levels for simultaneous Control Panel effect editing should be avoided.

You can select the channels that will participate in the running of an effect with the Enable buttons located in the center of the Control Panel. This enables a channel for running, which is different from the delegation of the Control Panel to edit a channel. Channels that are not enabled will not run. When an effect register is recalled, all the channels involved in that effect will automatically be enabled.

Translation and Transformation

Translation is a subset of transformation, and involves picture movement along the X, Y, and Z axis. The picture is simply relocated to a different place and does not change in actual size or shape (Figure 2-1).

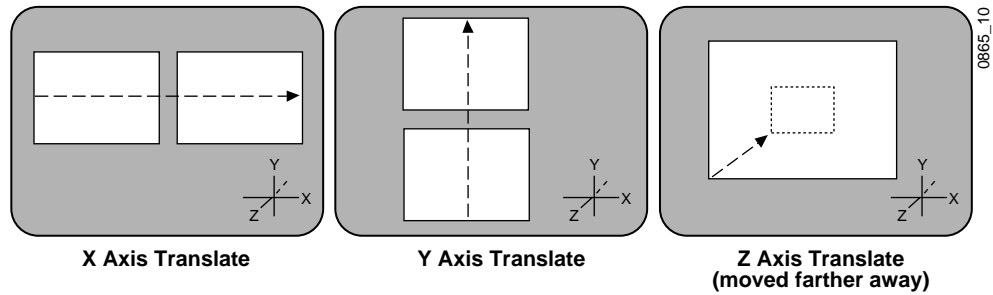


Figure 2-1. Picture Translation

Transformation includes translation, and also includes these other functions:

Size — Enlargement and reduction of the picture area while it remains in the same plane in 3-D space. This is different from picture translation in the Z axis, where the picture retains its original size, but appears smaller when moved away, and larger when moved closer.

Rotate — Picture rotation about the reference axis in the X, Y, and Z dimensions (Figure 2-2). Rotate is limited to ± 0.5 revolutions, and will always take the shortest path to the new position. Rotate uses quaternion math to calculate the move with increased accuracy. Multiple rotations are performed with the Spin function.

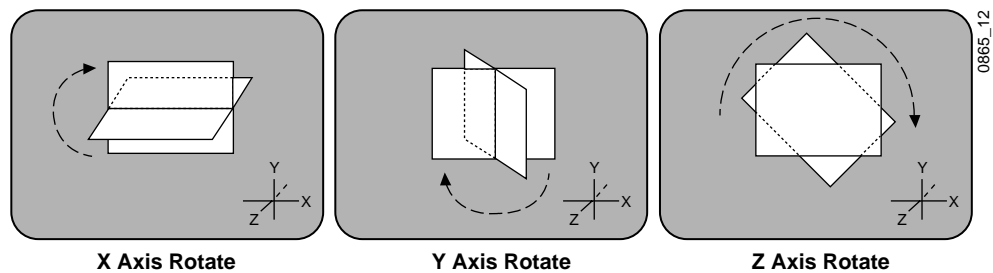


Figure 2-2. Rotate

Spin — Supports multiple rotations about the reference axis in the X, Y, and Z directions. Spin supports fractional values, and is similar to Rotate when the move is less than ± 0.5 revolutions. Spin uses Euler (pronounced “Oiler”) math to calculate the move, which is not quite as precise as quaternion, but permits multiple rotations.

Note Following broadcast conventions, moving the Joystick forward or back along the joystick's "Y" axis rotates the top of the picture forward or back (a rotation about the "X" reference axis). Similarly, moving the joystick left or right along the joystick's "X" axis rotates the side picture left or right (a rotation about the "Y" reference axis).

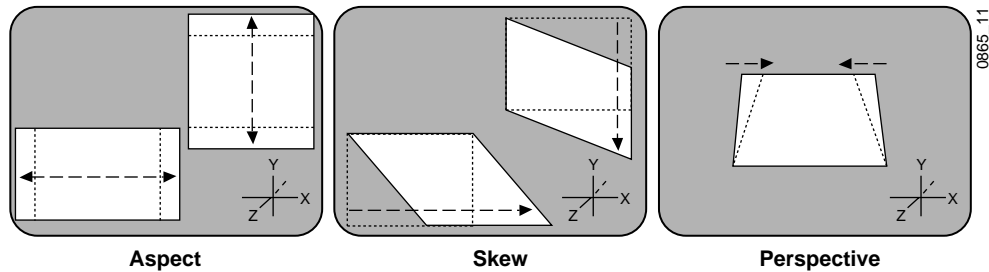


Figure 2-3. Aspect, Skew, Perspective

Aspect — Scaling the X or Y components of the picture. X axis changes affect horizontal size, Y axis changes affect vertical size (Figure 2-3). Z axis changes affect both X and Y dimensions, and is the same as Size.

Skew — Slanting the picture in the X (horizontal) and Y (vertical) directions (Figure 2-3).

Perspective — Changing the viewer's apparent viewpoint of a picture. This only applies when a picture is tilted so part of it is farther from the viewer. The farther portion appears smaller than the closer portion, and the amount of perspective controls how much smaller the distant part is (Figure 2-3). Multi-channel perspective is discussed later in this section.

Frames of Reference

Front and Back, Near and Far

Pictures manipulated by the Krystal DPM have front and back sides, each of which is revealed in turn as the picture spins or rotates. After a picture has been translated it can be difficult to determine which side was originally on the front and which was originally on the back. This distinction can be important when, for example, different sources are being selected for different sides of an effect.

Krystal systems use a "Near" and "Far" convention to ease system operation. Near is always the side of the picture that is visible (facing toward the viewer), and far is the hidden side of the picture (facing away from the viewer). The currently Near side may be the original Back side, and vice versa.

Axis Location

The axis location of the channel determines the center point of translations, spins, and rotations for that channel. You can move the axis to a new location to change the behavior of that channel. The axis location can be within or outside the screen area (Figure 2-4).

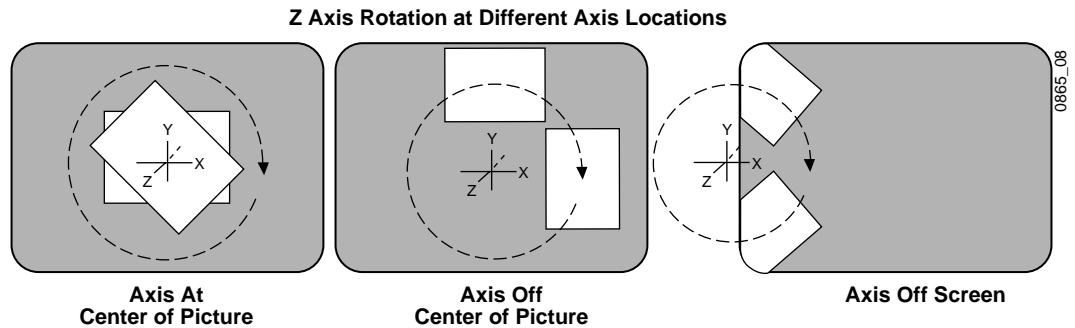


Figure 2-4. Frame of Reference Axis Locations

The axis location can be locked so that when you perform a transform, the axis keeps the same spatial relationship to the picture being transformed. You can also unlock the axis, which leaves the axis at its current location when a transform is performed, and so changes its relationship to the transformed picture.

Source and Target Space

The Krystal system uses source and target space frames of reference.

- Source space for a control channel uses that channel's coordinate system for reference.
- Target space for a channel uses the next higher level's coordinate system for reference.

Being able to use both source and target space can help make effects editing easier. One frame of reference may offer a simple and easy to understand context for a picture transform, while in another frame of reference the same transform may be difficult to understand and control. Krystal system effects can also employ both source and target space directed transforms simultaneously, which can create complex and beautiful effects.

The simplest example for source and target space concerns a logical channel that has been rotated while the global and camera channels remain unchanged (Figure 2-5).

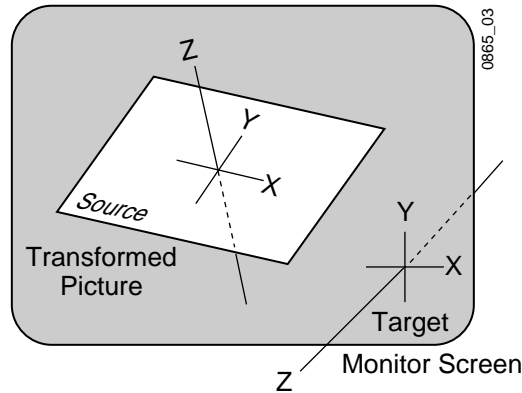


Figure 2-5. Source and Target Space

In this example the source space for the logical channel is referenced to the picture itself (tilted back at an angle) while the target space is referenced to the monitor screen (straight). X axis translations will move this picture differently, depending on whether source or target space is being used (Figure 2-6).

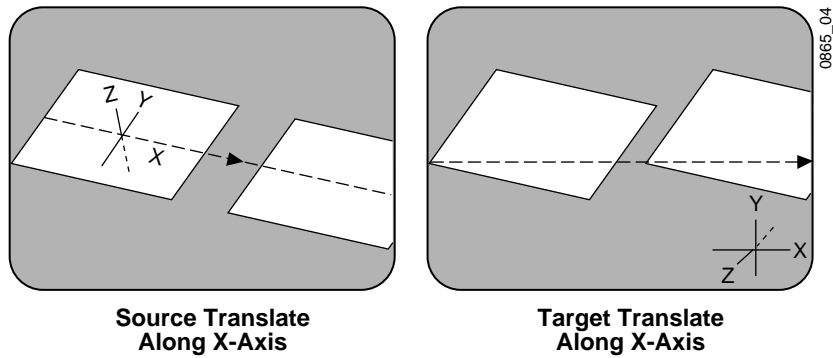


Figure 2-6. Source and Target Space Translation

If the channel is controlled by a global channel, and the global channel itself has been rotated, an X axis translate will depend on which channel (logical or global) is being manipulated, *and* whether source or target space is being used (Figure 2-7 and Figure 2-8). Note that the target translate of the logical channel is the same as a source translate of the global channel.

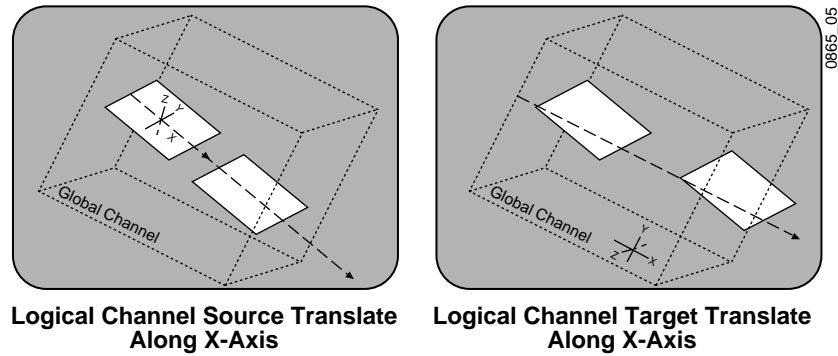


Figure 2-7. Logical Channel Translate with Global Rotated

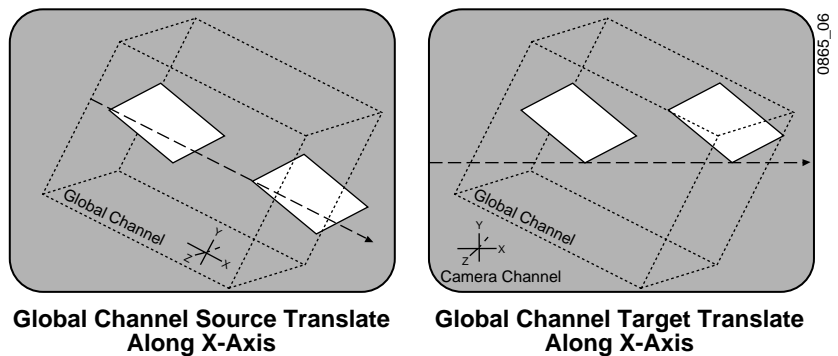


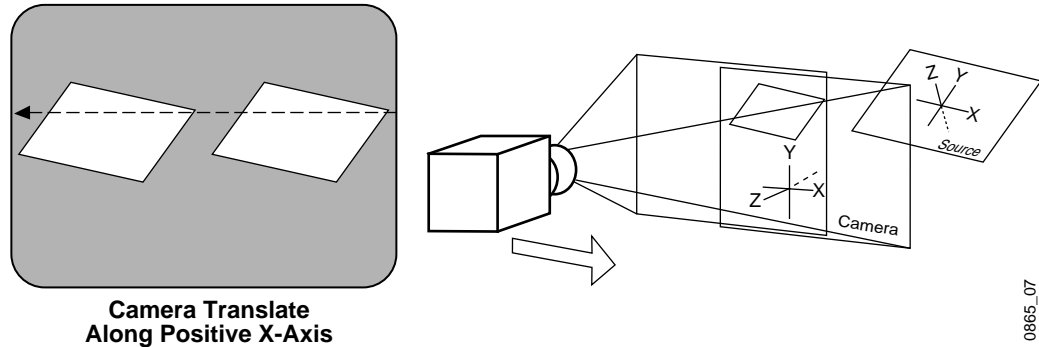
Figure 2-8. Global Channel Translate with Global Rotated

A target space translate of a global channel uses the next higher frame of reference, which is often the camera channel. If global 1 is controlled by global 2, the global 2 axis will be used for the global channel target translate. These higher level global and camera channels can be translated for additional levels of control.

Camera Channel Space

Because the camera channel represents the viewer's perspective, translations are reversed for this frame of reference. Translating the camera channel in a positive X direction makes the pictures being viewed appear to move in a negative X direction. This is equivalent to moving a camera

right, which relocates objects in the viewfinder left (Figure 2-9). The is also true for Y axis translations, which is equivalent to moving a camera up and down.



Camera Translate Along Positive X-Axis

Figure 2-9. Camera Channel Translation

0865_07

Post Transform Space

Post transform (Post Xform) is a special transform function that only affects size and location operations. It does not change the perspective of the image. This can be used as a convenient method to quickly project pictures onto new locations of the screen.

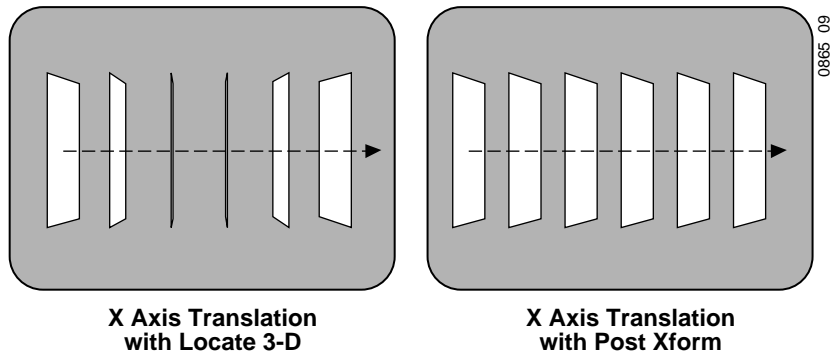


Figure 2-10. Post Transform Translation

0865_09

All post transform functions are made relative to the monitor screen frame of reference, i.e. a positive X post transform always moves to the right side of the screen.

Multi-Channel Perspective

Post transform can affect the perspective relationships between different channels. You are essentially violating perspective rules for the three-dimensional space when you do a post transform translation. With only one channel this violation is not evident, because you have changed your

viewpoint of a single picture. But when multiple pictures are present, it is possible to create different viewpoints of each picture and place these pictures next to one another. This places a single viewer in two locations at the same time, which is impossible in the real world but opens interesting creative possibilities for the Krystal operator.

Different perspective values can also be applied to each Krystal channel. Like post transform, this can create multiple viewpoints of adjacent pictures. Perspective can be applied to the global and camera channels as well. Because these channels can control other channels, it is possible to apply more than one perspective to the same picture. Perspective values are multiplied, not added like some other transforms. For example, if a zero perspective is set at any level, the net perspective for that picture will be zero no matter what perspective values are set for its other levels.

Kurl and Corner Pinning Perspective

Kurl and Corner Pinning Krystal effects simulate a three-dimensional look without actually generating a 3-D geometric model of the effect. Kurl and Corner Pinning effects actually occur on a 2-D plane. Lighting can be applied to Kurl effects for enhanced realism, but rotating a Kurl image outside of its default planar perspective compromises the 3-D illusion.

Transform Numbering Systems

The Krystal system uses the following numbering systems to precisely define picture locations, picture size, and picture rotation and spin.

Screen Coordinates

The Krystal system accommodates two different aspect ratios, 4 x 3 and 16 x 9, selectable via the Video Standards menu. In 4 x 3 mode, the screen is six units high and eight units wide. In 16 x 9 mode, the screen is 18 units high and 32 units wide. The numbering system begins in the center of the screen, and has the standard horizontal X axis and the vertical Y axis (Figure 2-11). For simplicity, examples in this manual use the 4 x 3 aspect ratio.

These coordinates can be used for monitor screen locations (logical channel target space with default global and camera channels), or they can be applied to picture locations (logical channel source space).

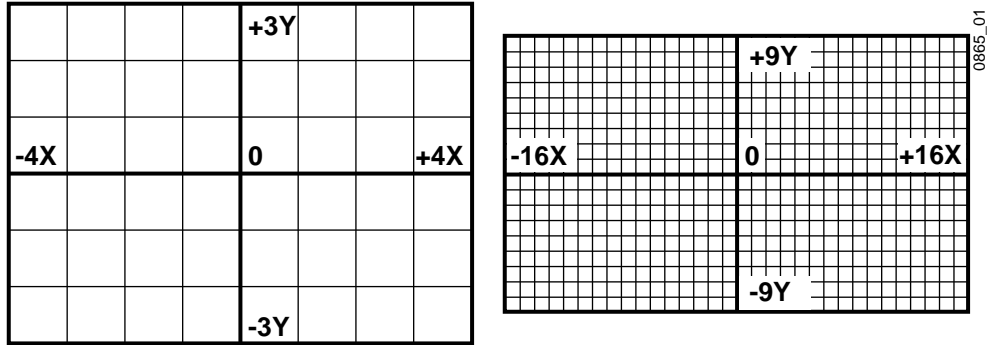


Figure 2-11. Screen Coordinates

Screen units are also used to define Z axis dimension depth in 3-D space. Positive Z axis values are back behind the picture, and negative values are in front of the picture (Figure 2-12).

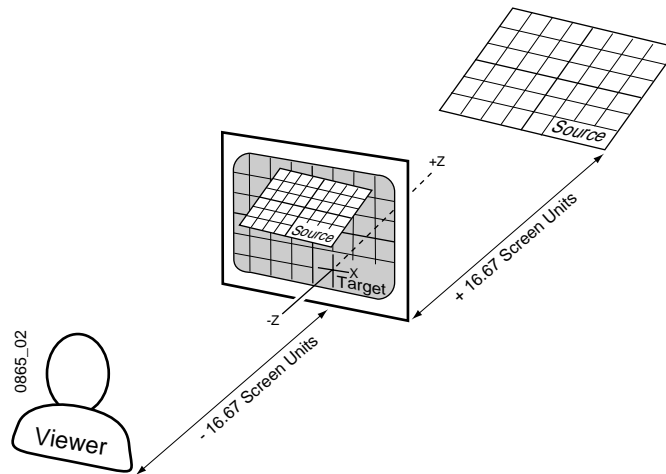


Figure 2-12. Viewer Location in 3-D Space

For perspective calculations the Krystal DPM factory default camera view-point places the viewer -16.67 screen units from the monitor screen surface (4 x 3 aspect ratio). In this case, moving a full screen image 16.67 screen units back behind the screen makes the picture appear half its normal size to the viewer.

Size

Picture size is defined relative to picture screen units. A size of .5 indicates a picture is one-half its full size.

Rotation

Rotation is measured fractionally with respect to 360°. A value of .25 indicates a rotation of 90 degrees; .50 indicates 180 degrees (maximum rotation). Rotation values can be positive or negative, which determines the direction of rotation.

Spin

Spins are measured in number of 360° rotations (up to 999). Fractional spin values are also supported. A single axis .50 spin is the same as a single axis .50 rotation. Spin values can be positive or negative, which determines the direction of spin.

Skew

Skew supports values of ±999, though extreme values will probably rarely be used.

Aspect

Aspect values are in percentage of the original size, with 1.0 = 100%, 0.5 = 50%, etc.

Perspective

Perspective supports values from 0-100, with 0.06 as the default.

Effects

How effects are organized is an important concept you need to understand to make full use of your Krystal DPM.

Keyframes, Timelines, Events

A *function keyframe* represents a point in time at which a particular function for a channel matches certain values. These values can be a simple ON or OFF state, or they can be parameters that specify a particular function value from a range of values. A single function may have several parameters that can be adjusted individually.

The space between function keyframes is interpolated by the system and turned into smooth transitions of motion, color changes, size changes, etc. This process of interpolation is also known as “inbetweening.” How these

interpolated values are generated (and so exactly how an effect changes between keyframes) can be controlled by setting different path parameters for the keyframes (explained later in this section).

Keyframes are arranged on timelines. Function keyframes reside on independent function timelines. Each channel in the system manages a set of independent function timelines, one for each function active in that channel of the effect. Wherever function keyframes exist for a channel, a *channel keyframe* is generated that represents all that channel's function keyframes at that point in the effect's time. Channel keyframes reside on channel timelines. Wherever a channel keyframe exists, a *master keyframe* is generated that represents the state of all the channels in the effect that have keyframes at that time. (Figure 2-13).

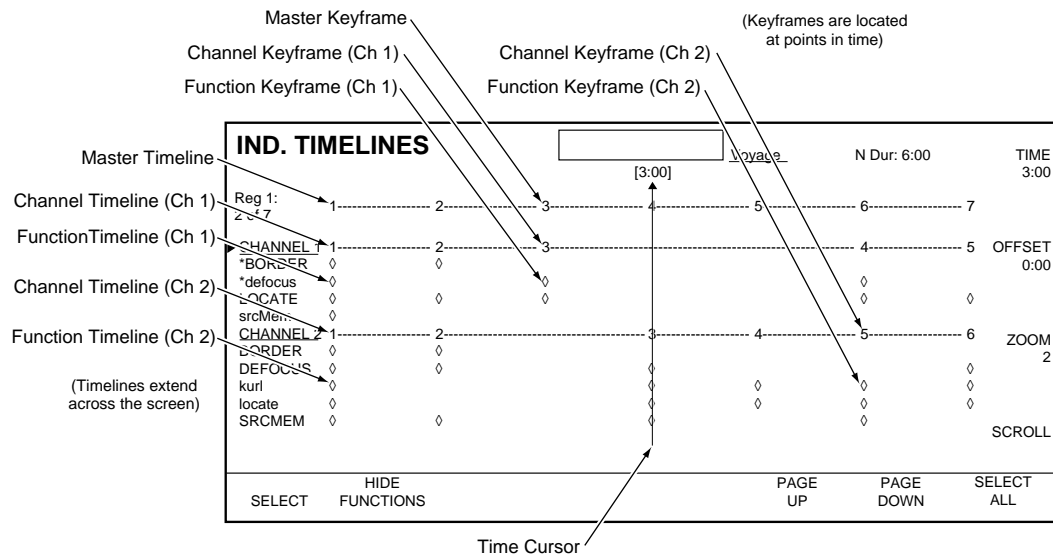


Figure 2-13. Keyframes and Timelines

Channel keyframes do not have to contain information about every function, only those which are active at a certain time. When Partial Keyframing is ON (described later in this section), channel keyframes also do not have to contain information about all the active functions, only those that have been changed. Thus, the size (amount of data) associated with a channel keyframe at a point in time may vary according to how many functions are active and how many have been changed at that time. Similarly, a master keyframe at a particular time in an effect may not contain channel keyframes for all the channels active in the effect.

Channel and master keyframes are fundamentally different from function keyframes, and may more accurately be thought of as “events”. Channel and master events are used to manage the sequential order and spacing through time of the effect's function keyframes. They do not contain static data, as the function keyframes do, but instead act as handles to manage function keyframe data that occurs at that time in the effect. Essentially,

each channel event handles values for all the function keyframes of that channel at that time, and each master event handles values of all the channel events at that time in the effect. For simplicity, channel and master events will be referred to as keyframes in this manual.

Note *Elsewhere in the Krystal documentation, the term “keyframe” is applied to function, channel, and master keyframes collectively. This approach is suitable for single channel effects with aligned keyframes. However, maintaining a distinction between function, channel, and master keyframes is useful for describing multi-channel effects, and is a better representation of actual Krystal system behavior.*

The Master Timeline

To provide a consistent set of rules for editing across different channel’s individual function timelines, a single overall effect timeline, or *Master Timeline*, is used.

The Master Timeline consists of a series of master keyframes that appear along a timeline that represents the current effect. A master keyframe is shown on the Master Timeline each time information from any channel is inserted into the effect for all delegated channels. [Figure 2-14](#) shows a simplified example of how master keyframes on the Master Timeline are derived from channel keyframes.

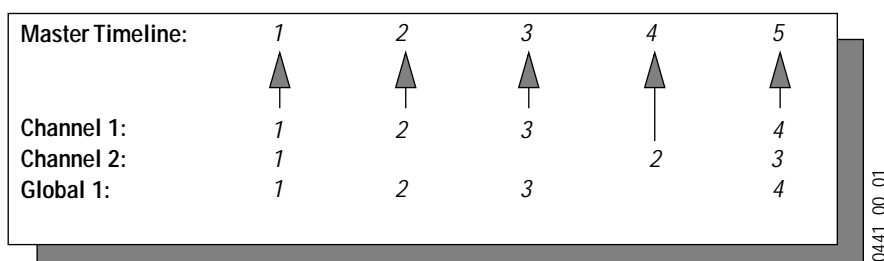


Figure 2-14. Master and Channel Timeline Keyframes

Notice that the numbering of the keyframes for each timeline varies, and the master timeline contains a keyframe wherever a channel keyframe exists.

Only master keyframes for enabled channels appear on the Master Timeline, and only the master keyframes for delegated channels are numbered. Master timeline keyframes for undelegated channels appear as solid diamonds ([Figure 2-15](#)). While undelegated channels cannot be edited, their presence on the Master Timeline can affect how the other delegated channels are edited. Multi-channel editing procedures are different when dele-

gated and undelegated channels have keyframes of different durations. See the *Section 5 - Basic Effect Editing* and *Section 6 - Advanced Effect Editing* for detailed information.

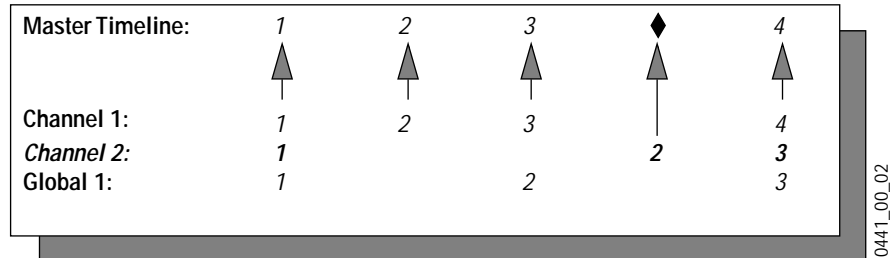


Figure 2-15. Master Timeline with Channel 2 Undelegated

Partial Keyframing

The Krystal system provides two modes of keyframing operation, Partial Keyframing ON or OFF. Partial Keyframing ON provides the most versatile operation. Partial keyframing allows each function to transition or interpolate from change to change independent of the other functions for that channel.

Figure 2-16 shows an example of timelines with Partial Keyframing ON. Note that for Channel 1, keyframes do not exist for function 1 at the second channel keyframe, or for function 2 at the third channel keyframe. Therefore, function 1 interpolates from keyframe 1 to 3, and function 2 interpolates from keyframe 2 to 4 for Channel 1.

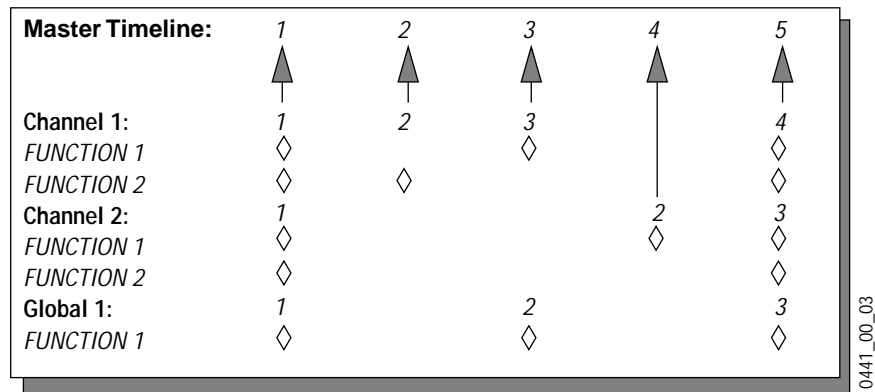


Figure 2-16. Partial Keyframing ON

Turn Partial Keyframing ON for greater path control, independent function control, and to conserve memory when building effects.

When Partial Keyframing is OFF, Krystal system operation looks and feels similar to a traditional DPM keyframing architecture. Keyframes are added to that channel's function timelines for all active functions when any of that channel's functions change (Figure 2-17). Note that the keyframes for each channel are independent from each other, regardless of whether Partial KF is ON or OFF. The relationship between channels is reflected in the Master Timeline.

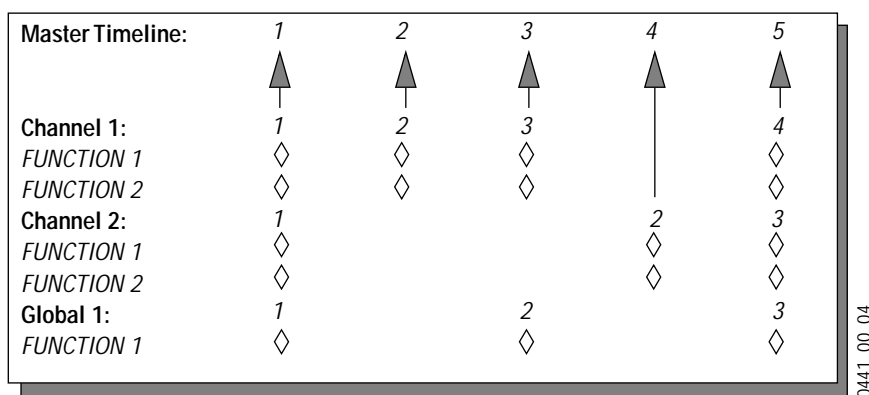


Figure 2-17. Partial Keyframing OFF

Work Buffer

The Krystal work buffer contains the effect data for the current run time location of that effect. The work buffer also contains any changes you have made to the effect. The work buffer is what appears on your monitor screen when you run or edit effects. This is an important concept. As an effect runs, the work buffer is continually updated with the latest information, including all interpolated function values.

When you move the time cursor to a specific effect location during editing, the work buffer reflects exactly what is occurring at that point in time. When you edit an effect and manipulate the picture to a new location, you are changing the work buffer, *not* the effect itself. You must modify an effect keyframe with the changed work buffer information, or insert a new keyframe with that work buffer information before your changes will be incorporated into an effect. This lets you experiment with the work buffer to find the desired settings, and only alter the effect when you are satisfied with your change. You can also use the work buffer to find exact interpolated values for effect functions, which you can then copy for use elsewhere.

An additional buffer exists for work buffer information, called the restore buffer. Information is loaded to this separate buffer when a work buffer is cleared, a keyframe is deleted, a new register is recalled, or the Store Work Buffer function is used. Restore buffer information can be loaded back into the work buffer with the Restore Work Buffer button.

Clipboard

The clipboard is a separate memory location where you can temporarily store effect information. Unlike the work buffer, which contains all the effect information for a single moment in time, the clipboard can hold keyframes for a range of time. Effect information can be cut, copied, and pasted to and from the clipboard for any combination of channels.

Unity Keyframe

Default values exist for effect parameters. New systems are shipped with a set of GVG factory default values, and these defaults can be recalled to restore the system to a known baseline. It is also possible to define user defaults, which are separate from the GVG defaults.

The Unity Keyframe is one set of user defined effect parameter values you can adjust to your needs. Unity Keyframe parameter values are imposed when an empty effect register is recalled, and when the Clear Work Buffer button is pressed. Note that pressing Rewind imposes factory values, not Unity KF values, to any functions not defined at the beginning of the effect.

The Unity Keyframe consists of a set of transform values (Size, Rotate, etc.), which are available to all channels, a set of picture appearance values (Border, Hue, etc.), available only to the logical channels (1, 2, 3, 4), and a set of Combiner values (Depth, etc.) available to the Camera channel (only active for systems equipped with a Combiner option). Only one Unity Keyframe exists, which can be applied to all delegated channels.

Source Memory

Source memory allows the system to remember source-related keyframable parameters on a source-by-source basis. This lets you choose different sources during an effect and have the appropriate parameters for each source be applied at the proper times during the running of that effect.

Each video source has a block of source memory parameters associated with it (Key, Mask, Coring, etc.). Each Krystal channel in turn maintains its own set of source memory parameters for all its available sources. This allows different channels to use the same source with different source memory parameters at the same time.

Factory default values exist for source memory. User defined values can also be set for source memory parameters (Source Memory Unity). However there also is only one set of Source Memory Unity values associated with each video source. This single Source Memory Unity is shared by all the Krystal channels.

Source Memory Unity is separate from the Unity Keyframe. These two groups of parameter are defined and recalled separately from one another.

Effect Registers

The Krystal system has 100 effect registers, where the information for each effect is stored. Each effect is assigned an *effect register number* (0 to 99). You use this number to load and store your effects in the Krystal system. Effect registers can also be saved to floppy disk for storage outside the Krystal system.

Active Channels

Each effect register holds information for all the active channels in that effect when the effect was saved. For example, suppose the effect saved in Register 7 was for flying Channels 1 and 2 in 3-D space. Register 7 will contain keyframes for the timeline functions used by Channels 1 and 2 in the effect. It will not contain any keyframes for Channels 3 and 4, Globals 1 or 2, or the Camera channel since none of them are used in the effect. Channels which have at least one keyframe in an effect are considered *active* in the effect. In the example, Channels 1 and 2 are active in effect number seven. Channels 3 and 4, Globals 1 and 2, and the Camera, are not active.

Current Effect

An important concept in the Krystal system is that of the *current effect*. Edit and run operations that are performed on the Krystal Control Panel always apply to the current effect. The recall operation is used to make one of the effect registers the current effect. When an effect becomes the current effect, its data is entered into the work buffer, and run and editing operations become available.

Paths

Keyframes specify parameter values at specific times in an effect. Most of the duration of an effect, however, occurs between these keyframes. The Krystal system interpolates parameter values between keyframes (inbetweening). The trajectory, or path, a manipulated picture travels through between keyframes is determined by how these inbetween values are interpolated.

Path Types

Krystal offers you several path controls ([Figure 2-18](#)):

HOLD — No interpolation. Keyframes hold their values for their durations, then change all at once for the next keyframe.

LINEAR — applies a linear interpolation between keyframes; no acceleration or deceleration is applied. Movement is mechanical having a constant velocity.

S-LINEAR — applies a linear or straight line motion between keyframes, with acceleration and deceleration applied at the beginning and end of each keyframe.

CURVE — this selection causes a smooth and rounded path through the keyframe. Paths are user adjustable with path modifiers (tension, continuity, and bias) described below.

SMOOTH — not currently implemented.

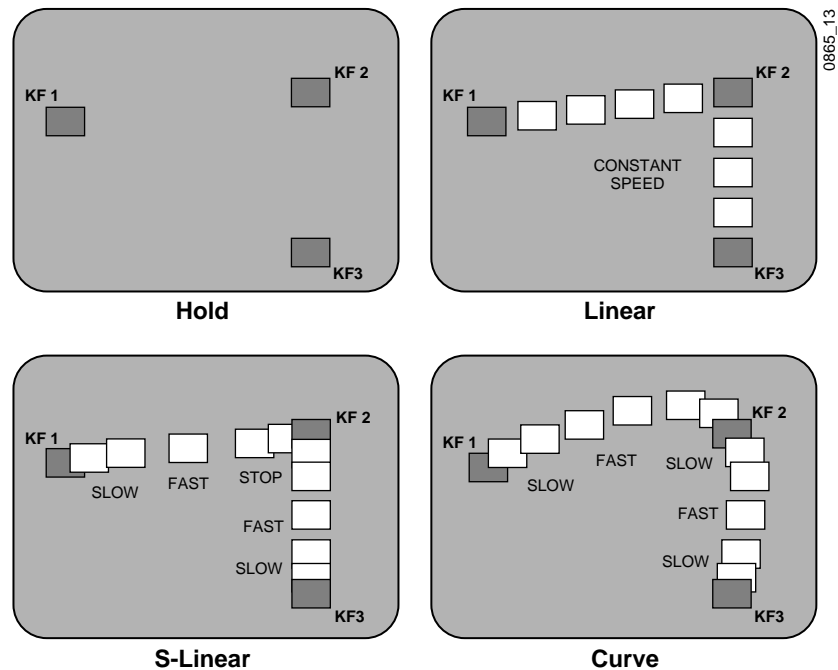


Figure 2-18. Path Types

The path concept can also be applied to functions that do not move a picture across the screen, like matte hue changes. For these functions, the rate of change of the parameter follows the same path types above. For example, an S-Linear hue rotation will accelerate and decelerate the speed of the hue change at the beginning and end of the keyframe.

Tension, Continuity, and Bias Controls

When the CURVE parameter is selected, additional fine-tuning path controls become available:

TENSION — controls the length of the tension vector. At a setting of 0.0, this imaginary line extends an equal distance into and out of the keyframe, and the path through the middle keyframe is curved.

CONTINUITY — determines the angle of the path into and out of the keyframe.

BIAS — determines whether the path will be “pulled” towards the previous or the following keyframe.

In the following examples, a physical path is shown between three keyframes. The first keyframe (KF1) is the upper left square; the last keyframe (KF3) is the lower right square. The adjustments in these examples are applied to the middle keyframe only (KF2).

Path Vectors

With respect to the path between keyframes, each keyframe is made up of three vector parameters as shown below. The soft knob controls act on these vector parameters to adjust the path into (entry) and out of (exit) the keyframe. The path through KF2 is parallel with an imaginary line drawn between KF1 and KF3 (Figure 2-19).

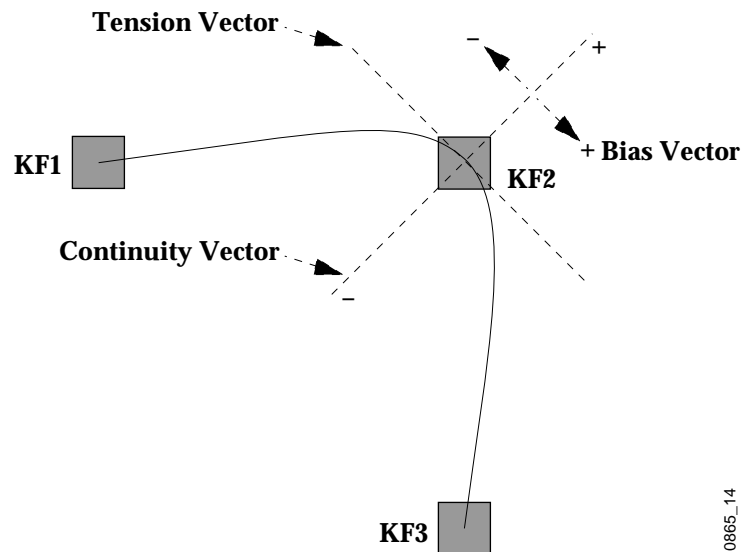


Figure 2-19. Path Vectors

0865_14

Vector Values

Path vector setting values of ± 999 are available. Settings of ± 100 correspond to Kaleidoscope ± 1.0 settings. Settings beyond ± 100 exaggerate the motion path, which can be useful for special applications.

Tension Control

In the example below, the keyframes are at right angles so the TENSION control operates on a 45° line drawn through the keyframe. This line is referred to as the Tension Vector and is parallel to a line drawn between adjacent keyframes (Figure 2-20).

The TENSION soft knob controls the length of the tension vector. At a Tension setting of 0, this imaginary line extends an equal distance into and out of the keyframe, and the path through the middle keyframe is curved. The unmodified KF2 is said to have a correction value of 0.

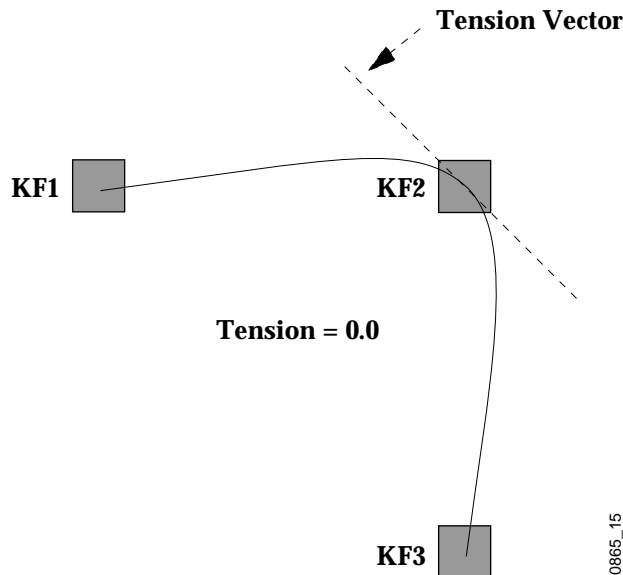


Figure 2-20. Tension Control Setting Zero

In the example below, the TENSION control is increased to 100, so that the Tension vector is shortened to non-existence through KF2 (Figure 2-21). The path enters and leaves the middle keyframe in a straight line as it takes on an S-Linear motion; decelerating as it enters the middle keyframe and accelerating as it leaves.

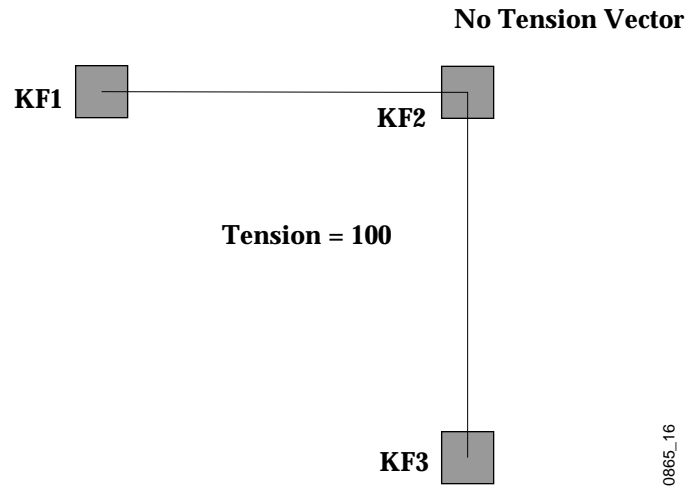


Figure 2-21. Tension Control Setting 100

In the example below, the TENSION control has been set to -100. This lengthens the Tension vector, causing the path through the middle keyframe to be longer and broader (Figure 2-22). The longer path will appear to make the image speed up through KF2 as it travels from KF1 to KF3.

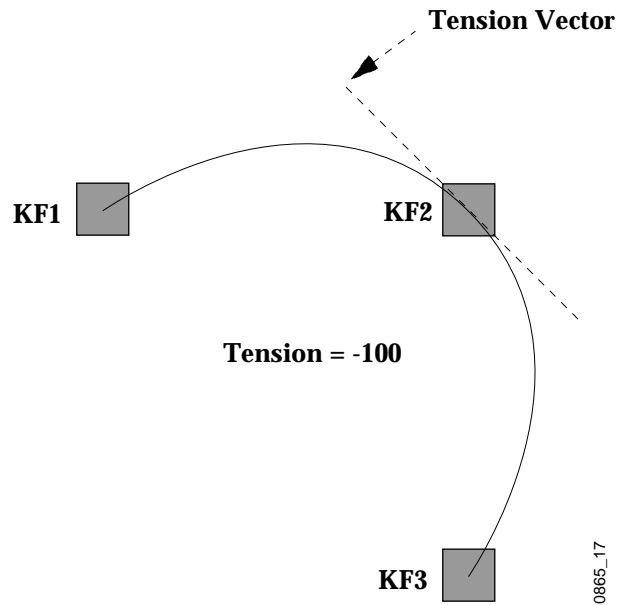


Figure 2-22. Tension Control Setting -100

Continuity Control

The continuity adjustment determines the angle of the path into and out of the keyframe. It is represented by a vector 90 degrees to the tension vector (Figure 2-23). The unmodified path shown is identical to the unmodified path of the other controls.

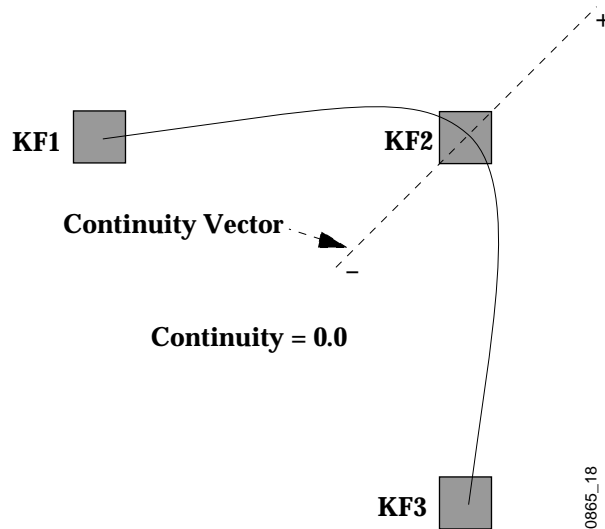


Figure 2-23. Continuity Control Setting Zero

With continuity set to 100, the entry path through the keyframe is pulled positively along the continuity vector. The effect of 100 continuity is that of motion dropping into and then out of the keyframe, similar to a bouncing ball (Figure 2-23).

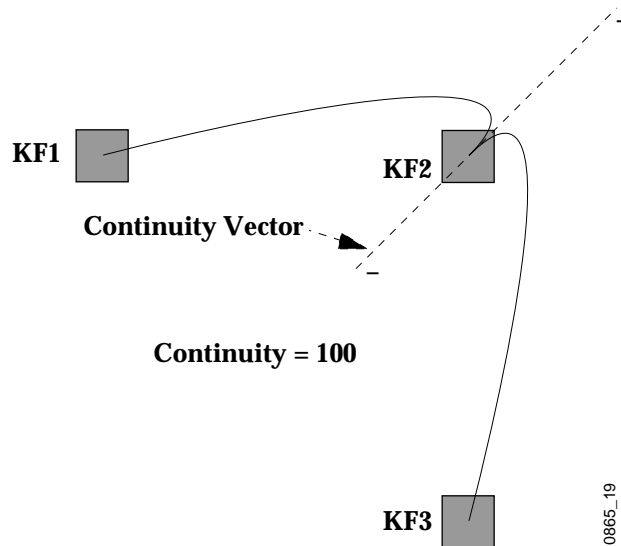


Figure 2-24. Continuity Control Setting 100

With continuity set to -100, the paths between the keyframes become straight lines, accelerating into the keyframe and decelerating as it leaves the keyframe (Figure 2-25).

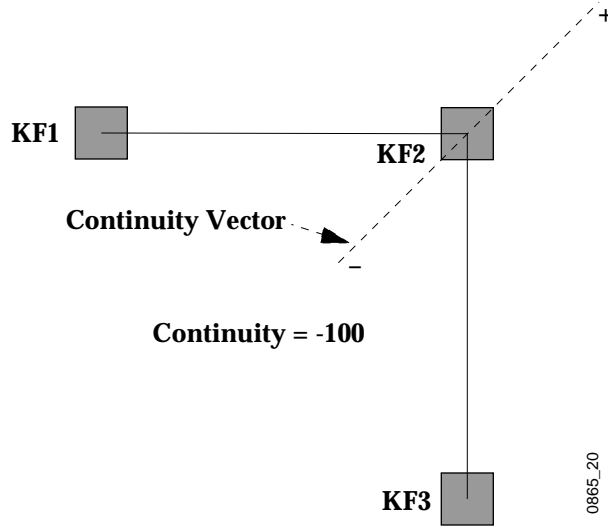


Figure 2-25. Continuity Control Setting -100

Bias Control

The BIAS control determines whether the path will be “pulled” towards the previous or the following keyframe. With extreme settings, all of the biasing will occur either before or after KF2. With bias set to 0, the curve through the keyframe is gentle as shown in [Figure 2-26](#).

Note A Tension vector *MUST* be present for Bias control to have an effect.

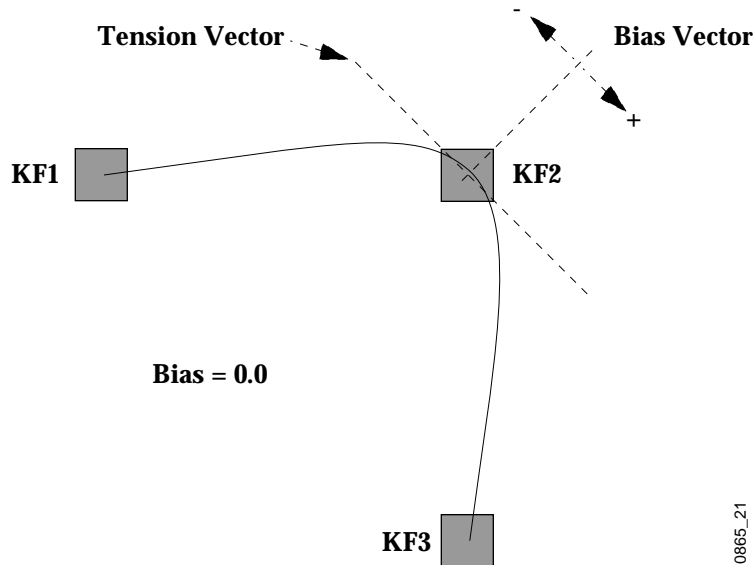


Figure 2-26. Bias Control Setting Zero

With the bias set to 100, the path is pulled towards the following keyframe. Entrance and exit to the keyframe are on a straight line from the previous keyframe, and the path of the effect travels completely through KF2 before turning towards KF3 (Figure 2-27).

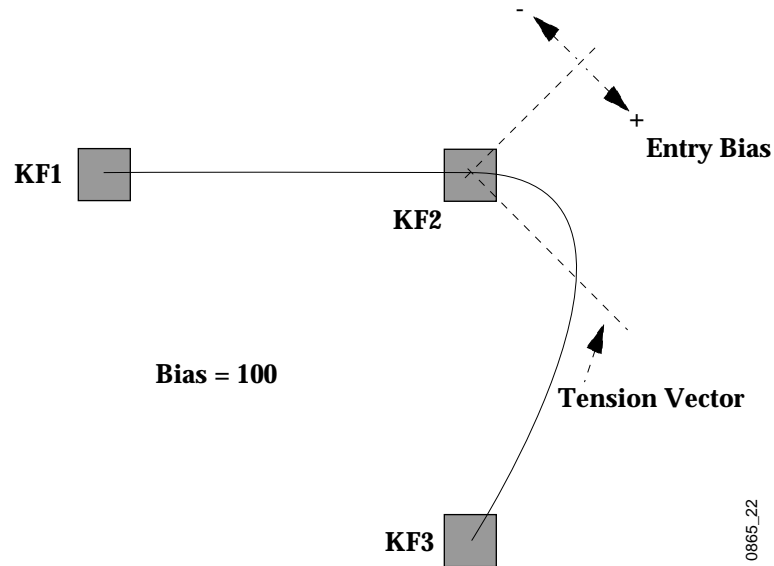


Figure 2-27. Bias Control Setting 100

With the bias set to -100, the path is pulled towards the previous keyframe. Entrance and exit to the keyframe are a straight line pointed to the following keyframe (Figure 2-28).

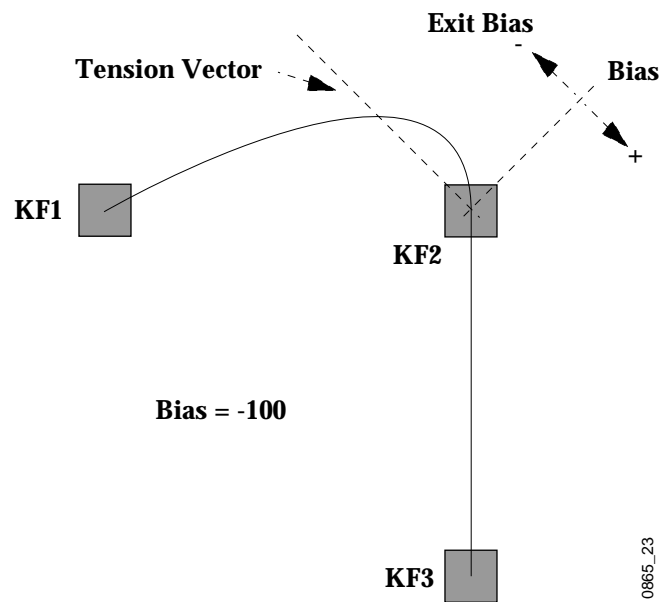


Figure 2-28. Bias Control Setting -100

Four Channel Combiner Background

Overview

The Four Channel Combiner allows the Krystal operator to combine up to four video and key streams into one combined output video and key stream. This feature permits the video sources to be combined, composited, or layered in a variety of ways required in both live and post production. The combiner permits a variety of effects combinations not practical with a production switcher, including depth combining and Lucasfilm composition operations.

The Krystal Four Channel Combiner works by first performing a depth sort of each input source on a pixel by pixel basis. This initial sorting permits accurate layering control of the sources, eliminating ordering limitations associated with conventional serial combining. The sources are then processed in three combiner stages. At stage 3, two of the inputs are combined. At stage 2 an additional input is combined with the output of the stage 3, and at stage 1 another input is combined with the output of stage 2. Finally background and shaping is applied and the appropriate signals are routed to the combiner's primary and secondary outputs (Figure 2-29).

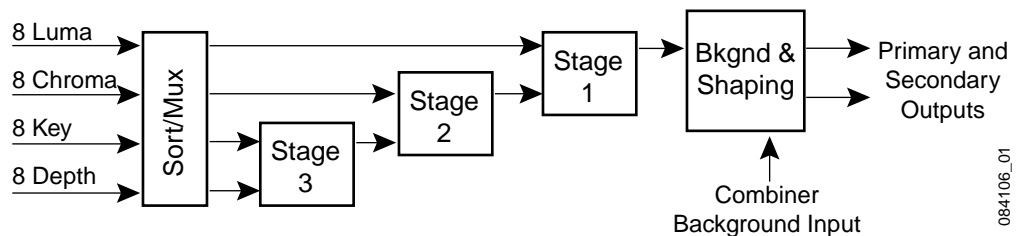


Figure 2-29. Four Channel Combiner Processing

Capabilities

- Each user can combine 4 logical channels from a pool of up to 8 channels, and the system supports up to 4 simultaneous users. Any user can combine any channel in any combination. For example, in an eight-channel four-user system two users can each combine 4 channels, or four users can each combine 2 channels, or any intermediate variation.
- Complete keyframeable input assignment control.
- Extensive keyframeable layering control (normal, depth, and Lucasfilm compositing) for each stage.
- Primary and Secondary Video and Key output pairs, with Iso capabilities.
- Combiner background, either an internally generated matte or matte/wash (with control of saturation, brightness, hue, offset, angle, and slope), or an external background video input.
- Keyframeable Depth Softness and Depth S-Shaping.
- Combiner channel opacity control.
- Path control of all Four Channel Combiner functions.

Four Channel Combiner Configuration

The Krystal system automatically detects the presence of Four Channel Combiner hardware. When a combiner is present, each Channel's output is automatically set to Resolution = 10 Bit, Shaping Format = Shaped, and Depth = On. These controls are grayed out in the Channel Output menu and cannot be changed by the user.

Camera Channel Parameters

Most Krystal Four Channel Combiner parameters are stored in the Camera channel. These combiner parameters are saved to Krystal registers and to disk as Camera channel information.

Loop Control Background

The Loop Control feature allows you to modify the running of an effect by specifying jumps from one effect time to another.

Overview

With Loop Control you can make an effect jump from its end back to its beginning, which makes the entire effect loop. You can have the effect loop continuously (up to 64,000 times), or you can specify the number of times an effect will loop. It is also possible to specify jump times within an effect, by identifying a “Jump From” time and a “Jump To” time. If the Jump To time is earlier than the Jump From time, that portion of the effect will loop. The effect will loop back to the earlier time, run until it encounters the Jump To time again, and repeat. This portion of the effect can loop continuously, or you can specify the number of times it will loop. If the “Jump To” time is later than the “Jump From” time, the effect will jump over the intermediate portion of the effect, and looping will not occur (Figure 2-30).

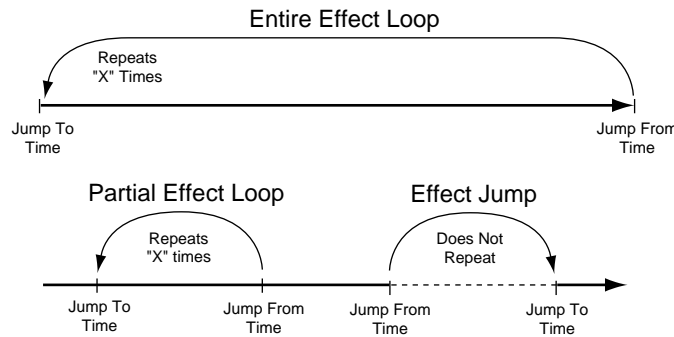


Figure 2-30. Simple Loops and Jumps

An effect can have up to three different time jumps, each exhibiting the above behavior. Multiple loops allow the creation of contained and overlapping loops.

Contained Loops

A contained loop is completely inside a larger loop. The inner loop runs in its entirety its specified number of times for each repetition of the outer loop. The counter value for a contained inner loop resets when exiting that inner loop, which causes it to loop again each time the outer loop runs (Figure 2-31).

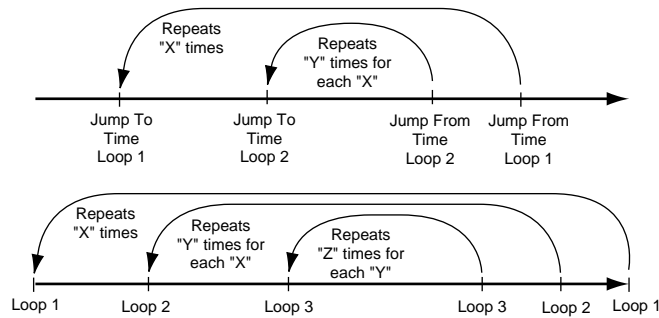


Figure 2-31. Contained Loops

Overlapping Loops

When loops overlap, the From and To times are staggered (Figure 2-32). Overlapping loops behave differently from contained loops.

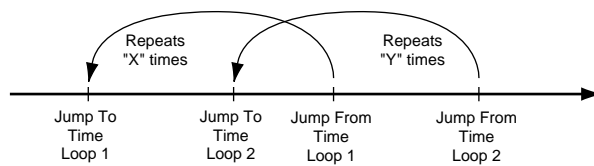


Figure 2-32. Overlapping Loops

For example, if the first loop in Figure 2-32 is given a Loop Repeat value of 2, and the second loop is given a value of 3, the following will occur. The effect will run to the Jump From Time of loop 1, repeat that loop 2 times, then run to the Jump From Time of loop 2, repeat that loop 3 times, and then run to the end of the effect. The counter values for overlapping loops are *not* reset when exiting these loops, causing the first loop to *not* repeat each time the second loop repeats. The effect would never terminate otherwise.

Loops Run Backward

When an effect is run in reverse, the Krystal system automatically reverses each pair of jump times (To becomes From, and From becomes To). In most situations (simple loops and jumps, contained loops) this makes the effect run identically forward and backward (Figure 2-33).

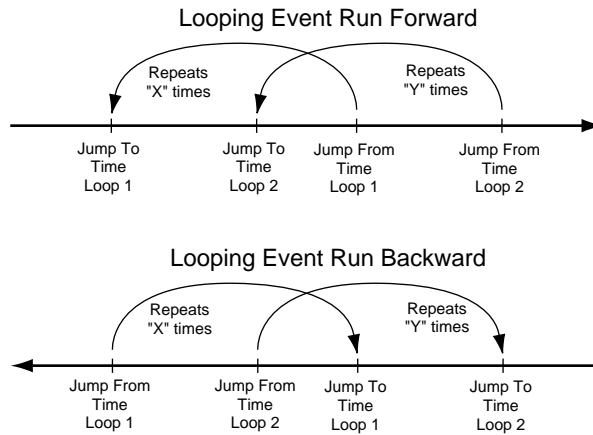


Figure 2-33. Looping Effect Run Backward

If an effect has backward loops and forward jumps that overlap, running the effect backward may result in jumps that skip the starting times of loops. These effects may loop properly when run forward, but will not loop properly when run backward.

Startup

Introduction

This section explains how to power up the Krystal DPM system, how to acquire system resources required for operation, how to safely power down the system, and includes information about how the system initializes.

Note *The procedures in this manual apply to Krystal DPM systems that have already been properly installed and configured into your facility. Because facilities can be creatively configured to meet special needs, procedures described in this manual may need to be modified to match your facility's requirements.*

Power Up

Single Channel System Power Up

1. Power up the Video Processor frame by turning on the AC power switch located on the rear, then turning on the DC power switch located inside the front access door.
2. Wait 45 seconds for the Effect Manager and other Video Processor modules to initialize. The Effect Manager should have both its green LEDs lit.
3. Power up the Control Panel by turning on its power switch located on the rear.

Multi-Channel System Power Up

1. Power up all the Video Processor frames by turning on the AC power switch located on the rear of each frame, then turning on the DC power switch located inside the front access door of each frame.
2. Power up the System Controller by turning on the AC power switch located on the rear, then turning on the DC power switch located inside the front access door. Wait 45 seconds for initialization and channel communications to be established. The Effect Manager(s) should have both their green LEDs lit.
3. Power up all Control Panels by turning on their power switches located on the rear of each unit.

Resource Acquisition

Before you can operate the Krystal DPM system, you must acquire the necessary hardware resources (an Effect Manager and one or more Video Processor Channels).

Single Channel System Acquisition

1. The Resource Acquisition menu will be displayed after the Krystal Control Panel powers up (Figure 3-1). If a different menu has been selected since the Control Panel initialized, you can reach the Resource Acquisition menu by pressing System Setup \ RESOURCE > .

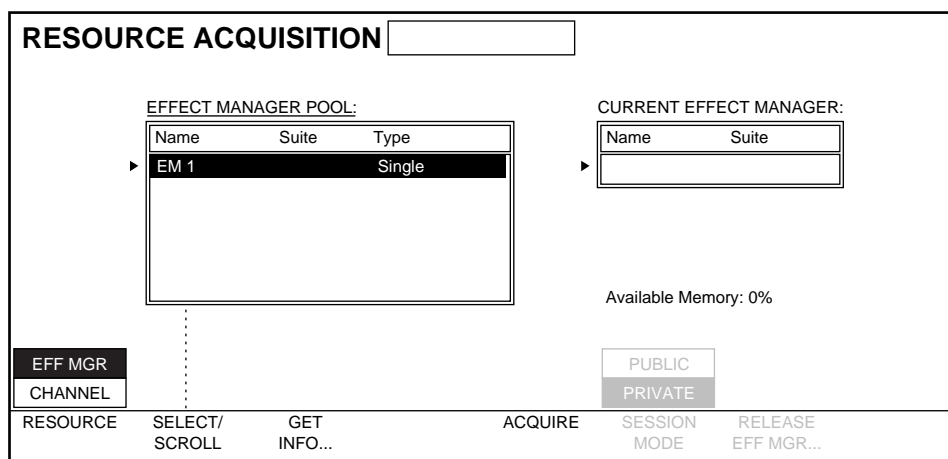


Figure 3-1. Single Channel Resource Acquisition Menu

2. Press the RESOURCE soft button to select EFF MGR. The EFFECT MANAGER POOL box lists the Effect Managers on the network. If only a single channel Krystal system is present, only one Effect Manager will be available. Other Effect Managers may be present if other Krystal systems reside on the network.
3. Press the ACQUIRE soft button to acquire the desired single channel Effect Manager and place its name in the CURRENT EFFECT MANAGER box (Figure 3-2).

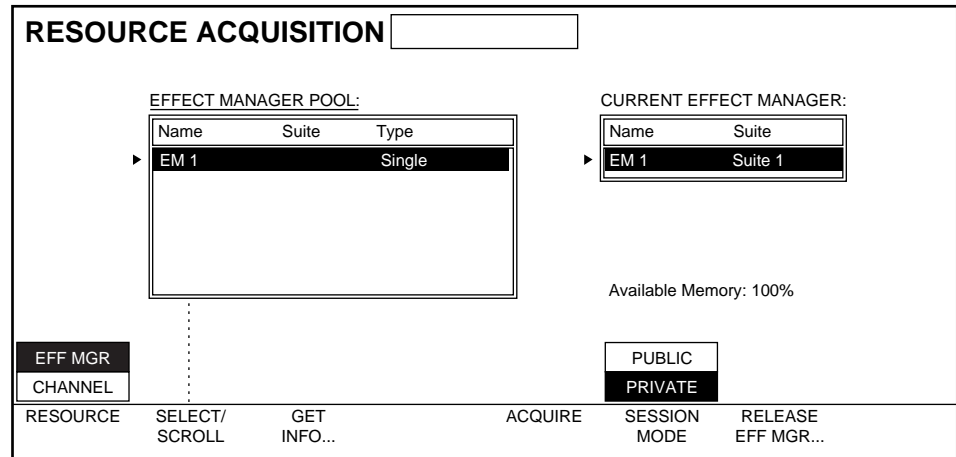


Figure 3-2. Single Channel System, Effect Manager Acquired

4. On a single channel Krystal system the Video Processor Channel will automatically be acquired along with the Effect Manager. Check this by pressing RESOURCE to select CHANNEL. The acquired channel should appear in the ACQUIRED CHANNELS list on the right (Figure 3-3).

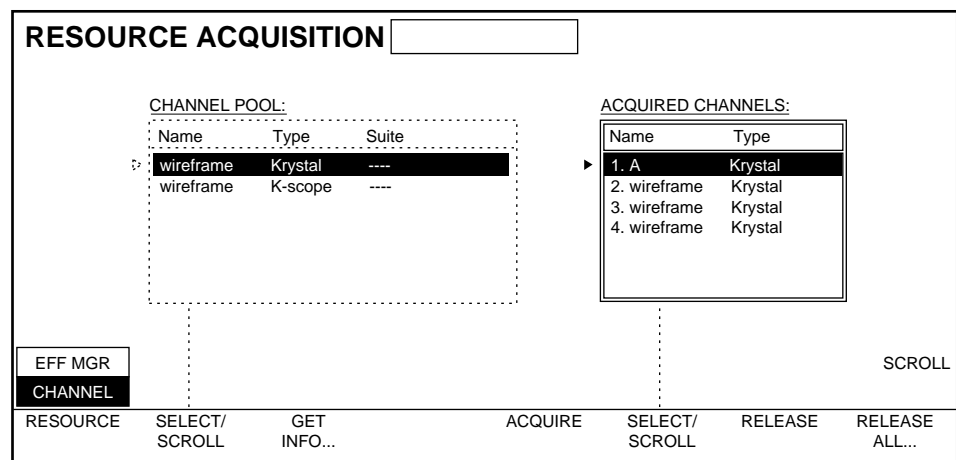


Figure 3-3. Single Channel System, Channel Acquired

Multi-Channel System Acquisition

On multi-user Krystal systems, Control Panels at different locations are assigned different suite numbers (1-4). The currently assigned suite number affects the configuration of the system resources you acquire. The following procedure assumes the Control Panel has the correct suite number. See *Control Panel Suite Number* on page 3-6 for more information.

1. The Resource Acquisition menu will be displayed after the Krystal Control Panel powers up (Figure 3-4). If a different menu has been selected since the Panel initialized, you can reach the Resource Acquisition menu by pressing System Setup \ RESOURCE > .

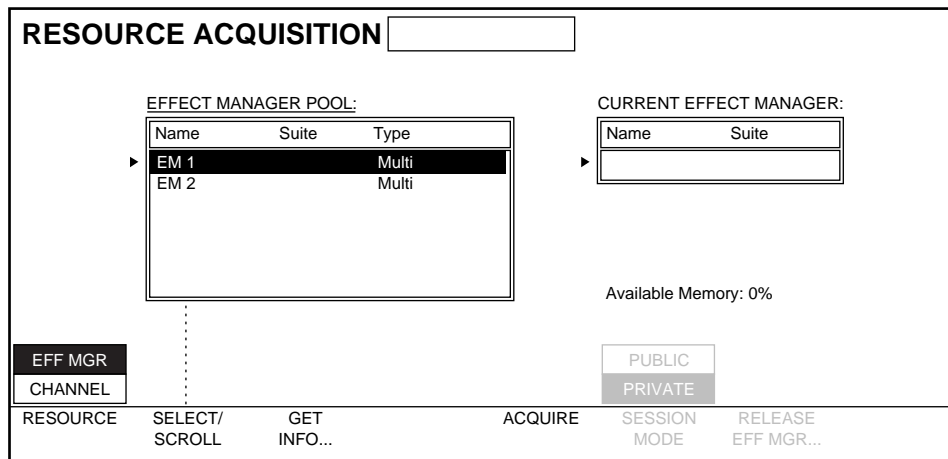


Figure 3-4. Multi-Channel System Acquisition Menu

2. Press the RESOURCE soft button to select EFF MGR. The EFFECT MANAGER POOL box lists all the Effect Managers available on the network.
3. Press SELECT/SCROLL to select the desired Effect Manager and then press ACQUIRE to acquire that Effect Manager and place its name in the CURRENT EFFECT MANAGER box.

- On multi-channel systems you must also acquire the Video Processor Channels you wish to use with the Control Panel. Press the RESOURCE soft button to select CHANNEL, press the left SELECT/SCROLL soft button to highlight the desired channel. Then press ACQUIRE. The channel will appear in the ACQUIRED CHANNELS box. Acquire all the Video Processor Channels you will be using for your session (Figure 3-5).

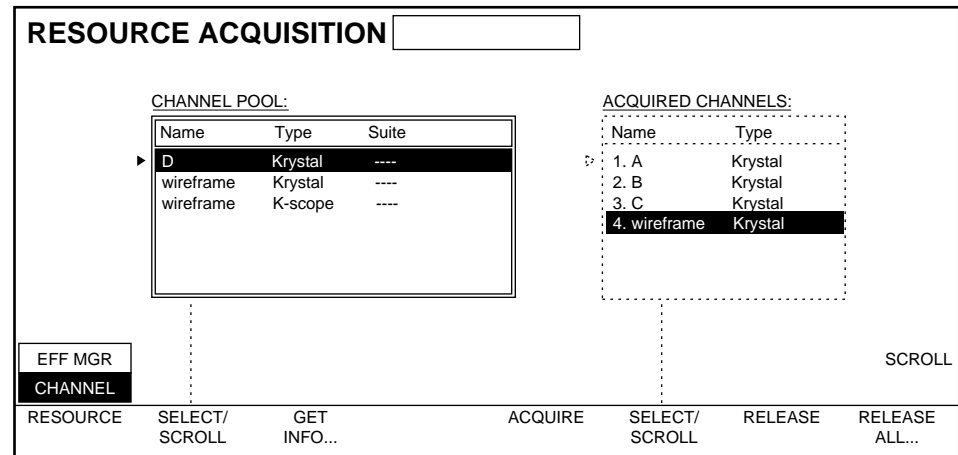


Figure 3-5. Multi-Channel System, Channels Acquired

Releasing Resources

When you are finished with your session you can release the Krystal resources. On systems with multiple users it may be important to make the Krystal resources available to others.

To release all your system resources:

- Press System Setup \ RESOURCE > to go to the Resource Acquisition menu.
- Press the RESOURCE soft button to select EFF MGR.
- Press RELEASE EFF MGR... . This releases the Effect Manager and any acquired Video Processor channels.

To release channels only and retain the Effect Manager.

- While at the Resource Acquisition menu, press the RESOURCE soft button to select CHANNEL.
- Select the channel you wish to release with the right SELECT/SCROLL soft button, then press RELEASE.

Pressing RELEASE ALL releases all the acquired channels.

Wireframe Channel Acquisition

The “wireframe” channels that appear on the Resource Acquisition menu are used in conjunction with the Graphic Display option to show representations of manipulated images on your monitor. This allows you to work “off line” to plan effects for later use, even if physical Krystal channels are not available. You must, however, acquire an Effect Manager to use wireframe channels. The Graphic Display option can be used to show the edges (wireframes) of the manipulated pictures, and display additional information to help you design your effects off-line.

Wireframe channels are acquired and released the same as standard channels.

System Initialization

NV RAM

Information that specifies Krystal system operating parameters exists in configuration data files. These configuration files reside in non-volatile random access memory (NV RAM). Two different NV RAMs exist, one for the Krystal Control Panel, and one for the Effect Manager(s). Each device reads its NV RAM when that device is powered up or reset, and this information determines that device’s initial behavior for that operating session.

Control Panel Suite Number

When you acquire Krystal system resources, the suite number assigned to your Krystal Control Panel affects how the system operates. Each suite number can have different configuration settings, and these settings are applied when that Control Panel acquires an Effect Manager. The current suite number is included as part of the Control Panel’s NV RAM.

The name of the suite (not the actual suite number) used to acquire your Effect Manager appears in the CURRENT EFFECT MANAGER box. The names of the Control Panel suites of other system users that have acquired

Effect Managers appears in the EFFECT MANAGER POOL box (Figure 3-6). Default suite names are Suite 1-4, but these may have been changed during system configuration.

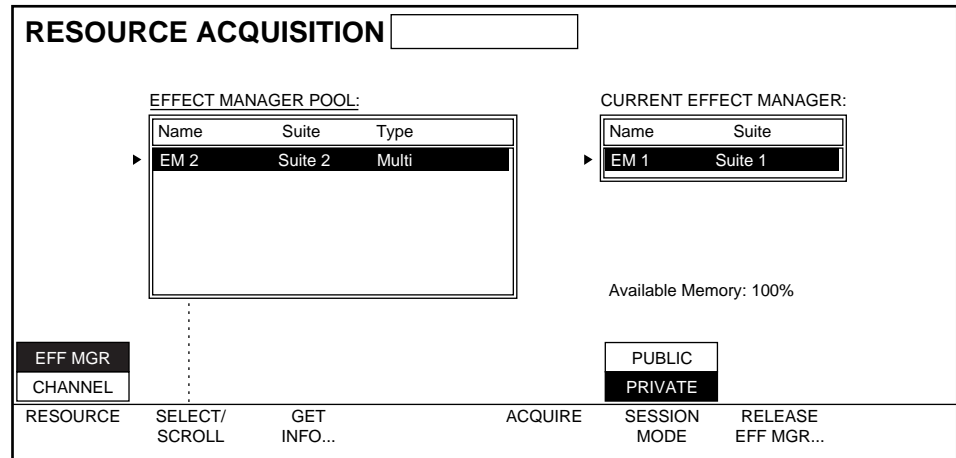


Figure 3-6. Suite Names for Acquired Effect Managers

To check the actual suite number assigned to your Krystal Control Panel:

1. Press System Setup \ PANEL CONFIG > \ SUITE ASSIGN... to go to the Suite Config menu. The currently assigned suite number appears in the text entry window (Figure 3-7).

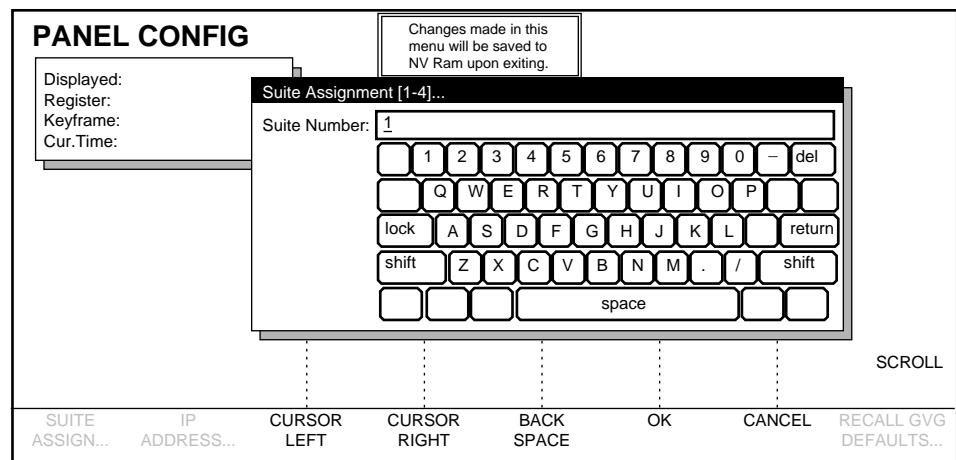


Figure 3-7. Panel Config Menu, Suite Number

It is possible to change the suite number from the Suite Config menu, but the suite you select must be compatible with the facility hardware configuration you intend to use.

Note Do not change your Control Panel's suite number unless you are certain the new suite number is properly configured for your purposes.

When a Control Panel's suite number is changed, if an Effect Manager was acquired it will automatically be released and reacquired. The new suite configuration information will be applied to the Effect Manager when it is reacquired.

On single channel systems the Video Processor channel will also be reacquired after the suite number is changed. On multi-channel systems Video Processor channels will *not* automatically be reacquired. You will need to acquire the channels you wish to use with the new suite number.

See the separate *Krystal Installation and Service Manual* for more information about system configuration.

Power Down

Whenever possible, release an acquired Effect Manager before powering down or resetting the Krystal Control Panel.

Single Channel System

1. Release the acquired Effect Manager via the Control Panel. This will automatically release the Channel if it has been acquired.
2. Power down the Control Panel.
3. Power down the Video Processor frame by turning off the DC power switch, and then turning off the AC Power Switch.

Multi-Channel System

1. Release every acquired Effect Manager from every Control Panel. This will automatically release any acquired Channels.
2. Power down the Control Panels.
3. Power down all the Video Processor frames. Turn off the DC power switch and then turn off the AC Power Switch on each frame.
4. Power down the System Controller by turning off the DC power switch, and then turning off the AC Power Switch.

Basic Operation

Introduction

This section covers basic techniques involved in operating the Krystal DPM system. This section explains how to use essential buttons and knobs on the Control Panel, and how to perform other fundamental tasks. Effect editing, which will probably occupy most of your time spent on the Krystal system, is covered in the following sections.

See the separate *Krystal Reference Manual* for more detailed information about the functions of each Krystal Control Panel button and menu screen.

Menu Navigation and Parameter Adjustments

The upper area of the Control Panel contains the menu display, buttons, and knobs used for selecting menus and adjusting video parameters. The keypad and LED display on the lower area of the Control Panel can also be used to adjust video parameters ([Figure 4-1](#)).

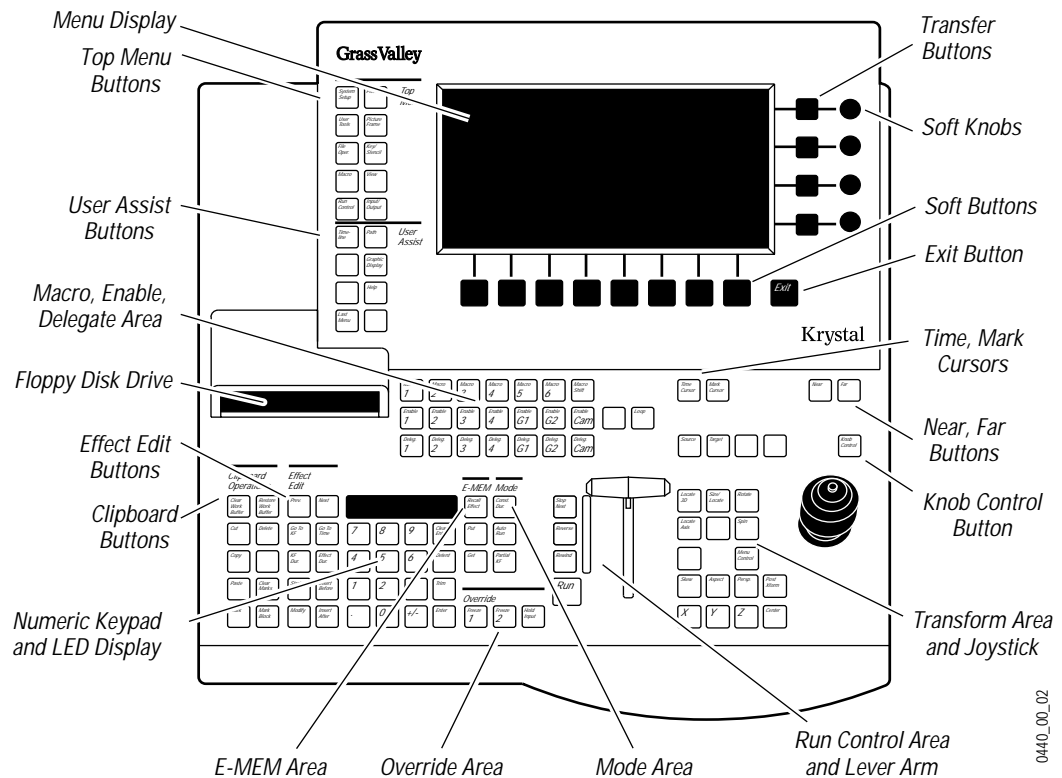


Figure 4-1. Krystal Control Panel

Top Menu Buttons

Pressing a top menu button located to the left of the menu display takes you to the first menu of the menu tree associated with that button. The five top menu buttons on the right side control functions that can be keyframed. The five buttons on the left side are for system setup and other Krystal operations.

Soft Buttons and Exit Button

The functions of the eight buttons located along the bottom of the menu display vary depending on the selected menu. Pressing a soft button can change a menu parameter or take you to a related submenu. Pressing the Exit button on the right exits the current menu, moves you up one level in the menu tree, and repeated pressing eventually takes you to the highest level System Status menu.

Complete menu tree diagrams are included in the separate *Krystal Reference Manual*.

Programming DPOP Functions

You can program any top menu button to go directly to a particular submenu when that button is pressed twice quickly (called Double Press Opens, or DPOP).

1. Select the desired menu.
2. Hold down the Exit button and then press the desired top menu button.
3. Release both buttons. Double pressing that top menu button will now display the selected menu.

Menu Display Parameters, Stacks, and Windows

The Menu Display shows the controls for the current menu function. [Figure 4-2](#) shows an example screen that contains a “stack” of parameter selections controlled by a soft button (FILE TYPE), and two windows controlled with the SELECT/SCROLL soft buttons and/or the SCROLL soft knob.

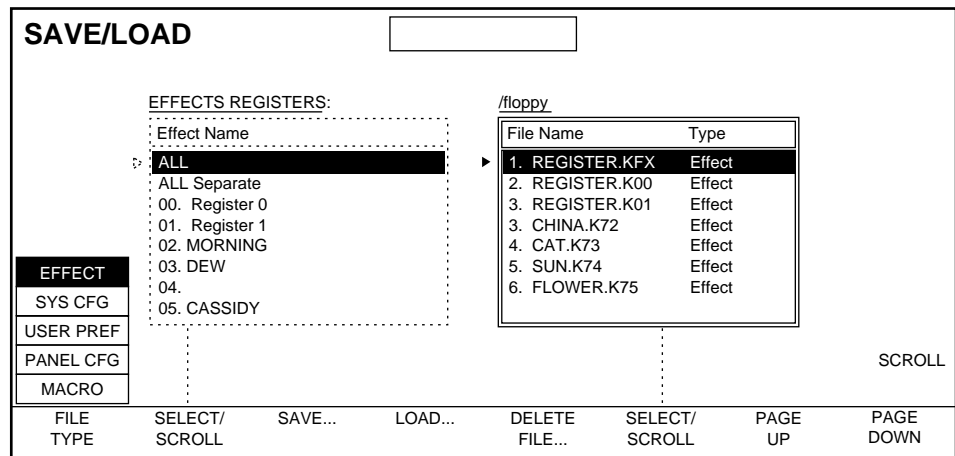


Figure 4-2. Menu Screen Stack and Windows

Accessing Scroll Pane Items

You can directly select an item in a scroll pane with the keypad. Type the number preceding the item label on the list and press Enter. If numbers do not exist the top item is #1.

Reversing Scroll Direction

You can reverse your scroll direction by holding down the Exit button while pressing the soft button for a menu stack or the SELECT/SCROLL soft button for a window.

Soft Knobs

The four knobs to the right of the menu display are used to adjust parameter values. These parameters vary depending on the displayed menu.

The soft knobs operate as acceleration, not linear controls. Turning the knob faster accelerates the rate of change of the parameter. This allows both rapid changes of large values (fast knob turn), and fine control of small values (slow knob turn).

Soft knobs performs relative parameter changes. See *Absolute and Relative Parameter Changes* on page 4-5 for more information.

Keypad Entry of Soft Knob Parameter Values

The Transfer Buttons next to the soft knobs can be used to transfer control of that soft knob parameter to the keypad located in the lower part of the Control Panel. You can then enter numeric values directly on the keypad for the transferred parameter.

1. Select the menu with the soft knob controlled parameter.
2. Press the Transfer button next to the soft knob. The parameter name and value will appear in the keypad's LED display.
3. Type the new value for the parameter on the keypad. Use the "+ -" key to make the value positive or negative.
4. Press the Enter key to apply the new value to that parameter.

You do not need to enter leading zeros. Any number entered with less than two digits is read as a single digit.

Pressing the "." (dot) button after typing a time value specifies the second field. An "f" will appear on the keypad's LED display and on the timeline display to indicate the second field time location.

The keypad (excluding the Detent and Trim function) performs absolute parameter changes. See *Absolute and Relative Parameter Changes* on page 4-5 for more information.

Trimming Parameter Values

The Trim button is used to change the keypad parameter by a specific value.

1. Enter the trim value, using the “+ -” key as required.
2. Press the Trim button. The parameter will be increased or decreased by the entered value.

The last trim value is retained in memory. Repeatedly pressing Trim will repeatedly apply that value. Pressing the “+ -” key, then pressing Trim reverses the sign of the trimmed value and applies it, which will undo the previous trim. When trimming a time function, you can move along the timeline by fields by entering 0 • (zero dot) as the trim value.

Trim performs relative parameter changes. See *Absolute and Relative Parameter Changes* [on page 4-5](#) for more information.

Detent

Pressing Detent will trim the current keypad parameter to its nearest detent value. Detents are system defined increments of selected functions. For example, Size function detents occur every 0.25 units. Some functions do not have detent values. Detent values are also used when the Center transform button is pressed once.

Detent performs absolute parameter changes. See *Absolute and Relative Parameter Changes* [on page 4-5](#) for more information.

Default

When a parameter has been transferred to the keypad, pressing • (dot) Enter sets the parameter to its default value. This default is defined by the Unity Keyframe.

Default performs absolute parameter changes. See *Absolute and Relative Parameter Changes* [on page 4-5](#) for more information.

Absolute and Relative Parameter Changes

It is possible to apply function changes to multiple keyframes by pressing Modify twice. How a change is applied to multiple keyframes depends on whether the change is absolute or relative. Absolute changes replace each

keyframe's value with the modified value. Relative changes alter each keyframe by the value's difference from the modified keyframe's original value. This is an important distinction, as [Figure 4-3](#) shows.

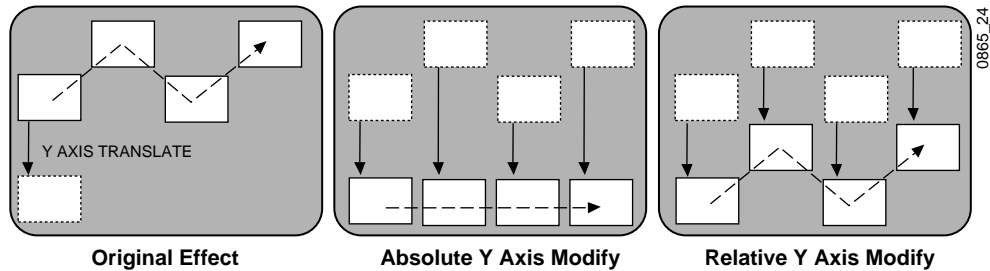


Figure 4-3. Absolute and Relative Modify

Relative parameter changes are made using a soft knob, the Joystick, and the Trim keypad functions. Absolute parameter changes are made by entering hard values on the keypad and pressing Enter, and using the Center and Detent functions.

User Assist Buttons

The user assist buttons provide various capabilities designed to help you edit and run your effects. For example, you will regularly use the Timeline button to display various detailed views of the current effect. When an effect is displayed it replaces any currently selected menu display.

Control Panel Delegate and Channel Enable

The Delegate and Enable buttons in the center of the Control Panel are used to control which channels are subject to effect editing, and which channels participate in the running of a completed effect.

Delegate Buttons

Pressing the Deleg. button for a channel delegates the Control Panel to control that channel. Pressing a single Deleg. button deselects any other delegated channels. Delegate buttons do not toggle. Pressing a lit delegate button does *not* turn it off. Pressing more than one Deleg. button simultaneously, or holding down one button while pressing others, allows the simultaneous effect editing of all the selected channels. Pressing a Deleg. button also automatically enables that channel (see below). A channel must be both delegated and enabled before editing will be allowed for that channel.

Enable Buttons

Pressing the Enable button for a channel enables or disables that channel for running a completed effect. Unlike the delegate buttons, the enable buttons toggle on and off individually. Pressing a lit enable button will turn it off, and pressing one enable button does *not* affect the state of any other channels. A channel must be enabled before it will participate in the running of an effect.

Recalling an effect register automatically enables all active channels to ensure proper playback of the effect.

Transforms and Joystick Control

The Transform area of the Control Panel contains the controls used for transforming video images when building an effect. These controls include the Joystick, buttons that assign functions to the Joystick, and buttons that assign function parameters to the keypad.

Joystick

The Krystal Joystick is a precision three-axis device used to control various functions assigned to it. Moving the Joystick towards or away from you controls the Y-axis, left and right movement controls the X-axis, and rotation of the Joystick controls the Z-axis.

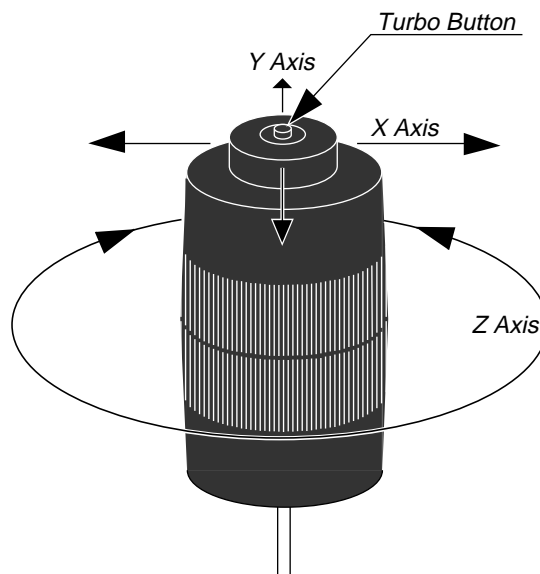


Figure 4-4. Krystal Joystick

The selection/turbo button on the top of the Joystick is used to accelerate transform moves.

The Joystick performs relative parameter changes. See *Absolute and Relative Parameter Changes* on page 4-5 for more information.

Transform Function Assignment

The following transform area buttons assign control of that function to the Joystick. Many of the following functions are affected by Source and Target reference axis selection. See *Section 2 - Concepts* for more information about transforms, translation, and Source and Target reference axes.

Locate 3D — controls translation of a picture along the X, Y, and Z (depth) reference axes.

Size/Locate — controls picture positioning in the X and Y reference axes and controls picture size. Joystick deflection in its X and Y directions translates the picture the same as Locate 3D above. Twisting the Joystick scales the picture about its center. Locate changes are reference axes dependent, while size changes are reference axes independent.

Rotate — controls the rotation of the picture around the X,Y, and Z reference axes, limited to ± 180 degrees between keyframes.

Spin — allows control of multiple rotations of the picture about the reference axes.

Note *Following broadcast conventions, moving the Joystick forward or back along the joystick's "Y" axis rotates the top of the picture forward or back (a rotation about the "X" reference axis). Similarly, moving the joystick left or right along the joystick's "X" axis rotates the side picture left or right (a rotation about the "Y" reference axis).*

Skew — controls the skew of the picture in the X and Y source axes only. The Z-axis is disabled in skew.

Aspect — controls the scale of the picture in its X, Y and Z source axes only. The Z-Axis control duplicates the Z control of the Size/Locate button. When scaling any component of the picture, the center of rotation maintains its proportion to the picture.

Persp. — controls the picture's perspective and is reference axes independent.

Post Xform — controls the movement of an image along the X and Y axes of two-dimensional screen space (this appears to move over a flat space and perspective changes do not occur). Deflecting the Joystick along its Z-Axis will scale the picture in 2D (post scale).

Locate Axis — controls the placement of the reference axes of rotation of a picture. The Joystick can be used to locate the axes anywhere on or off the screen. The picture is not moved by this function, only its reference axes.

Axis Lock Control

Press **Locate Axis** twice to go to the **Axis Lock** menu located in the **View Top Menu**. This lets you lock or unlock the reference axis to the picture. When locked, the axis moves with the picture. When unlocked, the axis remains at its last location while the picture moves to a new location.

Axis Lock is a system level control and is not a keyframeable parameter. Remember to turn it back on after you have finished using it in the **OFF** mode.

Centering

Press the **Center** button (located at the bottom of the transform area) once to go to the nearest detent for the current transform parameter. For example, size detents occur every 0.25 units. If you use the Joystick to scale the picture somewhere nearer 0.25 than 0.5 in size, pressing **Center** once will snap the image to the 0.25 detent.

Press **Center** twice to set the current transform parameter to its factory default value.

Center performs relative parameter changes. See *Absolute and Relative Parameter Changes* on page 4-5 for more information.

Axis Constraint

Holding down the **X**, **Y**, and **Z** axis buttons (located at the bottom of the transform area) individually or in any combination constrains the Joystick parameter changes to the selected axes. For example, if the **X** button is held down while the Joystick is moved, then only **X**-axis deflection is performed. Axis constraints also apply to **Centering** and **Detents** functions.

Note *Following broadcast conventions, constraining the Joystick to its "Y" axis limits picture rotation and spin about the "X" reference axis. Similarly, constraining the joystick to its "X" axis limits rotation and spin about the "Y" reference axis.*

Keypad Function Assignment

Pressing and releasing the X, Y, and Z buttons transfers the current transform parameter to the keypad. The keypad may then be used to enter an exact value for that parameter. Parameters for more than one axis can be transferred to the keypad by pressing multiple axis buttons. A plus (+) sign in the LED display indicates multiple selections. The parameter for the first button appears in the LED display, but values entered from the keypad are applied to all assigned axes.

Typing • Enter for a transform assigned to the keypad sets Unity KF values to the transform. If no Unity KF values are defined, factory defaults will be used.

E-MEM Operations

Recalling Effect Registers

To recall an effect register

1. Press the Recall Effect button.
2. Enter the number of the effect register (0 to 99) on the keypad and press Enter.

Recalling the Next Empty Effect Register

An effect register is considered empty if an effect has not been created and assigned to it—there are no keyframes in any channel on the timeline that corresponds to the effect register. You will want to recall an empty effect register before creating a new effect (the system default brings up Reg 0 automatically).

To recall the next empty effect register, press: Recall Effect • Enter.

The next available empty register will be recalled and functions will be given their currently defined Unity KF values or, if undefined, factory default values. Note that if Unify KF exist, these functions will appear with change indicators (*) to show they are different from the factory defaults.

If you try to recall an empty register when the current register is empty, the system will retain that register as the current register.

Putting Part of an Effect Into Another Register (Put)

In the process of building an effect, you may wish to put all the information about one or more timelines into another effect register. This may be done to save a working copy of part of the current effect, or to create a new effect from pieces of other effects.

Note *The Put operation involves only delegated channels/selected timelines. Delegate those channels whose timelines you wish to put into timelines corresponding to the new effect register before you press Enter.*

To copy timeline information from delegated channels or selected timelines in the current effect to timelines corresponding to a new or different effect register:

1. Press the Put button.
2. Enter the number of the destination effect register on the keypad and press Enter.

The Put operation will replace any information that existed in the destination register with the current timeline information from each delegated channel. Timelines unaffected by the “put” operation will remain intact.

Getting Part of an Effect From Another Register (Get)

To copy timeline information from another effect register to delegated channels in the current effect:

1. Press the Get button.
2. Then enter the number of the source effect register on the keypad and press Enter.

Note *The Get operation involves only delegated channels/selected timelines. Delegate those channels whose current timelines you wish to replace with timeline information from the source effect register before you press Enter.*

Selecting Sources

The Krystal system allows the selection of sources for your effects. Sources can be selected independently for each channel and for the front and back sides of each channel’s picture. Sources can be programmed to change during the running of an effect (source selection is keyframeable). The number and types of sources available to each channel varies depending on your system configuration.

Source Select Menu

Press the Input/Output top menu button and then press the SOURCE SELECT > soft button to go to the Source Select menu (Figure 4-5).

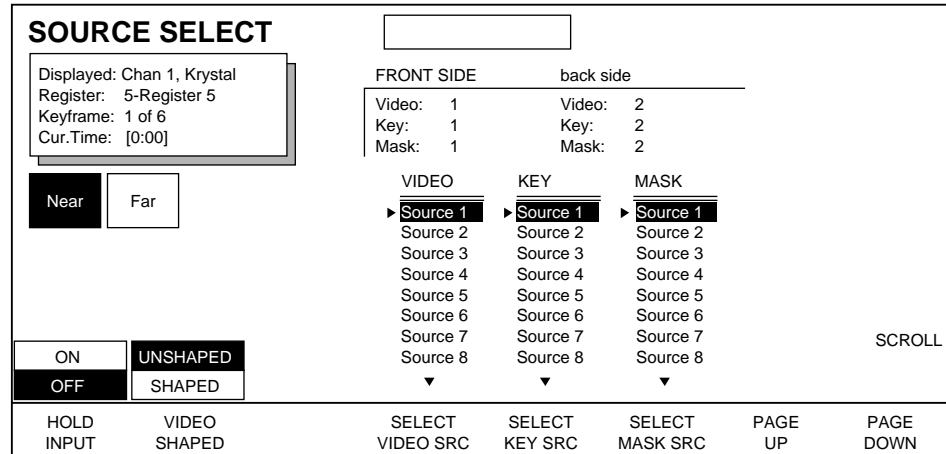


Figure 4-5. Source Select Menu

The currently delegated display channel, along with the register, master keyframe number, and time, is indicated in the box on the upper left side of the screen. The currently selected sources for the front and back sides of the display channel appear at the top center of the screen.

The sources available to the currently delegated channel are listed in the lower center of this menu (a Krystal software Source Selector Device must be installed and configured for that channel before any sources will appear). Up to eight sources can be displayed on the screen at a time. Scroll the list to see the names of any additional available sources. The types of sources for each physical channel can be either Video/Key/Mask, or Video/Key, depending on your system configuration.

Delegating Front and Back Sides

Pictures manipulated by the Krystal DPM can have front and back sides. The same source can be applied to both sides of the picture, or the two sides can display different sources. Source Selection menu operations are applied to the delegated sides of delegated channels.

The Source Select menu indicates the near, or visible, side of the picture by capitalizing the name of that side. The name of the far, or hidden, side of the picture is displayed in lower case. In Figure 4-5, FRONT SIDE is capitalized, indicating it is the near, visible side of the picture.

The Near and Far Control Panel buttons are used to delegate the front and back sides of the picture for source selection (see below).

Source Selection Procedure

To change source selections:

1. Move the edit cursor to the effect location where you wish to change the source.
2. Press Input/Output \ SOURCE SELECT > to go to the Source Select menu.
3. Press the Control Panel Deleg. button for the channel whose sources you wish to change. Delegating multiple channels allows the selection of sources to be applied to all the delegated channels.
4. Press the Control Panel Near and/or Far buttons to delegate the desired side of the channel(s). Pressing both buttons delegates both sides.
5. Use the scroll knob to scroll the selection arrow to the desired source name.
6. Press the SELECT VIDEO SRC soft button to select that video source for the delegated channels and sides. Each video source has a key source and, if available, a mask source associated with that video source. In normal operation (Source Memory Locked), selecting a different video source will automatically select its associated key and mask sources, as well as all its other related source memory parameters (see Source Memory below).
7. If the cursor is located on a SrcMem keyframe, press **Modify** to apply the new source selection to the current keyframe. If not located on a SrcMem keyframe, press **Insert Before** or **Insert After** to add a new keyframe to the effect. You can also press **Modify** twice to apply the changed source selection to the entire timeline (see the following sections for detailed information about effect editing).

The above procedure changes only that delegated channel's source parameters. For example, if you change the key associated with Source 1 for delegated Channel 1, and Source 1 is also being used by non-delegated Channel 2, Channel 2's key for Source 1 will *not* be changed. This allows different keys and masks to be used by the same sources on different channels at the same time.

If the Krystal system is configured to use an external device for source selection (a switcher's Aux bus or a routing switcher), you can select different sources directly on that device's panel, rather than use the Krystal Source Select menu.

Source Memory

Source memory allows the Krystal system to remember keyframable source-related parameters on a source-by-source basis. Each video source (up to 64) for a Krystal channel has a block of source memory parameters associated with that source.

Source memory parameters include:

- Video Source Selection with associated Key and/or Mask Selection
- All Key Settings (External, Self, or Off, Clip Low, Clip High, Offsets)
- All Mask Settings (Internal, External, Pattern Selection)
- Coring
- Motion Detection
- H/V Reverse
- Matte Fill
- Input Video Shaping
- Enhanced Image Fidelity Option (On or Off)

Because each Krystal channel only has one video input active at a time, only one set of these source memory parameters is active at a time for that channel. However, each channel maintains its own set of source memory parameters. Different channels can use different source memory parameters, and the source memory parameters for the same source can be defined differently by each Krystal channel.

Two types of source memory exist: short term (a work buffer separate from the KF work buffer), and long term (Source Memory Unity). Whenever you change a source memory parameter, that parameter selection is entered into the short term source memory for that source. The next time that source is selected those parameters will be applied (provided Source Memory is locked, as described below).

Clearing Source Memory

The current source memory parameters for the delegated channels are *not* affected when an empty register is recalled or the work buffer is cleared. To clear the current Source Memory parameters:

1. Hold down the Near and/or Far Control Panel button(s).
2. Press Clear Work Buffer.

The Source Memory Unity values will be applied to the delegated sides of the delegated channels. Source Memory Unity values are set via User Tools \ SOURCE MEMORY >.

Locking and Unlocking Source Memory

You can lock and unlock source memory when you build effects. This is a system state, and is not keyframeable. Locking and unlocking source memory lets you control how source memory parameters are applied to effect keyframes. Once an effect is built, the source memory parameters defined are included in the effect keyframes and will be applied when the effect runs (unless a hold input is applied, as explained below).

To lock and unlock Source Memory:

1. Press User Tools \ SOURCE MEMORY > to go to the Source Memory menu.
2. Press the SRC MEM LOCKED soft button to lock source memory (ON), or to unlock source memory (OFF).

When source memory is locked (ON), all the currently defined source memory parameters for a particular source will automatically be applied to that channel's source memory work buffer when that source is selected for that channel. For example, the key and mask sources are included in source memory and will change to match a change in the video source selection.

When source memory is unlocked (OFF), changing a video source will no longer bring up the new source's associated source memory parameters. Only the source video will change, and the current source parameters will be applied to the new source. This lets you see how a given set of source memory parameters affect different sources.

Holding Source Information

Holds can be applied to effects that will change how the sources are handled during the running of an effect. You can define holds on a keyframe by keyframe basis, and you can manually apply a hold override from the Krystal Control Panel.

To define a keyframe hold:

1. Move the cursor to the SrcMem keyframe where you wish to apply a hold input.
2. Press Input/Output \ SOURCE SELECT > to go to the Source Select menu.
3. Press the HOLD INPUT soft button to apply a hold to that keyframe (ON), or to remove the hold (OFF).
4. Press Modify to apply the hold to the current keyframe.

When an effect runs with keyframe hold inputs, any source selections programmed into an effect will *not* change for each input hold keyframe. This allows you to specify portions of an effect that may have unknown sources. You can then select different sources “on the fly” during the running of the effect.

To activate a hold input override, simply press the Hold Input override button on the Krystal Control Panel. All keyframe source selection for the entire effect will be disabled while this button is illuminated.

Effect Send

When a Krystal system is configured with a Switcher equipped with Effect Send, the operator can use the Switcher panel to toggle Effect Send mode ON and OFF. When a Switcher places Krystal into Effect Send mode, the switcher performs source selection for the effect. The separate Krystal Effects Send source memory parameters will be used for all the selected sources, not the standard source memory parameters.

Selecting a crosspoint in the Krystal Source Selection menu takes the Krystal out of Effect Send mode. The Krystal system can be put back into Effect Send mode from the Switcher control panel.

Running Effects

The Run Control area is used to run effects you have created. Both the Lever Arm and the Run button may be used to run effects. Effects may also be run under external control.

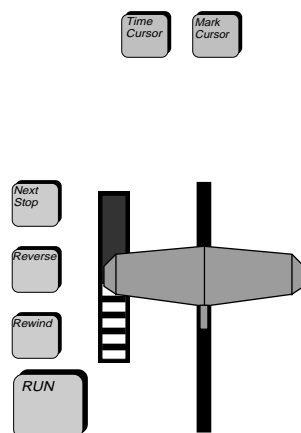


Figure 4-6. Krystal Run Control Area

Manually Running Effects

When Time Cursor is selected, the Lever Arm can be used to manually run an effect from the current position of the Time Cursor to the end of the effect. When the end of an effect has been reached by moving the Lever Arm to a limit, moving the Lever Arm back in the other direction will cause the effect to run again from its first keyframe.

If an effect is positioned with the Lever Arm at some point after the beginning but before the end, the direction of the effect may be reversed by moving the Lever Arm in the opposite direction.

The Effect Position Indicator (the vertical LED array to the left of the Lever Arm) provides a visual indication of the current position of an effect. If you have stopped an effect run, moving the Lever Arm towards the unlit segments will continue to run the effect in the forward direction. The lit segments of the bar graph always track the direction of the lever arm. When the Lever Arm reaches a limit, the direction of the bar graph (being lit top to bottom, or bottom to top) changes.

The Lever Arm moves whichever cursor (the Time Cursor or Mark Cursor) is active along the current effect's Master Timeline. Selecting Mark Cursor and moving the lever arm changes only the editing location of the effect, without updating the effect's work buffer (no interpolation or keyframe changes occurs).

Using the Run Button

Pressing the Run button runs the effect. If the button is pushed while the effect is running, the effect will stop where it is, until commanded to continue by another Run button press. If the effect has run to completion, another press causes it to run again.

Running an Effect One Keyframe at a Time

If Stop Next is selected, the effect runs only to the next keyframe on the Master Timeline after pressing the Run button or moving the Lever Arm.

The range of motion of the Lever Arm from one limit to the other corresponds to the distance from the current effect position to the next keyframe.

Pausing an Effect

Keyframe pauses can be added to an effect. To add a pause:

1. Move the cursor to the effect location where you wish the effect to pause.

2. Press Run Control \ PAUSE CONTROL > to go to the Pause Control menu.
3. Press PAUSE to turn the function ON.
4. Press Modify if the cursor is on a keyframe, or press Insert Before or Insert After if you are between keyframes.

When the Run button is pressed for these effects, the effect will stop at any keyframe pause. A pause on any channel will cause all channels to stop running. Pressing the Run button again runs the effect from the paused location.

Running an effect by moving the Lever Arm bypasses any pauses programmed into the effect.

Running an Effect Backwards

Pressing the Reverse button causes the effect to run backwards when the Run button is pressed. All other controls operate as usual, except that pressing the Rewind button moves the effect toward the end rather than the beginning. The bar graph indicates the running of the effect as if it had not been reversed.

If the Reverse button is pressed while the effect is running, the effect will immediately change direction.

Rewinding the Effect

Pressing the Rewind button causes the effect to be positioned at time 0 if the Reverse button is not lit, or at the end of the effect if the Reverse button is lit. If an effect is running when this button is pushed, the run is stopped and the effect is rewound to the appropriate time.

After a rewind, any functions lacking keyframes at the beginning of the effect will be given factory default parameter values. Unity Keyframe values, if defined, are *not* used in this case.

Using the Keypad Like a Shotbox

Press the Auto Run button to provide the keypad with one button access to effect recalls and runs. When the keypad is assigned to the Auto Run button, it will display the following:



Figure 4-7. Auto Run Display, Bank 0 Selected

As soon as a number is entered on the keypad, the corresponding effect register will be recalled and run. For example, suppose you press the “7” button on the keypad:



Figure 4-8. Auto Run Display, Register 7

Immediately, effect number seven would be recalled and run (you do not have to press Enter). As long as the effect is running, the keypad display number will appear as shown above. As soon as the run is completed, the keypad will return to showing just the bank number followed by a dash.

Changing the Bank Number

Since there are only ten numeric buttons on the keypad (0-9), the bank number is provided to give you access to effect registers 0-99. In the example above, the current bank is 0 (this is the default). When the bank is 0, you can recall effect registers 0-9 with a single button push.

To change the bank number, push the “.” button followed by the new bank number. For example, if you pressed “.” followed by “4”, the keypad would appear as shown below:



Figure 4-9. Auto Run Display, Bank 4 Selected

You now have instant access to effect registers 40-49. The bank number may be changed while an effect is running and cause no interference. However, as soon as another number is entered, the current effect will be stopped and the new effect will be recalled and run.

File Operations

Effects are saved and loaded to Krystal registers during normal operation. Effect and other files can also be saved to and loaded from floppy disk. Saving files to disk is an important part of the system configuration and software upgrade process.

Formatting Disks

The Krystal system uses standard PC formatted 1.44 MB floppy disks. However, it is recommended you format the disks you will be using with the Krystal Control Panel. To format a floppy disk:

1. Insert a 1.44 mB floppy disk into the Krystal Control Panel's disk drive.
2. Press the File Oper. top menu button, then press DISK MANAGER > to go to the Disk Manager menu.
3. Press the FORMAT DISK... soft button, and respond OK to the prompt warning that all files on the disk will be deleted. A message will be displayed when the formatting has completed. Press OK to continue.

Floppy Disk Reading

The Krystal Control Panel only reads the floppy disk when you enter the Save/Load menu, and after files have been saved to the disk. A disk is *not* automatically read when inserted into the Control Panel's disk drive. Files cannot be loaded from a disk that has not been read. If you insert a disk while in the Save/Load menu, press Exit and then press SAVE/LOAD > to re-enter the menu so the system will read the disk.

Saving Files

To save files to floppy disk:

1. Insert a formatted 1.44 mB floppy disk into the Krystal Control Panel's disk drive.
2. Press the File Oper. top menu button, then press SAVE/LOAD > to go to the File Operations Save/Load menu.
3. Select the type of file you wish to save with the FILE TYPE soft button.
4. Select the file you wish to save with the left SELECT/SCROLL soft button.

5. Press **SAVE...** , then press **OK** at the confirmation message. You will then be prompted for a file name (up to 8 characters). If you are saving an effect register, the effect's current name will be displayed by default. Note that the name of an effect file can be different from the name given to the effect itself. When the desired name has been entered, press **OK**. A warning message will be displayed if a file with the same name exists on the floppy disk.

Loading Files

To load files from floppy disk:

1. Insert a formatted 1.44 mB floppy disk into the Krystal Control Panel's disk drive.
2. Press the **File Oper.** top menu button, then press **SAVE/LOAD >** to go to the File Operations Save/Load menu.
3. Select the type of file you wish to load with the **FILE TYPE** soft button.

CAUTION *Loading configuration files incorrectly can adversely affect Krystal system operation.*

4. Select the file you wish to load with the right **SELECT/SCROLL** soft button. If you are loading an individual effect file, you will also need to use the left **SELECT/SCROLL** soft button to select the register you wish to load the effect file into.
5. Press **LOAD...** then press **OK** at the confirmation message. The file will be loaded to the Krystal system.

Saving and Loading Multiple Effect Files

All the Krystal registers can be saved and loaded as a group in two ways.

- You can save all the registers to a single file by selecting **ALL** in the **EFFECTS REGISTERS** scroll pane of the **SAVE/LOAD** menu, then pressing the **SAVE...** soft button. You then name the combined file, and the file will be saved with a **.KFX** extension. When this single file is reloaded with **ALL** selected, every Krystal register represented in the combined file will be overwritten with the data that was saved to disk. Krystal registers that were empty when the combined file was saved are not overwritten.

Note *A single register file can be loaded back to the register it came from by selecting **ALL** in the left **EFFECTS REGISTERS** scroll pane, selecting the individual file (**.Knn** extension) in the right scroll pane, and then press **LOAD...***

- You can also save all the registers to separate files by selecting **ALL Separate** in the **SAVE/LOAD** menu and pressing the **SAVE...** soft button. Each file will automatically be given the effect name (up to 8 characters) and a **.Knn** extension that corresponds to the register number. To reload all the files on the floppy disk, select **ALL Separate** and press the **LOAD...** soft button. All the files on the disk will be loaded back to the Krystal register they originated from, as determined by their **.Knn** extension number.

CAUTION *If two files with the same effect register number (.Knn) reside on the floppy disk, an ALL Separate load will overwrite the first loaded effect file with the last loaded effect file for that register. Using a newly formatted floppy disk whenever you use the **ALL Separate** function will prevent this from occurring.*

Basic Effect Editing

Introduction

Effect editing involves creating keyframes on timelines in an effect register. This section covers the basics of inserting and modifying keyframes. If you are not familiar with effects, keyframes, and timelines you should review *Section 2 - Concepts* before reading this section.

This section focuses on single channel effect editing. Editing a single channel effect with Partial KF OFF will be described first. Then the differences in editing with Partial KF ON will then be explained, to demonstrate the power of this special Krystal DPM editing mode. A description of some common effect editing techniques follow, including single keyframe clipboard operations. Advanced editing methods are presented in *Section 6 - Advanced Editing*.

Editing Fundamentals

Requirements

Before you can create or edit an effect:

- An Effect Manager must be acquired.
- One or more channels or wireframes must be acquired.
- An Effect Register must be recalled (default is Reg. 0).
- Edit Enable mode must be ON (User Tools menu).
- The Control Panel must be Delegated to one or more channels.
- The channel(s) involved in the edit must be Enabled.

Basic Editing Procedure

The basic process of effect editing involves the following steps:

- Choose the timeline location you wish to edit (default location is the beginning of the effect).
- Optional - Select the channel(s) and/or function(s) you wish to edit (this is covered in more detail in *Section 6 - Advanced Editing*).
- Change the current work buffer (using the transform controls and menu selections). Unchanged functions retain the user defined Unity KF or factory default values.
- Apply the work buffer changes to the selected channels and/or functions, by either inserting new keyframes or modifying existing keyframes.
- Cut, Copy, Delete, and Paste operations on an effect are also available.

Editing Displays

Various information displays are available to you during editing. You can pick the display that best suits your immediate need by pressing the Timeline top menu button located on the lower left side of the panel display. Depending on selections set in the Display Options menu (User Tools \ DISPLAY OPTIONS >) some or all of the following displays will appear in turn when the Timeline button is pressed.

See the separate *Krystal Reference* manual for more detailed information about these displays.

Independent Timelines Display

The Ind. Timelines display shows information for the current effect through time. This is probably the most useful display and will be used in examples throughout this manual.

The Ind. Timelines display is organized with time displayed along the horizontal axis, and channels and functions displayed along the vertical axis. The Time Cursor on the timeline shows your current effect location. The channels and functions are displayed in a hierarchal structure.

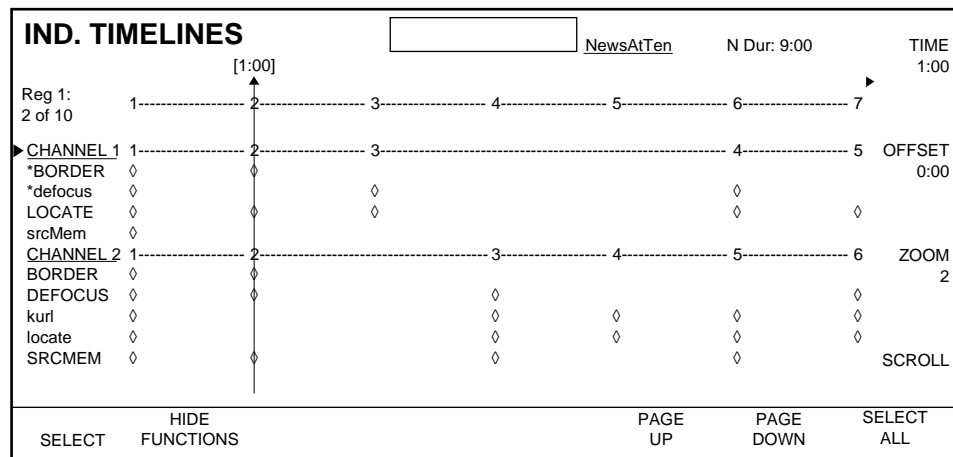


Figure 5-1. Independent Timelines Screen

The Master Timeline at the top of the screen gives an overview of the effect. Below the Master Timeline are Channel Timelines for each channel in the effect, and below each Channel Timeline are Function Timelines for every active function for that channel. Keyframes for each active function appear on each Function Timeline, and the Channel Timeline contains channel keyframes giving an overview of all the function keyframes in that channel. In turn, the channel keyframes are reflected as master keyframes on the Master Timeline at the top of the screen, which is the highest level of the hierarchy.

Channel Timelines are displayed vertically with the first delegated channel on top (this is the display channel). Any remaining channels are displayed below in sequential order (Ch 1-4, Global 1-2, Camera). As you change channel delegations during editing, the order of the channels on this screen will change so the display channel remains on top. Function Timelines for each channel are displayed in alphabetical order.

Active Functions

The names of functions active in each channel are listed beneath the channel name. An active function is one that is set to some state in the effect other than its default values. Inactive functions remain in their default values for the entire effect. A single parameter change at any time in the effect will make a function active.

Set and Interpolated Functions

If a function has a set value at the cursor location (shown by a diamond function keyframe) its name is shown in upper case text. Values for functions that have not been explicitly set at the current time in the effect are derived by interpolating between the previous set values and the next set values. The names of interpolated functions are shown in lower case text.

Change Indication

When you move through an effect, values are calculated in each channel from information in keyframes and is written to that channel's work buffer. The Krystal hardware then reads the work buffer and processes the video image accordingly. When function values are adjusted from the Control Panel, the work buffer changes. This results in a difference between the values in the work buffer and the information computed from the current effect position. Functions whose work buffer values are different from its set or interpolated values will display an asterisk (*) next to its function name. If a function keyframe is not present and no previous function keyframe exists (for example, cursor at the beginning of the effect), the change indicator reports changes from Unity KF (if defined) or factory default values.

Delegated and Undelegated Channels

The Ind. Timelines display shows both delegated and undelegated channels. Delegated channel names have upper case letters, while undelegated channel names are lower case. Master keyframes for undelegated channels appear as solid diamonds on the Master Timeline.

Master Timeline Display

The Master Timeline display shows information for the current effect at a specific point in time.

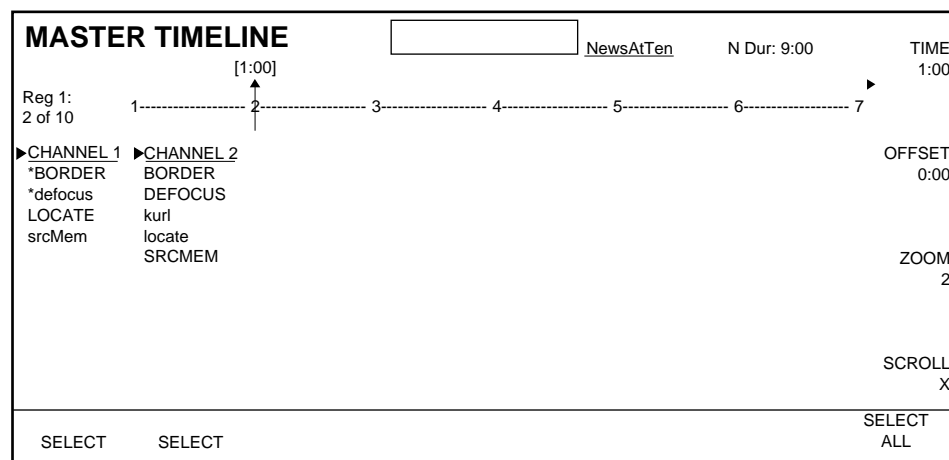


Figure 5-2. Master Timeline Screen

This screen contains the Master Timeline, which is identical to that shown on the Ind. Timelines display. Below the Master Timeline are areas for each delegated channel of the effect, which display information about that channel's work buffer at the current time in the effect.

Active, set, and interpolated functions, and the asterisk change indicator appear on this screen similar to the Ind. Timelines display.

The Master Timeline display does not show information for enabled channels that are undelegated, other than indicating diamond master key-frames on the Master Timeline.

Transform Display

The Transform display shows transform parameter values for the current effect at a specific point in time, and also shows source selection information for each channel.

TRANSFORM				NewsAtTen	N Dur: 9:00	TIME 1:00	
Reg 1: 2 of 10	1-----2-----3-----4-----5-----6-----7						
	X	Y	X	Front Src	Back Src	OFFSET	
▶ CHANNEL 1	LOCATE	1.0360	- 0.6243	0.0000	V:1 K:1 M:1	V:2 K:2 M:1	0:00
	ROTATE	0.2500	0.2500	0.2500			
	SIZE	1.0000	1.0000	0.5000			
▶ CHANNEL 2	locate	- 1.0360	- 0.5430	0.0000	V:4 K:4 M:2	V:6 K:6 M:2	ZOOM 2
	SIZE	1.0000	1.0000	0.5000			
	SPIN	0.0000	2.5000	2.5000			
							SCROLL
SELECT				PAGE UP	PAGE DOWN	SELECT ALL	

Figure 5-3. Transform Screen

The appearance of channel and function names is similar to the Ind. Timelines display, except only transform functions are shown. These functions are displayed below each channel in alphabetical order. The X, Y, and Z axis transform values for each function appear to the right. Under "Front Src" and "Back Src" are the source numbers assigned to the front and back sides of each channel for that effect location.

Clipboard Display

The Clipboard display shows what data is currently located in the clipboard. Information enters the clipboard via Cut and Copy clipboard operations. The layout of the information on the Clipboard screen is similar to the Ind. Timelines display.

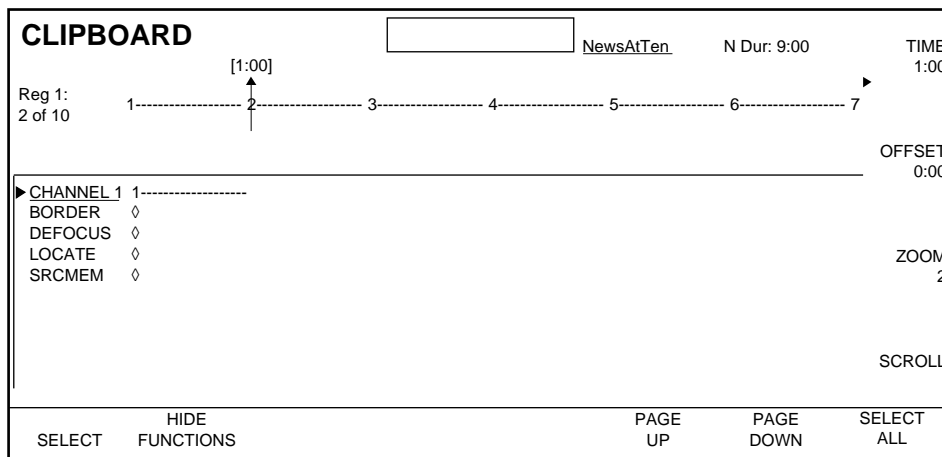


Figure 5-4. Clipboard Screen

The top of this display includes the Master Timeline of the current effect. Generally this will be the effect from which the clipboard data below was cut or copied from, but not necessarily. Recalling a different effect register will display that new current effect master timeline on the Clipboard screen, but will not change the clipboard contents.

Delegating and undelegating channels affects what is displayed on the Clipboard screen, similar to the Ind. Timelines display. Delegated channel names are upper case, and undelegated channel names are lower case. Channel delegations affect both the channel information contained in the Clipboard display *and* the delegation of channels for the current effect. Clipboard operations are covered in more detail later in this manual.

Tutorial: Creating a New Effect

To illustrate the basics of effect editing, we will create a simple single channel effect. The picture will be half size, grow a border, and then rotate back and forth. A spin will then be added to the effect.

The effect will be created and edited with Partial KF mode OFF (similar to traditional DPM editing you may be familiar with), and then with Partial KF mode ON. This will show how these modes differ, and demonstrate some of the advantages of editing with Partial KF mode ON.

Partial KF Off

Recall Empty Register

The easiest way to create a new effect is to recall an empty register.

1. Press the Deleg 1 button so it is illuminated. This delegates the Control Panel so it will affect only Channel 1 and automatically enables that channel. If any other channels are enabled, turn them off by pressing their Enable buttons so they are not lit.
2. Press Recall Effect, •, Enter. This will load the next empty register as the current effect and bring up the Unity KF values to the work buffer for Channel 1.

Press the Timeline top menu button to select the Ind. Timelines screen. At this time the effect has no keyframes and so cannot be run.

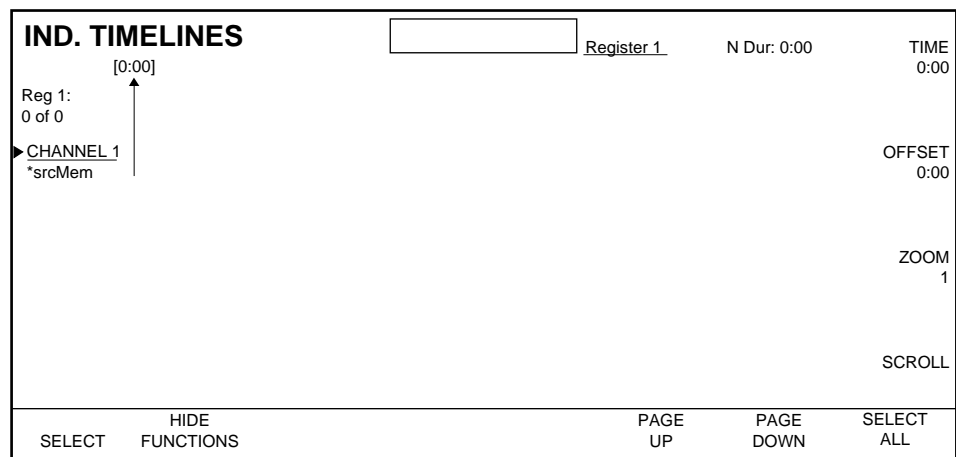


Figure 5-5. Empty Register Recalled

Create First Keyframe, Partial KF Off

You now need to create the first keyframe of the effect.

3. With the Partial KF button *not* illuminated (OFF), modify the work buffer to the desired initial setting with the Control Panel’s menus and transform controls. Do the following:
 - a. Press the Size/Locate transform button, then twist the Joystick counter-clockwise to reduce the picture to half its size. Alternatively, you can press the Z button, type • 5 on the keypad and press Enter.
 - b. Press the Picture Frame top menu button, press the BORDER > soft button, then press BORDER MODE to select BOX. Then press the BORDER WIDTH ALL SIDES transfer button, type 0 on the keypad and press Enter. The border will be turned on and set to zero width. This is done because we want the border to grow to the desired width when the effect runs, instead of popping on.
4. Press the Insert After or Insert Before button (either button can be pressed to create the first effect keyframe). This creates function keyframes containing the altered work buffer parameters.

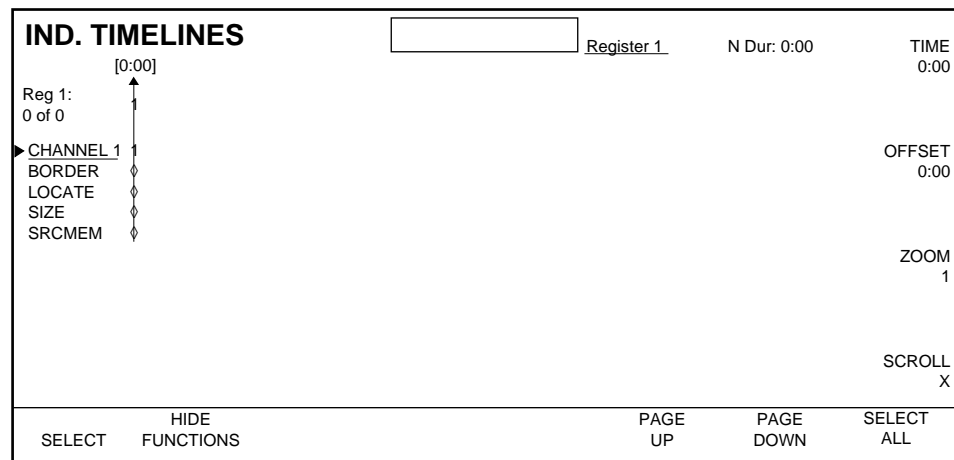


Figure 5-6. First Keyframe, Partial KF Off

Press Timeline to select the Ind. Timelines screen and notice that function keyframes now exist. The Channel 1 Timeline now has a numbered channel keyframe, and the Master Timeline at the top of the screen also has a numbered master keyframe. Besides the Border, Locate, and Size functions, a SrcMem function also exists that contains source selection information. SrcMem is present for all effects regardless of whether a specific source has been specified.

Because this effect has only one keyframe, the effect is static and cannot be run.

Create Additional Keyframes

You will now add some more keyframes. The first one will make the border grow and rotate the picture slightly.

5. Press Picture Frame and return to the Box Border menu. Press the BORDER WIDTH ALL SIDES transfer button so the parameter is highlighted, and then type • Enter on the keypad to restore the default border width (0.3500).
6. Press the Source button, press the Rotate transform button, then push the joystick gently toward the right so the picture rotates about 45°. When close, you can make it exactly 45° by pressing the Center button once. Alternatively, you can press the X button and type • 1 2 5 on the keypad and press Enter.

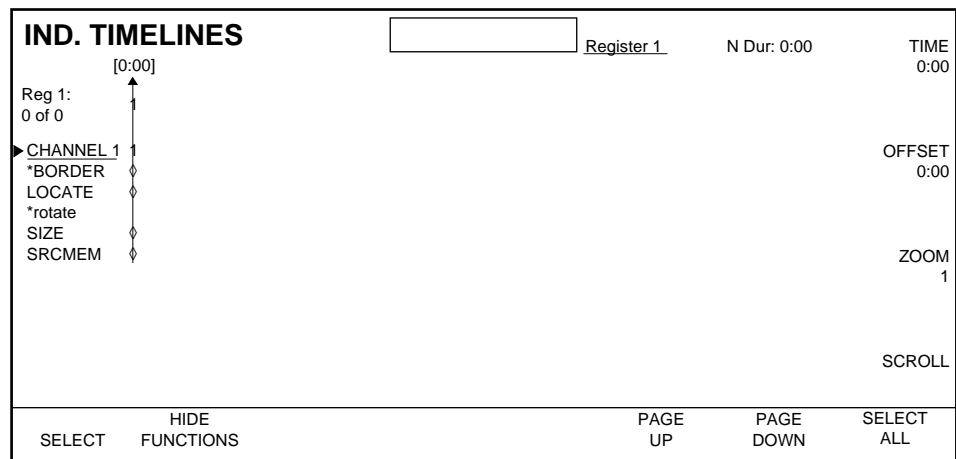


Figure 5-7. First Keyframe With Changed Work Buffer Values

Press Timeline to select the Ind. Timelines screen and notice that the names of the functions you changed now have asterisks (*). The Border function appears in capitals to indicate it has a defined value at that keyframe. The Rotate function is lower case to indicate it does not have a defined value (the change you made has not been applied to the effect yet).

7. Press the Insert After to add a keyframe to the effect.

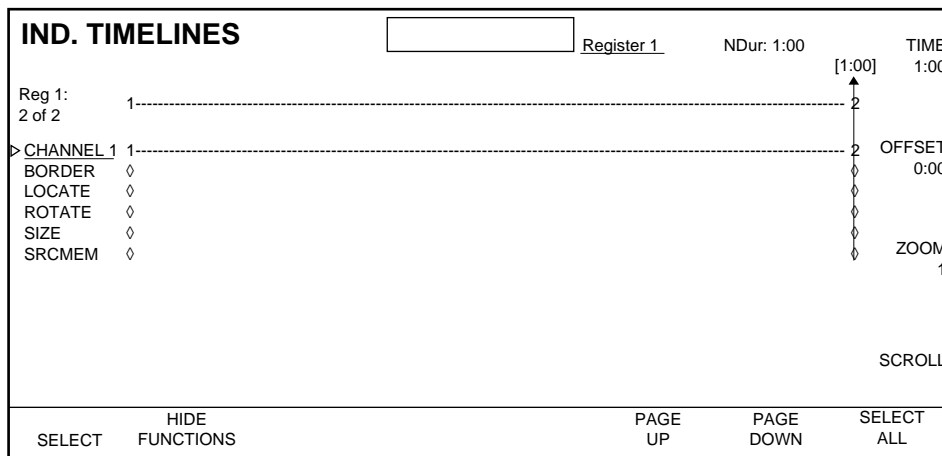


Figure 5-8. Second Keyframe Added, Partial KF Off

Notice that function keyframes are added to all the active functions at the new channel keyframe in the effect, including the Locate and Size functions that were not changed. Notice also that a new Rotate function keyframe has also been added to the first channel keyframe in the effect (this is called “back fill”). Back fills apply user default function values, which in this case was zero rotation. This is all characteristic of effect editing with Partial KF OFF.

Now that a second keyframe exists, the effect will have a duration and can be run. Press **Rewind**, then press **Run** and watch the border grow to the default width and see the picture rotate.

You will now add the back and forth rotation to the effect.

8. While on the last keyframe, press **Rotate**, then press the **X** button so it is lit, and type **+/-** Enter. This makes the rotation go the same distance in the opposite direction.
9. Press **Insert After** to add this keyframe to the effect.
10. Without touching any other buttons, type **0** Enter on the keypad. This applies a zero rotation and so turns the picture back flat with the screen.

- Press the Insert After to add this final keyframe to the effect.

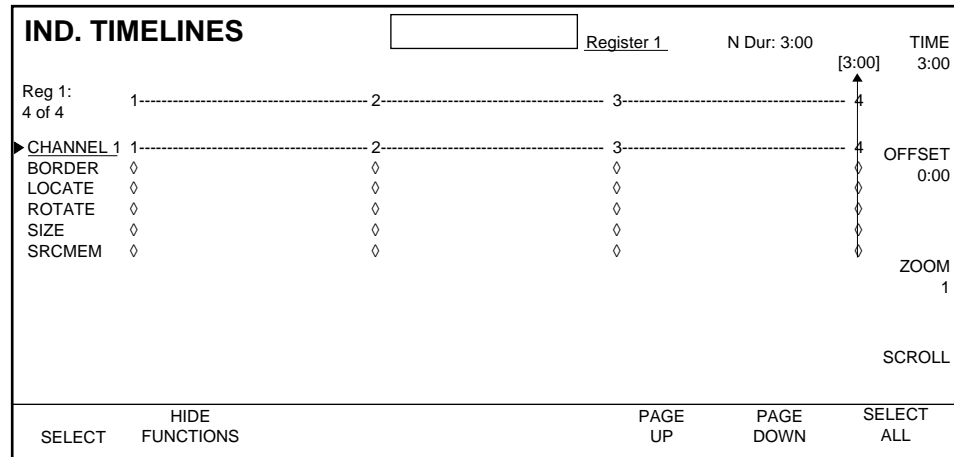


Figure 5-9. Third and Fourth Keyframes Added, Partial KF Off

Notice that editing with Partial KF OFF creates keyframes for every function at every channel keyframe in the effect.

Run the New Effect

Press Run to make the effect run for its duration. The border will grow to the second keyframe, and the picture will rotate back and forth.

The total run duration of the effect does not include the duration of the final keyframe. In the example above the fourth keyframe would acquire a duration if a fifth keyframe were to be added to the effect after it.

Partial KF On

Now repeat the above procedure with Partial KF mode ON. Retain the older effect and remember its register number so you can compare how these effects are created and edited.

- Press Partial KF so it is illuminated (ON).
- Press Recall • Enter to recall an empty register.
- Press Size/Locate, select the Z transform button, type • 5 and press Enter. The picture is reduced to half size.
- Press Picture Frame \ BORDER > \ and press BORDER MODE to select BOX, then select the BORDER WIDTH ALL SIDES transfer button, type 0 and press Enter. The border is turned on and set to zero.

5. Press the Insert After button to create the first keyframe. It will be identical to the first channel keyframe created with Partial KF OFF.
6. Press Picture Frame, return to the Box Border menu, select the BOX BORDER WIDTH ALL SIDES transfer button, and type • Enter on the keypad to restore the default border width.
7. Press Source, press Rotate, select the X button, type • 1 2 5 on the keypad and press Enter to rotate the picture.
8. Press the Insert After to add this keyframe to the effect.

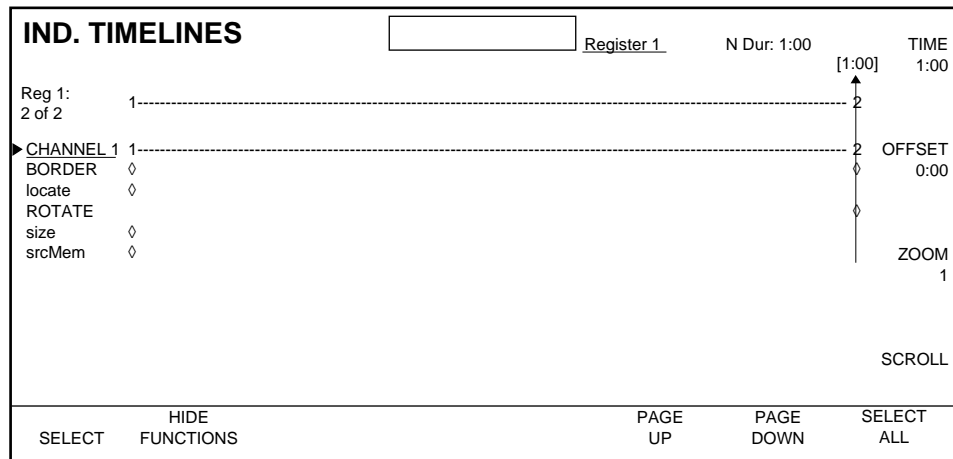


Figure 5-10. Second Keyframe, Partial KF On

Notice that function keyframes are added only for the Border and Rotate functions at that location in the effect. The remaining functions do *not* receive keyframes, since they were not changed. Also there is no back fill for the new Rotate function. This is characteristic of editing with Partial KF ON, which only keeps track of changed keyframes.

Even though a starting keyframe does not exist for the Rotate function, it is not necessary to enter one. We are using the default zero Rotate setting and transform functions cannot be turned on and off. These factory defaults are applied when you rewind the effect. In contrast, the border function needed to be turned on before interpolation to the defined border width could occur, and the default border width setting was not zero.

9. While on the last keyframe, press Rotate, select the X transform button, type +/- Enter, then press Insert After to add this keyframe to the effect.

- Without touching any other buttons, type 0 Enter on the keypad and press Insert After to add this keyframe to the effect.

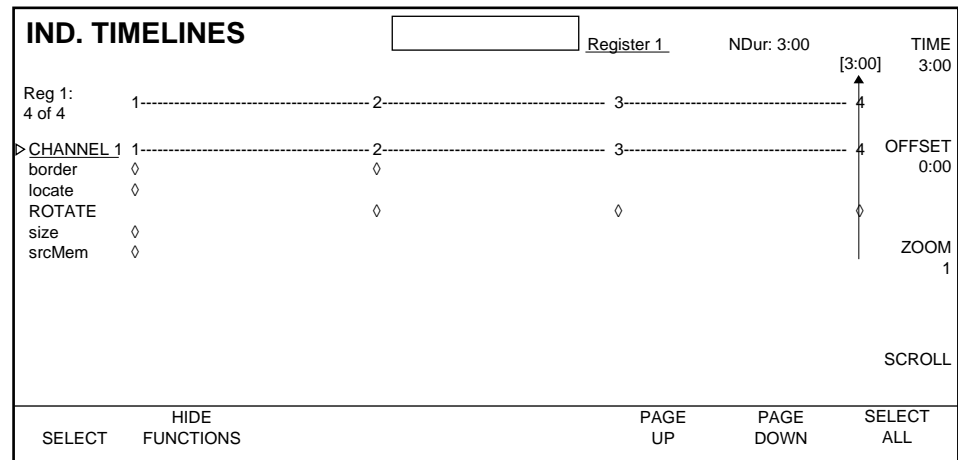


Figure 5-11. Third and Fourth Keyframes Added, Partial KF On

Notice that with Partial KF ON, keyframes were only added for the changed Rotate function, and numbered channel and master keyframes were added to the Channel 1 Timeline and the Master Timeline at these locations in the effect.

Run the New Effect

The effect you just created with Partial KF ON will run the same as the one built with Partial KF OFF. However, it has fewer function keyframes so the storage requirement for this effect is smaller. Subsequent editing of the Partial KF OFF effect is also significantly easier, as demonstrated below.

Edit the Effect

We will now add a Y axis Spin throughout the effect without changing the effect's duration. Instead of inserting new keyframes, we will be modifying existing channel keyframes by adding function keyframes to them. Here the value of editing with Partial KF ON becomes apparent.

Partial KF On

- Make sure the Partial KF mode is ON.
- Go to the last keyframe (you can just run the effect).
- Press the Spin transform button, press Y, then type 1 on the keypad and press Enter. We are using Spin because we want a complete rotation.

4. Press the **Modify** button. Do *not* press an **Insert** button, as this would add a new channel keyframe to the effect.

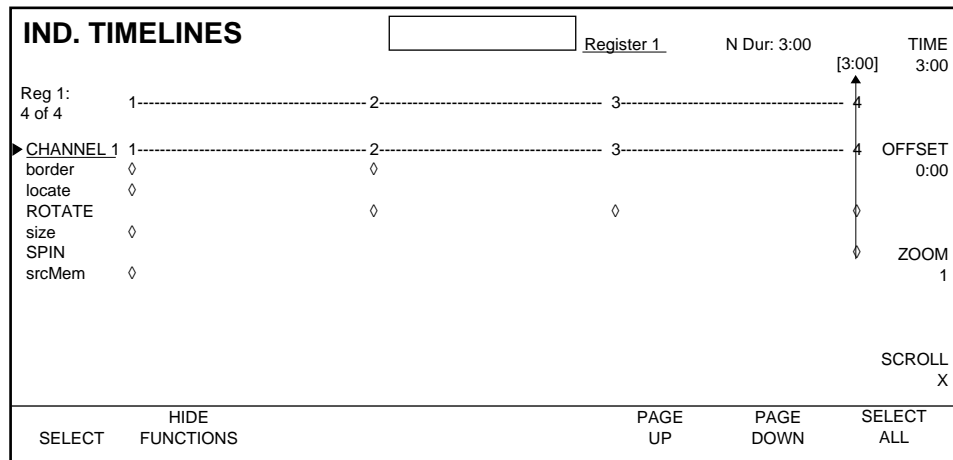


Figure 5-12. Spin Added, Partial KF On

Notice that only one Spin function keyframe was added to the last channel keyframe of the effect. That single change is all that is required. When you rewind and run this new effect the spin will interpolate from its factory default zero value throughout the effect to its final value.

Now suppose you change your mind and decide you want the picture to finish upside down. Simply go to the last keyframe, type a Spin value of 1.5 instead of 1, press Enter, and then press **Modify**. The spin function will be given the new value, and a new spin will be interpolated throughout the effect.

Partial KF Off

In comparison, to accomplish the above change of spin with Partial KF OFF, you would need to edit every channel keyframe in the effect. This is because function keyframes with default values back fill throughout this effect when Partial KF is OFF. Correct values would need to be given to all the back filled Spin keyframes. Modifying just the Spin keyframe in the last keyframe with Partial KF OFF creates an additional half spin only between the third and fourth keyframes, and would *not* smoothly interpolate the Spin through the entire effect.

For a spin of 1 with 4 keyframes in the effect, calculating the Spin values is not too difficult. You would need to enter values of about 0.25 for the second keyframe, 0.75 for the third, and 1.0 for the fourth. This could be done on the keypad, or you could use the Joystick and Center button detents. Obviously this would take longer than changing a single keyframe. To change the effect to have a Spin of 1.5, however, requires an

awkward calculation. The values turn out to be about 0.39, 1.11, and 1.5, detents cannot be used, and it would be difficult to find these values “by eye” with the Joystick.

Turning Partial KF On and Off

It is important to note that Partial KF is an editing mode, which can be turned on and off at any time. Keyframes do not disappear or reappear when you change the Partial KF editing mode. Even for the effect created with Partial KF OFF, it is not necessary to edit all the keyframes to add the new Spin transform. Simply turn Partial KF mode ON, go to the last keyframe, and change the Spin function to the desired value.

Creating effects with Partial KF OFF generates many function keyframes, and once these keyframes have been created they can only be removed via effect editing. Creating effects with Partial KF ON generates only the keyframes necessary for the effect, and adds greater flexibility for subsequent effect editing.

Clearing the Work Buffer

As you are creating and editing effects, it is sometimes necessary to clear the channel’s work buffer. This gives you a “clean slate” from which you can build a new effect. To clear the work buffer:

1. Delegate the channel(s) whose work buffers you wish to clear.
2. Press the Clear Work Buffer button for the following results.
 - Press Clear Work Buffer once to reset only the transform functions to their Unity KF values (if defined) or to their factory default settings.
 - Press Clear Work Buffer twice to reset all the channel’s functions to their Unity KF values (if defined) or factory default settings.
 - Holding down the Near and/or Far buttons and then pressing Clear Work Buffer returns source memory to its defined Unity settings.

Note *Rewinding an effect will give factory default parameter values (NOT Unity KF values) to any functions lacking keyframes at the beginning of the effect.*

Restoring the Work Buffer

A backup work buffer exists (called the restore buffer) that is separate from each channel's regular work buffer. Information is loaded to the restore buffer under the following conditions:

- When a keyframe is deleted (pressing the Delete button). If multiple keyframes are deleted, only the first keyframe is loaded to the restore buffer.
- When the Clear Work Buffer button is pressed.
- When a different register is recalled. The work buffers of previous current register are loaded.
- Using the Store Work Buffer function (User Tools \ WORK BUF PREF > \ STORE WORK BUFFER...).

To reload the Restore Buffer values to the current work buffer, simply press the Restore Work Buffer button.

Moving to a Specific Point in an Effect

Various methods exist for moving to an effect location, besides moving the Lever Arm or pressing the Run or Rewind buttons.

Moving Forward One Keyframe

Press the Next button to move forward one keyframe at a time. This operation is based on the Master Timeline, and moves to the next master keyframe even if channels are not delegated (the cursor will move to un-numbered diamond master keyframes).

Moving Backward One Keyframe

Press the Prev. button to move backward in the effect one keyframe at a time. This operation is based on the Master Timeline, same as the Next operation.

Moving to a Specified Keyframe

This operation is based on numbered master keyframes on the Master Timeline, which exist only for delegated channels (the cursor will skip un-numbered diamond master keyframes).

1. Press Go To KF to set up the Keypad for a keyframe number.

2. Type the desired keyframe number in the effect.
3. Press either Enter or Trim.
 - Enter moves the cursor to the specified keyframe number.
 - Trim moves the cursor by the specified number of keyframes. The +/- button on the Keypad changes the sign. Trimming by a negative number moves the cursor backwards.

With the Go To KF set up on the key pad, you can also press • Enter to go to the beginning of the effect quickly.

If a keyframe number is entered that is greater than the number of keyframes in the effect, the cursor will move to the end of the effect.

Moving to a Specified Time in the Effect

This operation is based on the effect time as shown on the Master Timeline.

1. Press Go To Time to set up the Keypad for a time entry. The Keypad will show the current effect time.
2. Enter the desired time in the effect.
3. Press either Enter or Trim.
 - Enter moves the cursor to the specified time.
 - Trim moves the cursor by the time amount specified. The ± button on the Keypad changes the sign. Trimming by a negative time moves the cursor backwards.

With the Go To Time set up on the keypad, you can also press • Enter to go to the beginning of the effect quickly.

Moving Before the Beginning or After the End of an Effect

Effects begin at zero seconds. However, the Go To Time operation may be used to move to a time *before* the beginning of the effect (a negative time value may be entered).

When moved before the first keyframe, the Time Cursor will show a negative time:

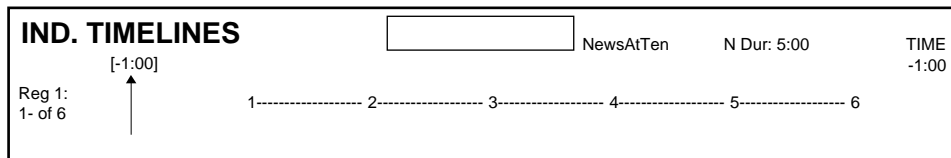


Figure 5-13. Cursor Before Start of Effect

If a new keyframe is inserted before the beginning of the effect, it becomes the new starting point. Since by definition effects start at zero seconds, the time is adjusted and channel and master keyframes are renumbered:

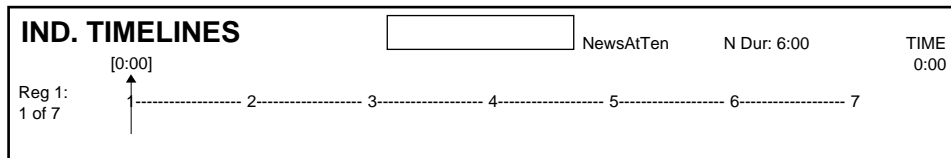


Figure 5-14. Effect After Insert Before Start

An effect will only run to the last master keyframe on the Master Timeline. However, the Go To Time operation may be used to move to a time *after* the end of the effect:

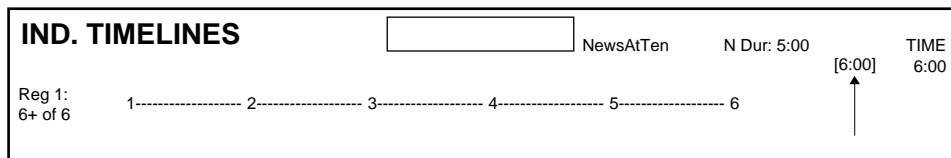


Figure 5-15. Cursor After End of Effect

If a new keyframe is inserted after the end of the effect, it becomes the new final master keyframe that appears on the Master Timeline. A new duration is set for the previous master keyframe, based on the cursor location:

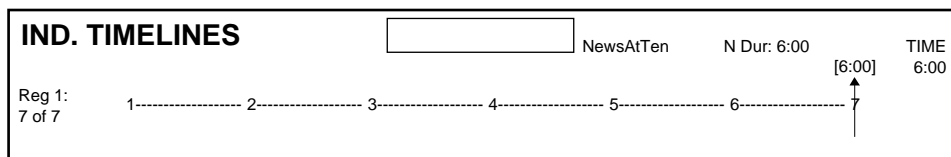


Figure 5-16. Effect After Insert After End of Effect

Running Effects Positioned Outside the Effect

If an effect is run when the cursor is positioned before the first keyframe, the effect will run from the cursor location. If the effect is run when the cursor is positioned after the effect, the time cursor will snap to the beginning of the effect and run from there.

Inserting Keyframes

The Insert Before and Insert After operations are used to insert new keyframes onto one or more function timelines in an effect. This in turn creates new channel and master keyframes on the Channel and Master Timelines of the effect.

The result of the Insert operation varies depending on whether the point of insertion (cursor location) is on a keyframe or between keyframes.

A keyframe consists of both function values and a duration. The keyframe duration is calculated by the Krystal system (time to the next keyframe) and is not actually contained in keyframe data.

Inserting on a Keyframe

In general, when the cursor is located on a keyframe the following insert operations occur.

Insert After

Pressing the Insert After button while on a keyframe inserts a new keyframe after the current one. By default, the insert occurs after the duration of the master keyframe the cursor is on, at the next numbered Master Timeline keyframe location

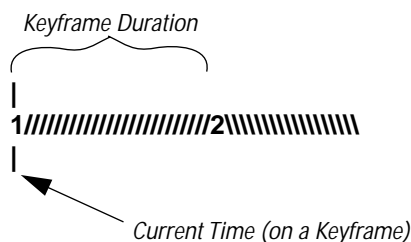


Figure 5-17. Insert After Keyframe, Before Insert

If the effect is positioned on a keyframe which has a duration of one second, then the next keyframe will be created one second after the current time position:

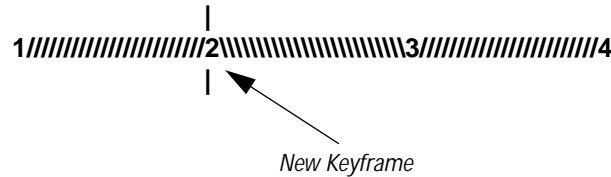


Figure 5-18. Insert After Keyframe, After Insert

Note that the cursor moves to the time of the new keyframe following the Insert After operation.

This operation will increase the duration of the effect by the duration of the inserted keyframe. This inserted keyframe’s duration is, by default, the duration of the keyframe the cursor was positioned on before the insert, though this value can be changed by the operator.

Insert Before

Pressing the Insert Before button while on a keyframe inserts a new keyframe at the current time position. The old keyframe, and all the keyframes that follow, are moved to the right the length of the new keyframe’s duration:

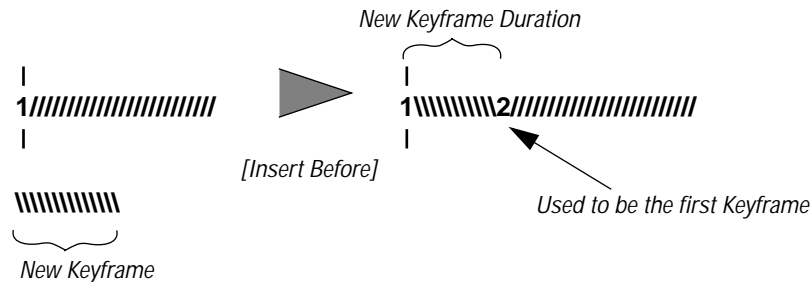


Figure 5-19. Insert Before Keyframe

Note that keyframes are renumbered after the insert (what was keyframe #1 is now keyframe #2).

This operation will increase the duration of the effect by the duration of the inserted keyframe, which by default is the duration of the keyframe the cursor was originally positioned on before the insert.

Note For best results, have Partial KF OFF if you Insert Before the first keyframe of an effect. This sets values for all active functions in the new first keyframe being inserted into the effect.

Inserting Between Keyframes

When you are not positioned on a keyframe, the insert operation inserts a new keyframe at the current location. This is called “inserting on the path”. The default duration of new keyframe inserted on the path will be the time between the cursor location and the next numbered master keyframe on the Master Timeline. When keyframes are inserted on the path, the overall effect duration does not change.

The Insert After and Insert Before buttons perform the same operation when you insert on the path.

In the example below, keyframes 1 and 2 both have a duration of one second, and the current position in the effect is between the two keyframes:



Figure 5-20. Insert Between Keyframes, Before Insert

When the Insert Before or Insert After button is pressed while between keyframes, a keyframe is created at the current position in the effect:



Figure 5-21. Insert Between Keyframes, After Insert

Note that when this is done, the preceding keyframe’s duration is shortened and the new keyframe’s duration extends to the next keyframe. When keyframes are inserted on the path in this manner, the overall effect duration does not change.

When an empty register is recalled, no keyframes exist yet for the cursor to be on or between. In this situation, because the cursor is not on a keyframe the Insert operation inserts on the path. This is why it doesn’t matter which Insert button is pressed when you create the first keyframe in a new effect.

Creating Empty Keyframes (Tabs)

When there are no changes to the work buffer and one of the Insert buttons is pressed, an empty channel keyframe can be created. This is only possible when Partial KF is ON.

This special empty channel keyframe contains a single function keyframe called a Tab. The Tab function keyframe generates a channel keyframe that acts only as a place holder on the timeline (the Tab function contains no data). A Tab keyframe will not affect the interpolation process between other adjacent function keyframes. Function keyframes may later be added to an empty channel keyframe, and this will remove the Tab function from that channel keyframe.

The same rules of inserting on a keyframe or on the path apply to inserting Tab keyframes.

Deleting a Keyframe

Pressing the Delete button while on a keyframe removes that keyframe from the effect. Unlike the Cut operation (described later in this manual), the deleted function keyframe information is *not* entered into the clipboard. Use Delete when you wish to retain the current clipboard information.

When Constant Duration mode is OFF, the duration of the deleted keyframe is also removed from the effect (time to the next Channel Timeline keyframe). When ON, the duration of the previous keyframe will be increased by the deleted keyframe's duration, so the total duration of the effect is unchanged. Constant Duration is discussed later in this section.

After a delete operation, any keyframes following the deleted keyframe will be renumbered accordingly.

Note that should you need keyframe information immediately after it has been deleted, you can load it back into the work buffer with the Restore Work Buffer function.

Modifying Keyframes

When the cursor is on a keyframe, you may make changes to a delegated channel's work buffer and modify that channel's function keyframes with those changes. Unlike Insert operations, the Modify operation does *not* create new channel or master keyframes, though new function keyframes for the delegated channel may be created.

You must be on a keyframe and modifications must have been made for that channel's work buffer before the Modify operation can be used. Some restrictions also apply regarding modifying keyframe durations with Constant Duration ON, which is discussed later in this section.

To modify a keyframe:

1. Move the cursor onto the delegated channel's keyframe you wish to modify.
2. Change the work buffer to the desired state.
3. Press the Modify button to complete the operation.

The example below demonstrates this concept.

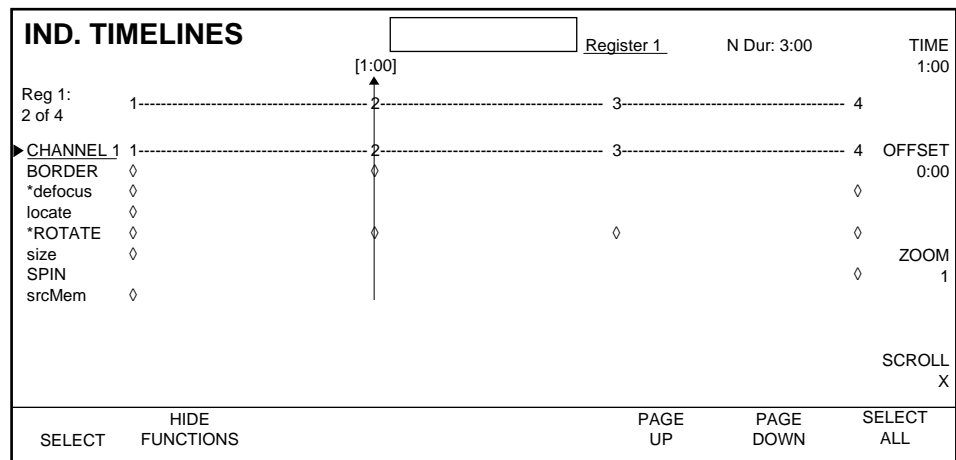


Figure 5-22. Keyframe With Changed Work Buffer

Figure 5-22 shows an effect parked on the second keyframe whose Defocus and Rotate function have been changed. The Rotate function had a set value and so has a keyframe, while the Defocus function was interpolated and currently lacks a keyframe. Pressing the Modify button changes the Rotate function's keyframe value and adds a keyframe for the Defocus function. (Figure 5-23).

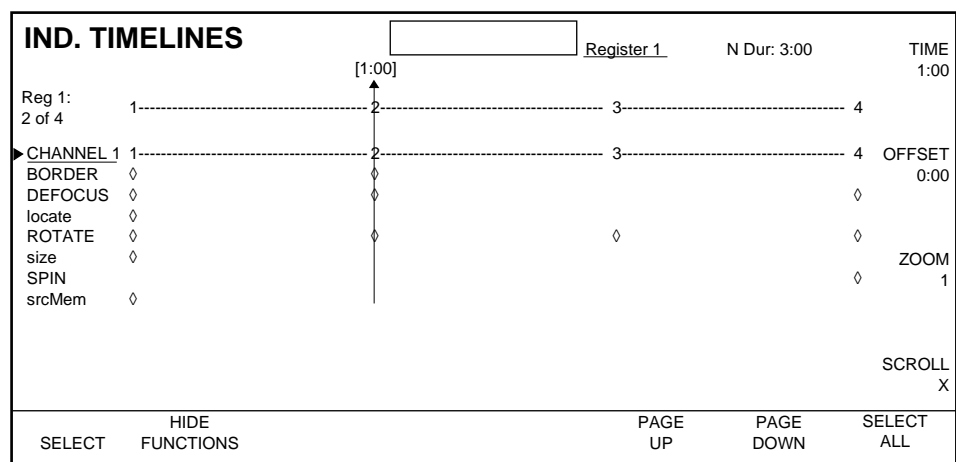


Figure 5-23. Changed Keyframe After Modify

Note that the asterisks have disappeared since the function keyframes now match the contents of that channels' work buffer, and the Defocus function name is now upper case because its value is now defined.

Modify also works for functions that are inactive in the effect. If a function not yet active in the effect is changed in the workbuffer, the Modify operation will add a function keyframe and new function timeline to the effect.

Modifying All Keyframes In The Effect

Pressing **Modify** twice quickly (called **Modify All**) applies any modified work buffer values made to a delegated channel's functions to *all* the changed function's keyframes for all the channel keyframes in the effect. Only existing function keyframes are affected, unless you are modifying a new function that was inactive in the effect (see below).

You do not have to be on a keyframe to use the **Modify All** function. This can be particularly useful for a two keyframe effect that begins and ends off screen. Simply run the effect so the picture is visible, modify the work buffer as desired, and press **Modify** twice to apply the change to both off screen keyframes.

You can also use **Modify All** to change a new function that is not active in the delegated channel. This will add a function timeline, and add function keyframes with the changed work buffer values to all the channel keyframes for that channel.

The **Modify All** function changes each function's keyframes differently, depending on whether an absolute or relative change has been made to the work buffer. See *Section 4 - Basic Operation* for an explanation of this principle.

Editing a Keyframe Duration

As mentioned before, duration values are not actually part of the keyframes in an effect. While they are associated with keyframes, durations are actually calculated by the Krystal system. This permits added flexibility during editing, including the ability to change the duration of an entire effect (**Effect Duration**), or fix the total duration of an effect during editing (**Constant Duration**).

General keyframe duration editing operations are explained here. Changes in system behavior when **Constant Duration** mode is ON is described later in this section.

Showing Keyframe Durations

Pressing the KF Dur. button so it is lit assigns the keyframe duration value to the keypad (this feature is not available when Constant Duration mode is ON).

Once assigned, keyframe durations will be displayed on the keypad's LED display. When the cursor is moved from keyframe to keyframe, the value will change to reflect the duration of the keyframe where the cursor is located:

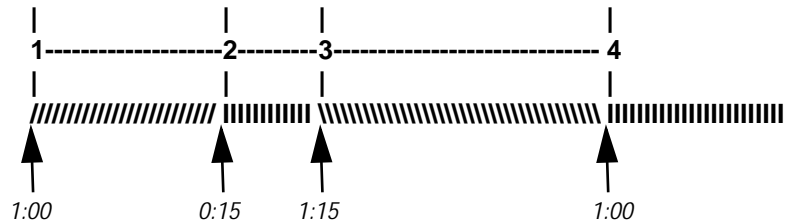
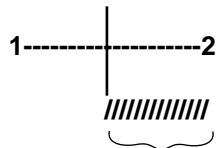


Figure 5-24. Keyframe Duration, On Keyframe

When the time cursor is moved between keyframes, the duration shown is the distance from the current time to the next numbered Master Timeline keyframe.



Keyframe Duration Value = 0:15

Figure 5-25. Keyframe Duration, Between Keyframes

This is how new keyframes may be inserted between keyframes and have a duration that extends exactly to the next keyframe.

Changing the Duration of a New Keyframe

The value for a new keyframe's duration may also be set explicitly from the keypad (this feature is not available when Constant Duration mode is ON).

In the example below, the duration parameter is currently set to the default value of the time from the cursor to the next keyframe.

1. Press KF Dur. so the button is lit.

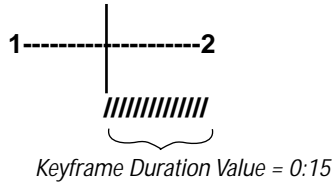


Figure 5-26. Before Keyframe Duration Change

2. Type the new duration value on the keypad, and then press Enter to change the value displayed on the keypad LED.

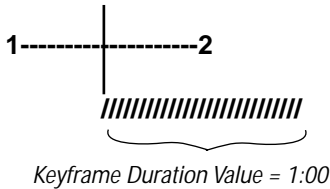


Figure 5-27. New Duration Entered on Keypad

3. Press Insert Before or Insert After to insert the new keyframe with the specified duration.

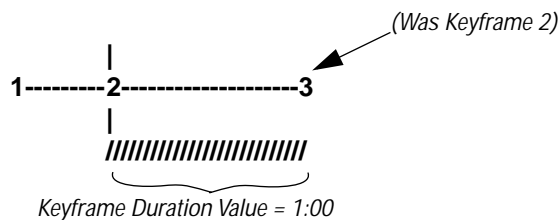


Figure 5-28. New Duration Applied to Keyframe

Modifying an Existing Keyframe Duration

This feature is not available when Constant Duration mode is ON.

1. Move the cursor to the keyframe whose duration you wish to modify.
2. Press the KF Dur. button so it is lit.
3. Enter the desired duration.

4. Press either Enter or Trim.
 - Pressing the Enter button will set the duration value to the time specified.
 - Pressing the Trim button will increase or decrease the duration value by the amount specified.
5. Press Modify to apply the new duration value to the keyframe.

Restoring KF Duration Default to the Keypad

The keypad will retain the last duration value entered until it is changed on the keypad, or until the effect is positioned to a new effect with a different duration.

You can reset the keypad to the factory default one second duration at any time by pressing the KF Dur. button so it is lit, then pressing • Enter (dot Enter).

Editing an Effect Duration

The total duration of an effect is the time from the beginning of the effect (time 0) to the beginning of the last keyframe. The duration of the last keyframe is not taken into account since an effect cannot be run past its last master keyframe.

The duration of an entire effect (rather than changing the durations of the keyframes in an effect) can be changed. When the effect duration has been changed, the Krystal system operates in “forced duration” instead of “natural duration” mode. A forced duration effect scales the values of the individual master keyframe durations. The time display on the screen indicates the duration mode with an N or F preceding the value (F Dur 1:00, vs. N Dur 1:00).

The Effect Dur. button is used to set a new duration for the current effect. Since effect duration is register-based, there is no need for any type of Modify operation and no concern for which channels or functions are delegated, enabled, or selected. The change will be applied to the entire effect. The effect duration cannot be changed when Constant Duration mode is ON.

To change the effect duration:

1. Press the Effect Dur. button to assign the Keypad to the duration of the current effect.
2. Enter the new duration value.

3. Press either Enter or Trim.

After the new duration has been entered, each master keyframe duration is proportionally changed.

The example below shows an effect containing five one-second keyframes, which has a duration of 4 seconds:

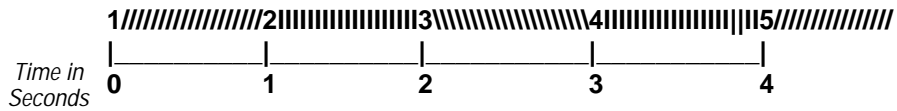


Figure 5-29. Original Effect

The effect duration is then changed to 2 seconds:

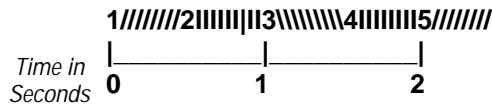


Figure 5-30. Effect Duration Changed

To go from a duration of 4 seconds to 2 seconds requires a scale factor of one half. Each master keyframe duration was multiplied by this scale factor to achieve the result shown above.

After the effect's duration has been forced to the new duration, normal effect editing is permitted. For example, if a keyframe is inserted on the path between keyframes 3 and 4, the new keyframe's duration will by default be 1/4 second.

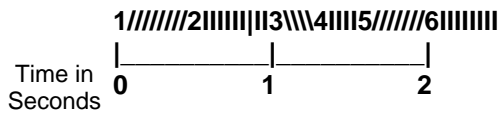


Figure 5-31. Edited Effect with Changed Effect Duration

Restoring the Effect Duration

To restore the effect's natural duration, press Effect Dur. • Enter.

The duration of each master keyframe in the effect is restored by multiplying the keyframe duration by the inverse of the scale factor. In the example, the scale factor is $1/2$. Therefore to restore the original duration, each keyframe's duration is multiplied by 2.

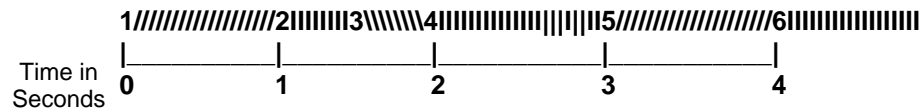


Figure 5-32. Natural Duration Restored

Note that the system does not distinguish between keyframes that were in the effect when it was scaled, and new keyframes created after the effect duration was changed. All keyframes are multiplied by the inverted scale factor.

Restoring the Duration After Several Duration Changes

An effect's duration may be changed more than once. When the duration is restored, it receives the original effect duration before the first duration change was made (provided it has the same number of master keyframes with their originally defined durations).

Constant Duration Mode

Pressing the Const. Dur. button turns Constant Duration mode ON and OFF. The button is lit when Constant Duration mode is ON.

Constant Duration mode maintains an effect duration, even when keyframes are inserted or cut out of the effect. This is useful when an effect has been created with keyframes that precisely match the source material. This mode helps keep you from accidentally offsetting keyframes with an edit operation.

Editing in Constant Duration mode means you cannot insert a new keyframe when parked on a keyframe (since this adds time to the effect). The exception to this rule is when the effect is at the beginning or end, since this does not disrupt the core of the effect. When at the beginning, the Insert Before operation is allowed even when parked on a keyframe. At the end of the effect, the Insert After operation is allowed. In both of these cases, time is added to the effect.

If the Keypad is currently showing the Effect or KF Duration values when the Const. Dur. button is turned on, the Keypad will continue to display the value, but will beep if you try to change it (since the Effect Dur. and KF Dur. buttons are disabled in Constant Duration mode).

Table 5-1 lists what happens to each Edit and Clipboard operation when Constant Duration mode is ON.

Table 5-1. Effect of Constant Duration on Edit and Clipboard Operation

Edit/Clipboard Operations	No Change	Limited Operation	Disabled	Notes
Effect Dur.			X	
KF Dur.			X	
Go To Time	X			
Go To KF	X			
Prev.	X			
Next	X			
Modify	X			
Insert Before		X		Works only between keyframes or on first keyframe.
Insert After		X		Works only between keyframes or on last keyframe.
Delete		X		Previous keyframe extended to fill deleted duration.
Cut		X		Previous keyframe extended to fill deleted duration.
Copy	X			
Paste	X Between keyframes		X On a keyframe	Disabled when on a keyframe. No change when between keyframes. Allowed on the last keyframe.
Clear Marks	X			
Mark	X			
Mark Block	X			

Basic Clipboard Operations

The clipboard is essentially an effect register that is always in memory. Clipboard operations can copy effect information onto the clipboard. Clipboard information may later be pasted back into the same effect or another effect. Each time new information is written to the clipboard, old information is erased.

Clipboard operations on a single keyframe with only one channel delegated with Constant Duration mode OFF are discussed here. Advanced clipboard operations, including use with marked blocks and selections, are discussed in *Section 6 - Advanced Editing*.

Copy Keyframe

1. Move the cursor to the keyframe you wish to copy.
2. Press the Copy button. The function values and duration of that keyframe will be copied from the effect to the clipboard.

In the example below, Channel 1 is delegated with the effect parked on the second keyframe.

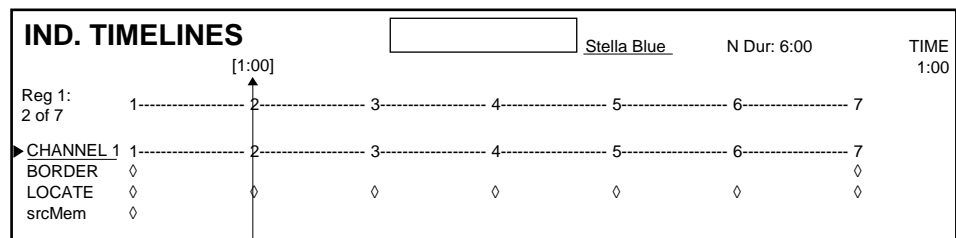


Figure 5-33. Original Effect

Now if you press Copy, then press Timeline to go to the Clipboard menu, the following is displayed:

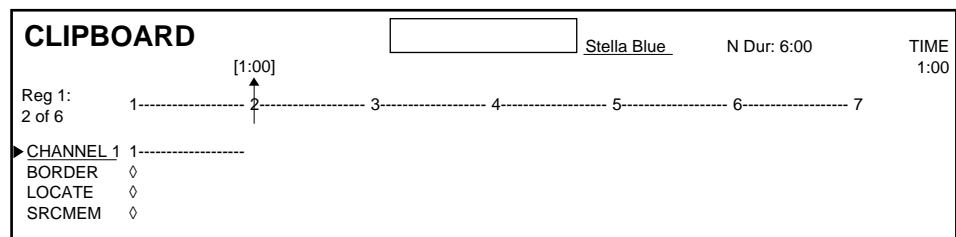


Figure 5-34. keyframe Copied To Clipboard

Function values for every active function in Channel 1 (since it was delegated) now appear on the clipboard. The value for Locate on the clipboard is the value that was set at the cursor location in the effect. Border was on an interpolated value at that keyframe location, but the copy operation makes no distinction between interpolated and set values. The interpolated Border values are copied onto the clipboard as a function keyframe. The clipboard now has a channel keyframe which contains information about Channel 1's Locate and Border functions. If the cursor had been positioned between effect keyframes, function keyframes for all the active functions would have been created in the clipboard, and these keyframes would be given the interpolated values at the copied effect's cursor location.

The duration of the clipboard keyframe is taken from where the information was copied from the effect, in this case the second keyframe for that channel. If the cursor had been positioned between keyframes, the duration of the clipboard keyframe would have been the time to the next channel keyframe on the Channel Timeline (*not* the Master Timeline).

Copying Unequal Function Keyframe Durations

A channel may contain function timelines with unaligned keyframes (created with Partial KF ON). This creates channel keyframes that have function keyframes with different duration times to their next function keyframes.

If you copy a channel keyframe that has function keyframes with different durations, the duration in the clipboard will be truncated to the shortest function duration. A single channel clipboard duration will be the time to the next channel event on the Channel Timeline.

Cut Keyframe

1. Move the cursor to the keyframe you wish to cut.
2. Press the Cut button. The function values and duration of that keyframe are copied from the effect to the clipboard, and then the keyframe (along with its influence on the effect duration) is cut from the effect.

In the example below, the effect is parked on the second keyframe just like the previous Copy example.

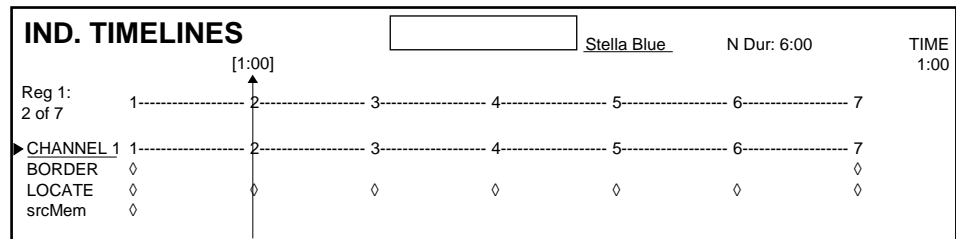


Figure 5-35. Original Effect

Now if you press Cut, the same information is copied to the clipboard (Figure 5-34), but an amount of time equal to the time to the next channel keyframe is removed from the effect:

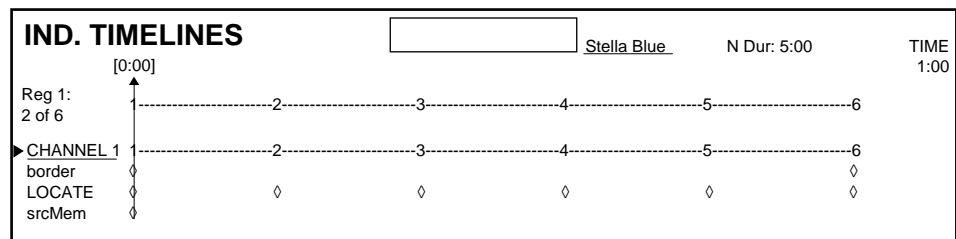


Figure 5-36. Effect After Cut Operation

After a cut operation, the cursor moves to the previous keyframe. This allows you to undo a simple cut operation by pressing the Paste button.

If the cursor had been positioned between keyframes, no time would have been cut out of the original effect (no keyframe would have been removed), but information would still be copied to the clipboard. The duration of the clipboard keyframe in this situation would be the distance to the next channel keyframe.

Cutting Unequal Function Keyframe Durations

Like the Copy operation, if you cut a keyframe that has function keyframes of different durations, the duration in the clipboard will be truncated to the shortest function duration. A single channel clipboard duration will be the time to the next channel keyframe.

Paste Keyframe

Once information has been copied to the clipboard, press the Paste button to insert these values at the cursor location of the current effect. The Master Timeline of the current effect always appears at the top of the Clipboard display for reference.

Though the Paste operation is similar to an Insert, there are important differences. Paste adds clipboard information, rather than work buffer information, to the current effect. Any current work buffer changes will be lost after a Paste, and keyframes are not front or back filled, regardless of whether Partial KF is ON or OFF.

Pasting on an Keyframe

When the effect is positioned on a keyframe, clipboard information is pasted at the end of that keyframe's duration. New keyframes being pasted will have the same duration they had on the clipboard.

For example, say the current effect is positioned on its second keyframe as before. (Figure 5-37).

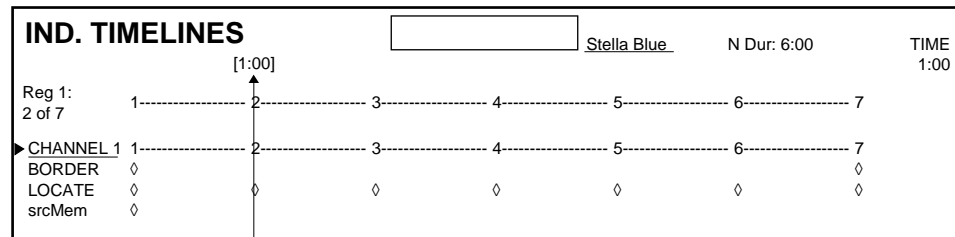


Figure 5-37. Original Effect

Also the clipboard contains the information from a single keyframe. Notice that some functions on the clipboard are different from those active in the current effect. Specifically, there is a Defocus timeline and no Locate timeline (Figure 5-38).

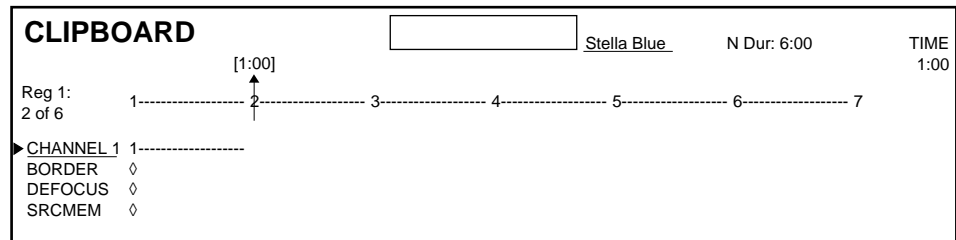


Figure 5-38. Clipboard Contents to be Pasted

When the clipboard is pasted into the effect, the following results:

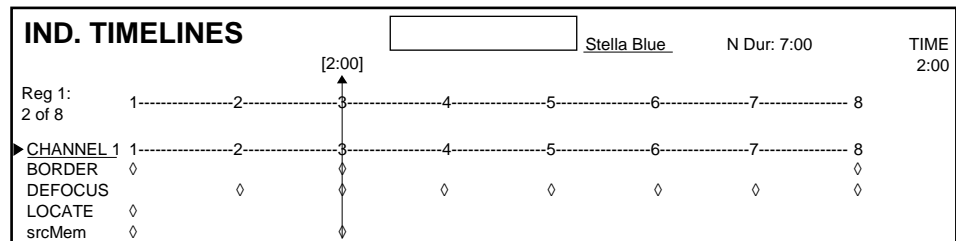


Figure 5-39. Effect After Paste

The Channel and Function Timelines are lengthened by the clipboard keyframe's duration and the keyframes are renumbered. Notice that the Border function that was interpolated in the original effect now has a keyframe and so has a set value. The Locate function that was interpolated and was not in the clipboard retains its interpolated value. The cursor also moves to the inserted keyframe.

Pasting Between Keyframes

When the cursor is positioned between keyframes, a single keyframe in the clipboard is pasted at the cursor location. The duration of the clipboard keyframe is ignored. The pasted keyframe takes its duration from the time to the next Channel Timeline keyframe.

For example, say the same effect in the previous examples is positioned between the second and third keyframes (Figure 5-40)

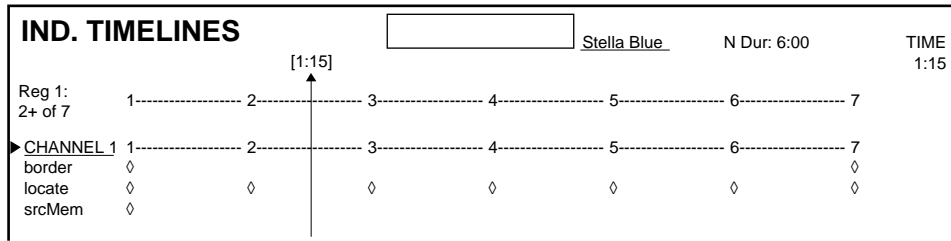


Figure 5-40. Effect Before Paste Between

Also the clipboard contains the information from a single keyframe. Notice that again some functions on the clipboard are different from those active in the current effect (Figure 5-41).

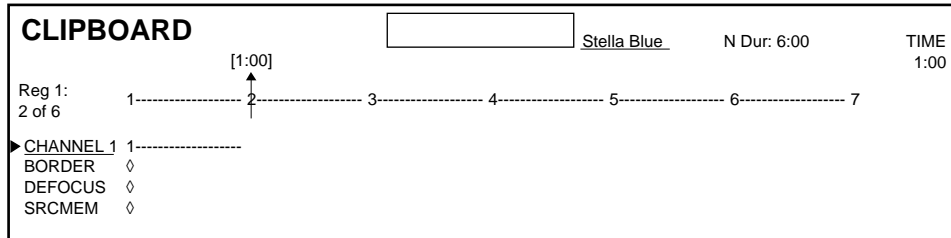


Figure 5-41. Clipboard Contents to be Pasted Between

When the clipboard is pasted into the effect, the following results. The effect duration is unchanged, and an additional keyframe is added to the Channel and Master Timelines.

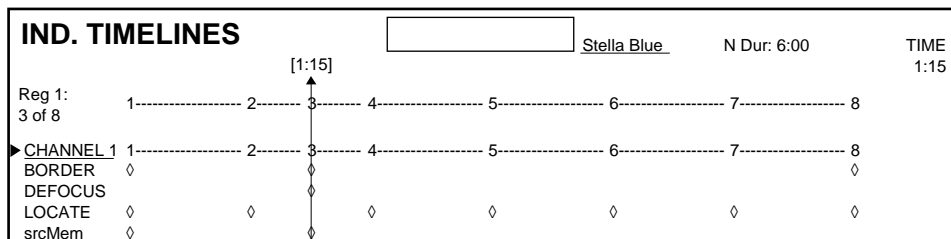


Figure 5-42. Effect After Paste Between

Advanced Effect Editing

Introduction

This section explains some advanced effect editing procedures for the Krystal DPM system. Techniques for editing a multi-channel effect will be discussed, including issues that arise when keyframes have different durations.

Methods for editing selected portions of an effect for editing will also be covered in this section. In general, a particular time or range of time can be *marked* for editing, and/or individual Channel or Function Timelines can be *selected* for editing. Used independently or in combination, marking time ranges and selecting items allows extremely fine control of Krystal DPM edit operations.

Effects can involve more than one channel. Even on a Krystal system equipped with only one Video Processor frame, multiple channel effects can be created and run using the Global, Camera and/or Wireframe channels. A fully equipped Krystal system supports effects containing up to seven channels (Ch. 1, 2, 3, 4, G1, G2, Cam).

The single channel effect editing principles described earlier generally apply to each channel in a multiple channel effect. However, issues regarding the relationships between different channels must be considered when you work with multi-channel effects.

Multiple Channel Delegations

Generally, only channels that have been delegated to the Control Panel will be affected by effect editing operations (selecting items is an exception to this rule). If multiple channels are delegated, these channel can be edited simultaneously. Undelegated channels in multi-channel effects continue to appear on the Ind. Timelines screen, and will make undelegated master keyframe diamond markers appear on the Master Timeline.

The Global and Camera channels support transform information. If you change a transform function for a logical channel (1, 2, 3, 4) and the Global or Camera channel that has influence on that logical channel, the transform will be applied more than once. Generally, it is best to apply a transform to only one level of channel control at time.

The Camera channel contains Combiner information (for those systems equipped with a Combiner), as well as transforms. You need to delegate the Camera channel to make changes to these functions.

Information Display

Some menus can only display one set of channel data at a time. When multiple channels are delegated, the first channel delegated is considered the “display” channel and its data will be shown. To see another delegated channel’s data, simply delegate the channels in a different order so the desired channel is the display channel. Channels are displayed vertically on the Ind. Timelines with the display channel always at the top of the list.

Multiple Channel Enables

Generally all the channels in an effect are Enabled when editing. You may routinely turn channel delegations ON and OFF as you edit complex effects. On multi-channel effects, you may also wish to completely remove one or more channels from the Master Timeline during editing. Channels removed from the Master Timeline will no longer affect Cut, Copy, and Paste durations (see discussion later in this section).

To completely remove a channel from the effect:

1. Press the Deleg. button of another channel to undelegate the channel you wish to isolate.
2. Press the Enable button on the channel you wish to remove to turn it OFF.

Only those channels that are Enabled will run in an effect. Test running an effect with only some of the channels enabled is a good way to isolate functions during editing. For example, disabling the Global channel can let you see exactly how each logical channel’s transforms behave, to help you create complex effects in a controlled manner. You can also run one channel to a specific location in the effect, disable that channel, and run the remaining channels to check their relationships to the disabled channel’s effect location.

When an effect is rewind, the channels active in the effect will automatically be Enabled. Enabled channels not active in the effect are automatically disabled after a rewind.

Unequal Keyframe Durations

Though for every channel keyframe there is a corresponding master keyframe on the Master Timeline, it does not necessarily follow that all the keyframes on all the channels in an effect will be in alignment. Different channel keyframe durations can create master keyframes associated with only some of the channels involved in the effect. This makes it possible to position the cursor on one channel's keyframe, but have it fall on another channel's path (cursor location in [Figure 6-1](#)). It is also possible to have channel keyframes begin at the same time but have different durations (master keyframe #3 in [Figure 6-1](#)).

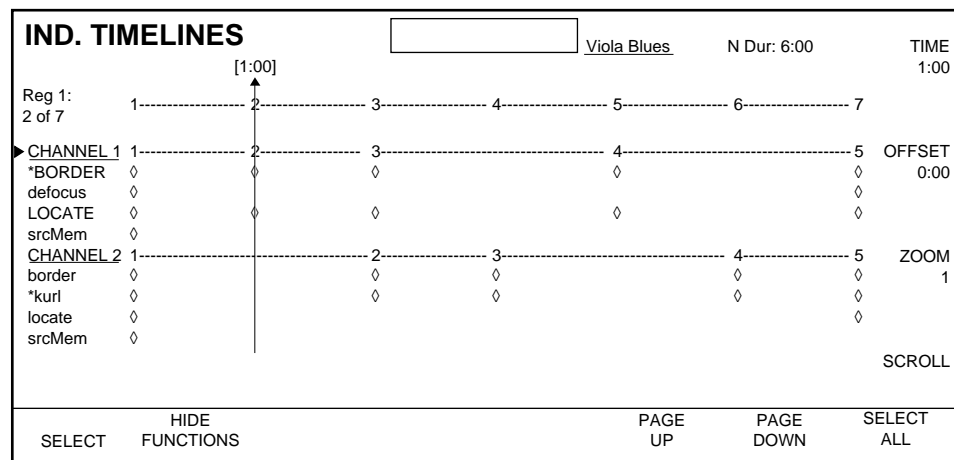


Figure 6-1. Multi Channel Effect with Non-Aligned Keyframes

These special cases may cause multi-channel edit operations to appear to behave differently from single channel effect editing, though the basic editing rules are the same.

The following discussion concerns operations on a specific point in time for the effect. Editing multiple keyframes or ranges of time in an effect is covered later in this section.

Insert Operations

Insert operations are referenced to the Master Timeline. If the cursor is located on a master keyframe, the new keyframe will be inserted at the position of the next numbered master keyframe on the Master Timeline (undelimited master keyframes with diamonds are ignored). The default duration for the new keyframe will be the time from the original cursor location to the insertion point.

For example, in [Figure 6-1](#) the cursor is on a master keyframe associated with only one channel keyframe. The cursor is on the path of the other channel (between channel keyframes). The Border function was changed in

Channel 1, and the Kurl function was changed in Channel 2. When Insert After is pressed (using the default keyframe duration, Partial KF ON, Const. Dur OFF), the following will result (Figure 6-2).

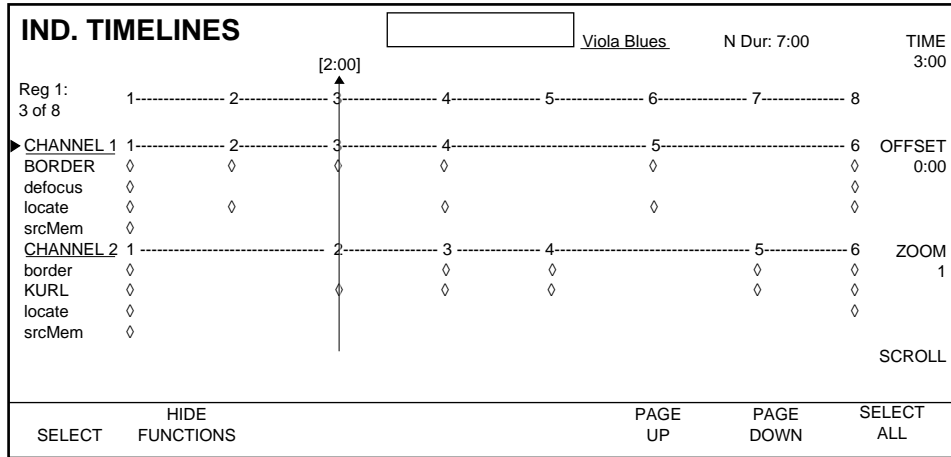


Figure 6-2. After Multi-Channel Insert on Keyframe and Path

The new keyframe’s insertion point for both channels is at the next numbered master keyframe on the Master Timeline, *not* the display channel’s next channel keyframe. The duration from the original cursor location to the insertion point becomes the default duration of the inserted keyframe (in this case one second). This duration is added to both channels’ timelines and to the master timeline. The cursor moves to the beginning of the new keyframe after the insert.

To demonstrate another case, the cursor can be moved to a point where two channel keyframes have different durations. The same Border and Kurl changes were made to the channels at that point (Figure 6-3).

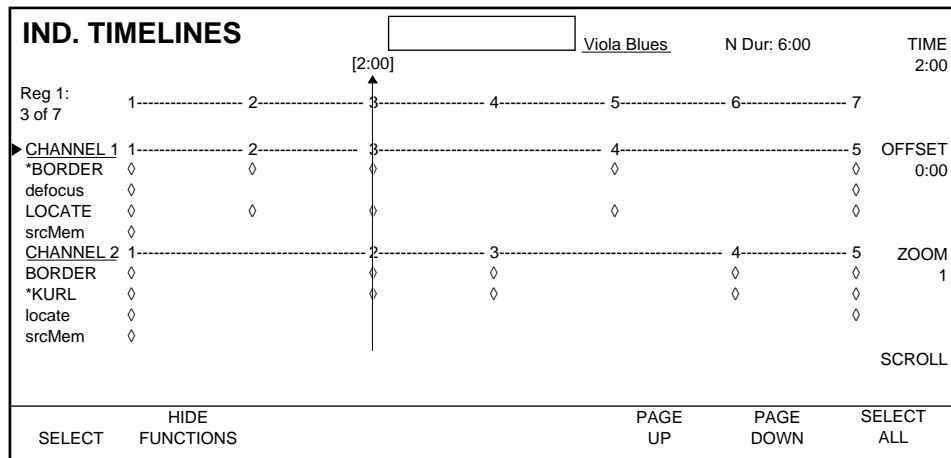


Figure 6-3. Channel Keyframes with Different Durations

When Insert After is pressed (using the default duration, Partial KF ON, Const. Dur OFF), the following results (Figure 6-4).

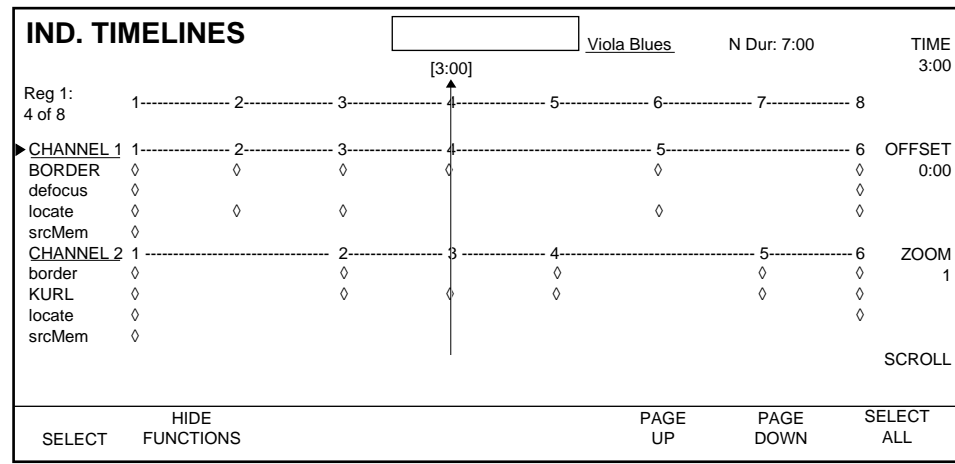


Figure 6-4. After Multi-Channel Insert on Different Durations

Again the new keyframe's insertion point is at the next numbered master keyframe on the Master Timeline. The duration from the original cursor location to the insertion point becomes the default duration of the inserted keyframe (*not* the time to the display channel's next channel keyframe). This duration is added to both channels' timelines and to the master timeline, and the cursor is moved to the beginning of the new keyframe after the insert.

Multi-Channel Insert Before operations while on a master keyframe follow the same rules, except the insert occurs at the cursor location. The default duration of the new keyframe will still be the time from the cursor location to the next numbered master keyframe on the Master Timeline.

When the cursor is between master keyframes, pressing Insert Before or Insert After has the same result. New channel keyframes will be inserted at the cursor location on each of the delegated channels. The default duration of each of these new keyframes will be the time to each channel's next channel keyframe, and the overall duration of the effect will not be changed.

Modify

Modify operations apply to all delegated channels, as described earlier. When changing keyframe durations with KF Dur., however, only the time to the next master keyframe on the Master Timeline will be modified. Effect times after this point are not affected.

For example, suppose the cursor is placed at the start of a one second duration keyframe for Channel 1 which falls at the start of a two second duration keyframe for Channel 2 (Figure 6-5).

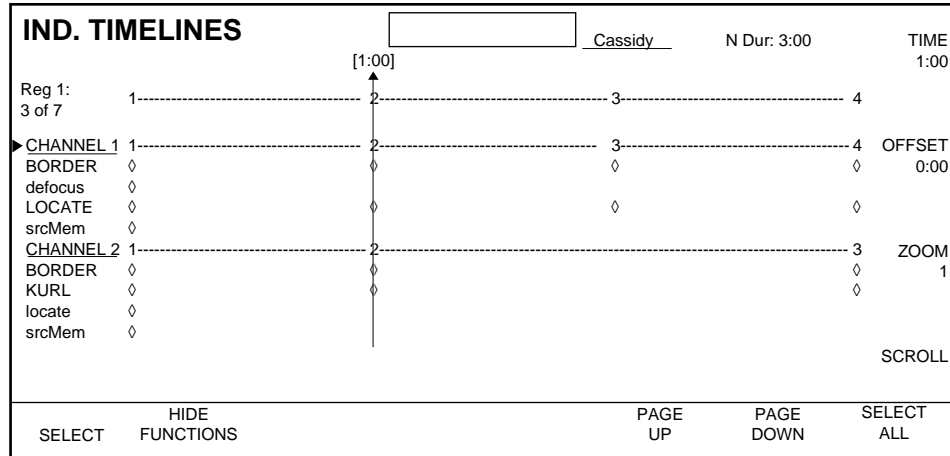


Figure 6-5. Unequal Channel Keyframe Durations

Modifying the duration for both channels to four seconds at that location results in the following (Figure 6-6).

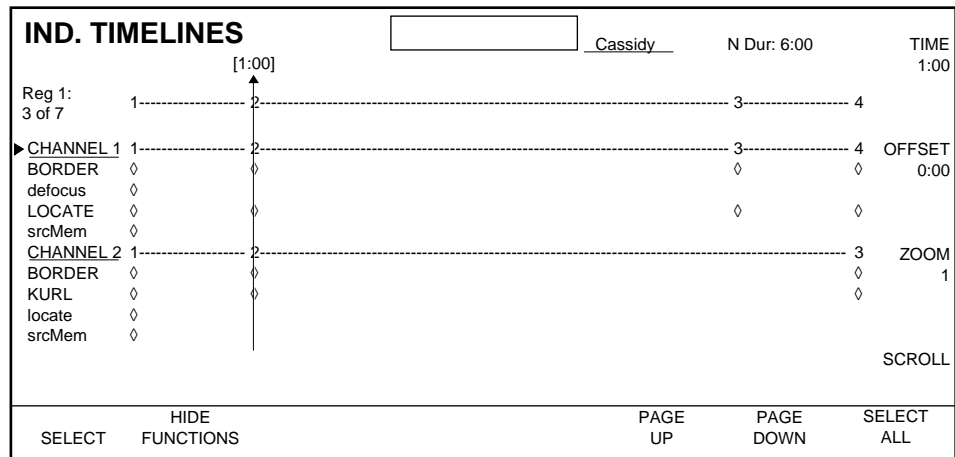


Figure 6-6. Effect After Keyframe Durations Modified

The time to the next master keyframe on the Master Timeline has been modified, which is where Channel 1's keyframe ends. The Channel 1 keyframe that used to be one second now has a duration of four seconds. This time change is also applied to Channel 2, but is restricted to the defined range. Channel 2's keyframe duration is now five seconds. The first second of that duration was changed to four seconds, which is added to the one second portion of the original duration that extended past the next master keyframe.

For single channel effects, the Modify operation does not create function keyframes between channel keyframes (the operation is refused when on the path). For multi-channel editing, however, the Modify operation will create new function keyframes if the cursor is on either a numbered master keyframe on an undelegated (diamond) master keyframe.

Copy

When copying keyframes with more than one channel delegated, the duration for the information put into the clipboard is referenced to the Master Timeline. This duration will be the time to the next master keyframe (when Constant Duration is OFF). This means if you copy information from multiple channels with different durations, the resulting time in the clipboard may truncate longer durations of some of the copied channels.

Cut

The Cut operation is based on Channel Timelines, not the Master Timeline. If (with Constant Duration OFF) keyframes are cut from multiple channels that have different durations, each channel's duration will be reduced by the time to the next channel keyframe on each Channel Timeline. This can cause the removal of different amounts of time from each channel, and the shifting of some channel's keyframes that were formerly aligned with keyframes on other channels.

For example, suppose the cursor is on channel keyframes with different durations (Figure 6-7).

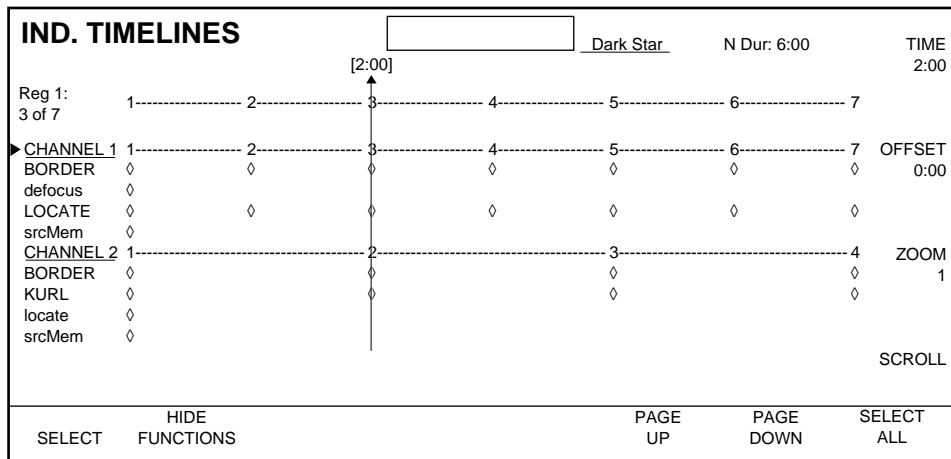


Figure 6-7. Multi-Channel Effect Before Cut

Pressing Cut at this location with Constant Duration OFF will result in the following (Figure 6-9).

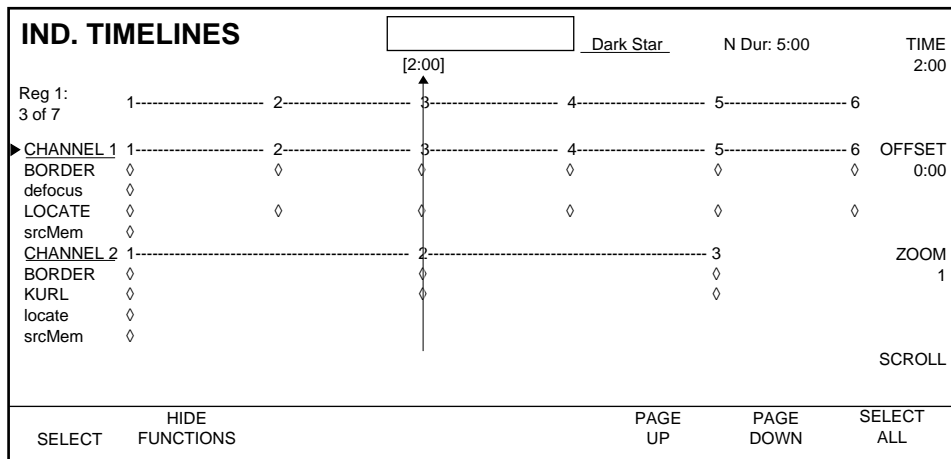


Figure 6-8. Multi-Channel Effect After Cut

A one second duration keyframe was removed from Channel 1, and a two second duration keyframe was removed from Channel 2. Note that the function keyframes in the channel timelines after the cut are no longer aligned as they were.

Though different amounts of time may be removed from the Channel Timelines, the information placed in the clipboard is the same as the Copy operation when Constant Duration is OFF. The duration on the clipboard will be truncated to the next master keyframe on the Master Timeline. For the example above, the clipboard will have a one second duration. In this situation, a Paste immediately after a Cut may not restore the effect to its original condition.

Delete

The Delete operation is also based on Channel Timelines, and works like the Cut operation except information is not placed in the clipboard. Different durations may be removed from each channel by the Delete operation if the channel keyframes in the effect have different durations.

Paste

Pasting single keyframes acts like an Insert After operation, but references each Channel Timeline to determine the starting location of the paste, and the duration, if any, involved. If located on a channel keyframe, a new channel keyframe with a duration equal to the information on the clipboard will be inserted at the next channel keyframe. If located between channel keyframes, the duration of the pasted keyframe will be the time to the next channel keyframe (*not* the time to the next master keyframe, or the time in the clipboard). Because it is possible to place the cursor on one channel keyframe and on the path of another channel, Paste operations can add different durations to each channel involved.

Because channel keyframe durations placed in the clipboard also may be truncated, use care when using Cut, Copy, and Paste operations on multi-channel effects with unequal keyframe durations. A Paste immediately after a Cut may not restore the effect to its original condition.

Mark Cursor

Mark Cursor vs. Time Cursor

Up to this point, we have used the Time Cursor for effect editing. Moving the Time Cursor changes the current time position in the effect. The Time Cursor is a solid line with an upward facing arrowhead. Another cursor is

available (Mark Cursor) whose movement does not change the current time in the effect. The Mark Cursor is a dotted line with a downward facing arrowhead

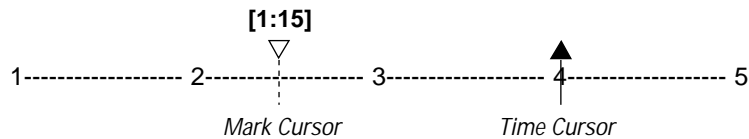


Figure 6-9. Mark Cursor and Time Cursor

The arrowheads of these cursors are solid when located on an keyframe, and hollow when between keyframes.

Each channel's work buffer represents function values for one point of time in the current effect. Work buffers may be modified, but as soon as the time is changed in the effect, the work buffer information is updated to reflect the new effect position.

Suppose you had modified several functions at the current time in the effect, then realized you wanted to apply those changes somewhere else on the Master Timeline. You cannot move the Time Cursor since that will overwrite your changes to the work buffer. The solution is to activate the Mark Cursor, move to the effect location you wish to change (using the Lever Arm, Prev, Next, or Go To operations, but not the Run button), and then edit that effect location with your modified work buffer values.

Activating and Deactivating the Mark Cursor

Press the Mark Cursor button to activate the Mark Cursor and deactivate the Time Cursor. The Time Cursor (and thus the current time in the effect) remains fixed when the Mark Cursor is active. Edit and Clipboard operations work relative to the active cursor.

Note *The Run function updates the work buffer no matter which cursor is active. Run is based on the Time Cursor position. If an effect is run when the Time Cursor is inactive, the Mark Cursor will remain at its current position.*

Press the Time Cursor button to activate the Time Cursor and deactivate the Mark Cursor, which will disappear.

Mark Cursor and Change Indicators

The asterisk (*) function change indicator is derived by comparing the calculated effect data at the Time Cursor location with the current work buffer values. When using the Time Cursor, after a Modify the new information added to the effect will match the current work buffer (that is where the information came from), and so the change indicator will disappear.

When using the Mark Cursor while the Time cursor is elsewhere in the effect, a Modify will not clear the change indicator. The values at the Time Cursor values will not change after a Modify somewhere else in the effect. With the Mark Cursor you can therefore quickly apply the same function change to different individual locations in the effect, one after another. To do this:

1. Change the function value(s) in the work buffer.
2. Press Mark Cursor to activate this cursor.)
3. Move the cursor to each desired keyframe in turn (using the Lever Arm, Prev, Next, or Go To operations, but not the Run button) and press Modify.

Marking the Master Timeline

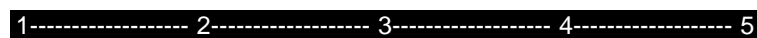
So far in this manual, single keyframes or single points of time between keyframes have been edited. It is also possible to select ranges of time in the effect to edit.

Marked areas apply to all the currently delegated channels, provided no item selections have been made to the effect (selecting items is covered later in this section).

You can use either the Time Cursor or the Mark Cursor to mark part of an effect.

Marked Blocks Overview

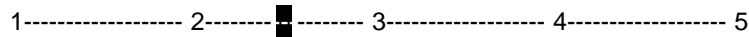
A portion of an effect can be marked for editing (Mark or Mark Block). Blocks are always marked in relation to the Master Timeline. A marked block may be as long as the entire duration of the effect.



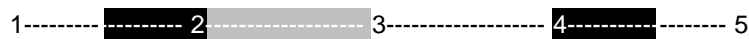
Or be some interval on or between keyframes



The marked block may be as short as a single point in time



Or the Master Timeline may be marked with several blocks.



Marked Block's Area of Influence

When a master keyframe has been marked, not only will the marked area be affected by an edit operation, but the duration of a marked keyframe may also be involved as well. In addition to highlighting marked blocks, this extra “area of influence” is shown shaded (Figure 6-10).

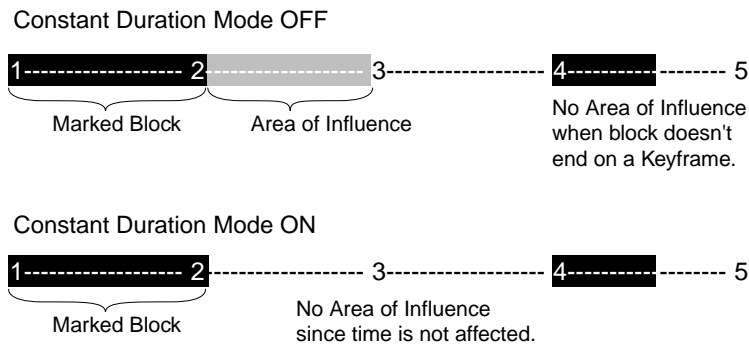


Figure 6-10. Marked Block Area of Influence

When a keyframe influences a marked block, the Master Timeline is used for reference. The duration of the area of influence is determined by the location of the next master keyframe. When Constant Duration Mode is ON the time duration of the effect is not affected and so areas of influence are not shown. After a block has been marked on the Master Timeline, the affected Channel and Function Timelines will be similarly highlighted and shaded.

Marking a Block of Time

To mark a block of time on the Master Timeline:

1. Move the cursor to one end of the effect location you wish to mark.

2. Press the Mark Block button located in the Clipboard Operations section of the Control Panel.
3. Move the cursor to the other end of the block you wish to mark. The Master Timeline will be highlighted as you move the cursor through the effect (Figure 6-11).

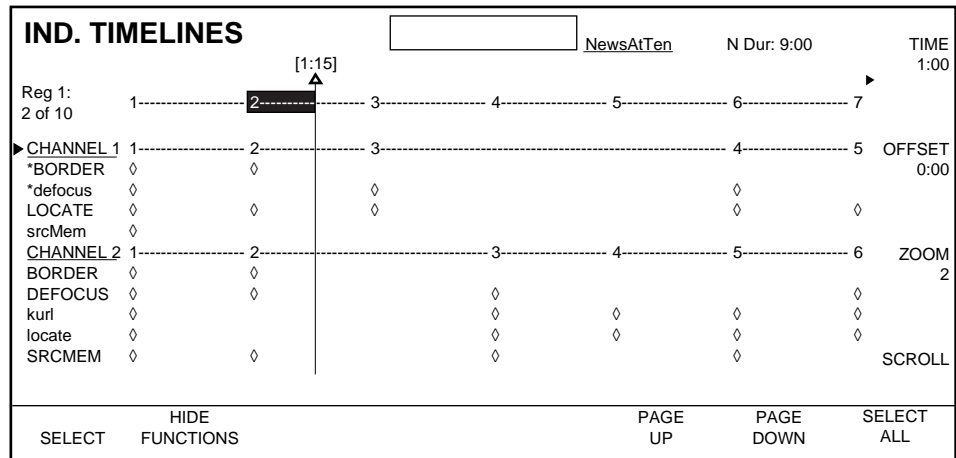


Figure 6-11. Marking a Time Range

4. Press the Mark Block button again to select the block (Figure 6-12).

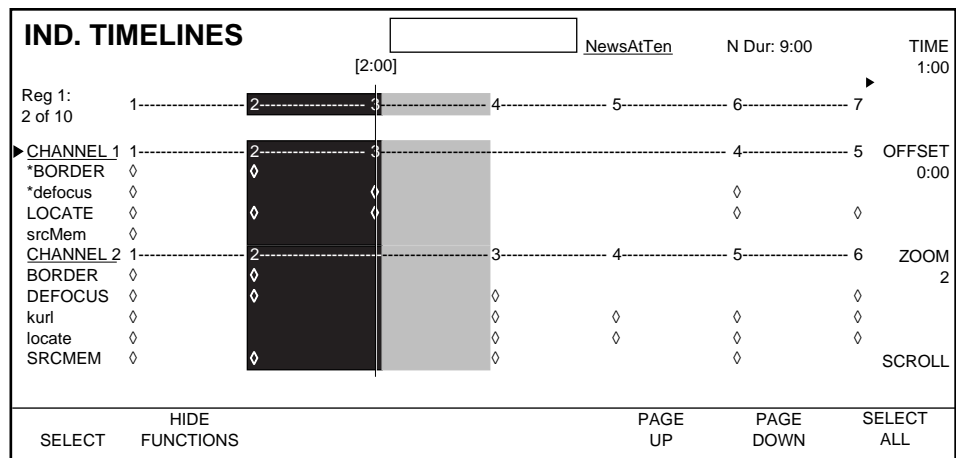


Figure 6-12. Time Range Marked

Marking a Single Point In Time

To mark a single point in time on the Master Timeline:

1. Move the cursor to the effect location you wish to mark.

2. Press the Mark button located in the Clipboard Operations section of the Control Panel.

The effect location will be highlighted on the Master Timeline and, if appropriate, the area of influence for that point will be shaded. The Channel and Function Timelines involved will also be highlighted and shaded (Figure 6-13).

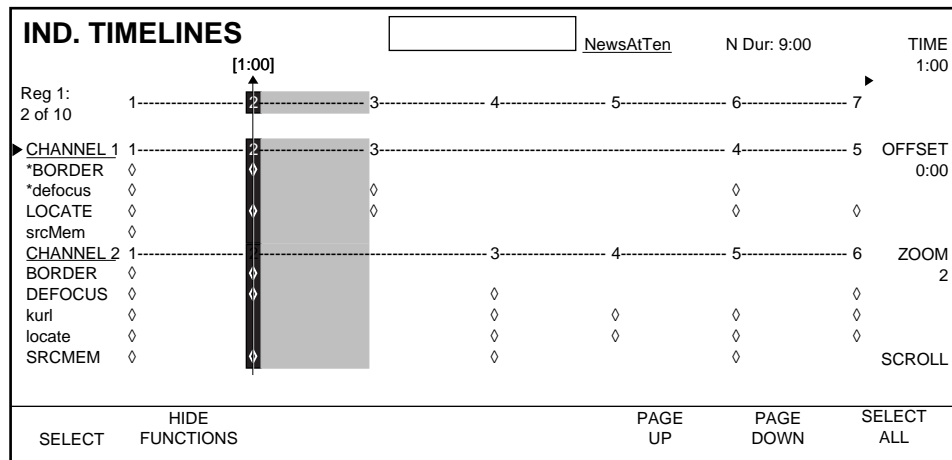


Figure 6-13. Single Master Keyframe Marked

Clearing Marks

To clear marked blocks of time on the Master Timeline, press the Clear Marks button. All the currently marked blocks will be cleared from the effect.

Mark Block Shortcuts

- Press and hold the Mark Block button, then press the Mark button to mark the entire Master Timeline.
- Press and hold the Mark Block button, then press either the Next button or the Prev. button to mark the Master Timeline from the cursor position to either the end or the beginning of the effect.
- Press and release the Mark Block button, then press either the Next or Prev. button to mark the Master Timeline from the cursor position to either the next or previous master keyframe on the Master Timeline.

Insert Operations Ignore Marked Blocks

Insert operations ignore any marked blocks. Insert operations only apply the current workbuffer values to the cursor location of the effect. After an Insert, if any blocks were marked will be automatically cleared.

Modifying Marked Blocks

Press the Modify button to apply changes in each delegated channel's working buffer to all the function keyframes that appear in a marked block. This is similar to the Modify All operation (pressing Modify twice), but the changes are applied only to the marked block, not the entire effect.

Absolute and relative parameter changes are taken into account when the system determines how each channel's work buffer has changed. See *Section 4 - Basic Operation* for more information about absolute and relative changes.

Clipboard Operations on Marked Blocks

Copy, Cut, Delete, and Paste clipboard operations work not only on single points in time, but also on marked blocks of time in an effect.

Copying a Marked Block

The Copy operation can be used when you want to copy function behavior across a range of time. You can then paste into an effect and have the functions behave as they did at their original location.

For example, suppose you marked a block of time from the second to the fourth keyframes of a single channel effect ([Figure 6-14](#)).

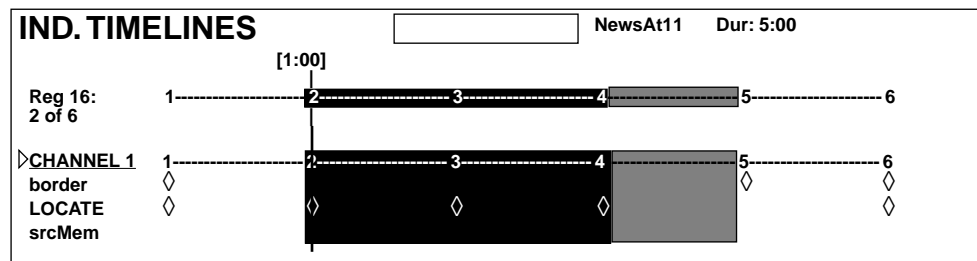


Figure 6-14. Multiple Keyframe Marked Block

Pressing Copy places information corresponding to the marked time on the clipboard and clears all marks on the Master Timeline (Figure 6-15).

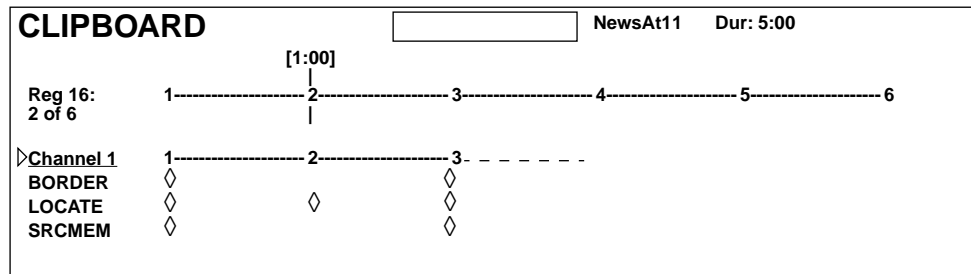


Figure 6-15. Clipboard After Copying Multiple Keyframes

In order to reproduce the copied behavior at another time in the effect, set values must exist at the beginning and end of the marked block for each function being copied. Note that in the example above the clipboard now contains Border function keyframes that did not exist in the original marked block. These values are taken from the effect’s path.

Note also that the original marked block in the above example ended on a keyframe. The duration of this last keyframe is included in the clipboard, and is determined by calculating the time to the next master keyframe (which is not necessarily the same as the duration of that function’s original keyframe). In the example above, the next Locate function keyframe was two seconds after the end of the marked block. A Border function keyframe, however, existed only one second after the marked block, which created a master keyframe on the Master Timeline. Therefore the duration of the last keyframe in the clipboard was one second, not two.

Marked blocks can also be copied from multiple channel effects, and in general behave the same as a single channel effect. Note, however, that it is possible to mark multiple channels with different duration channel keyframes, like the different duration functions shown in earlier examples. The duration of the final keyframe copied to the clipboard is again determined by calculating the time to the next master keyframe on the Master Timeline.

Copying Multiple Marked Blocks

More than one marked block on the Master Timeline may be affected in the same edit operation. In the case of Copy, when Constant Duration of OFF, blocks are copied into the clipboard from left to right and are appended at the end of the duration of the last keyframe of each preceding block.

For example, [Figure 6-16](#) shows an effect with a marked block from the first keyframe to midway between the second and third keyframes, a marked fourth keyframe, and a marked sixth keyframe.

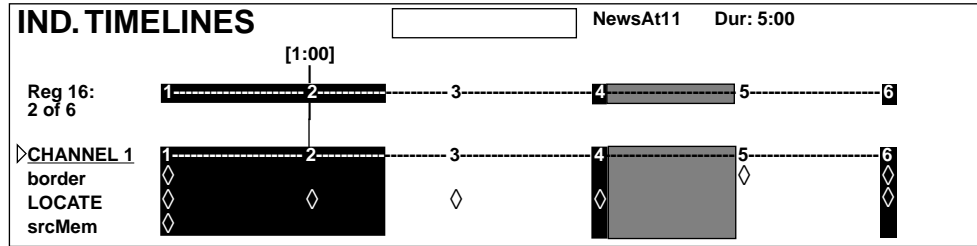


Figure 6-16. Multiple Marked Blocks

Now press Copy and go to the Clipboard display ([Figure 6-17](#)).

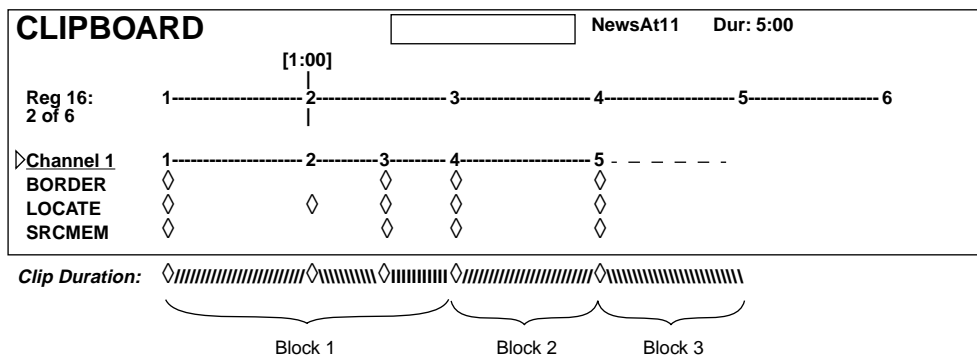


Figure 6-17. Clipboard After Multiple Block Copy

Notice that all the blocks are contiguous with one another. This is only the case when Constant Duration Mode is OFF.

Copy in Constant Duration Mode

When Constant Duration mode is ON, the distance between marked keyframes is maintained when they are copied to the clipboard. For example, copying with the same marked blocks as shown in [Figure 6-16](#) places the following on the clipboard when Constant Duration is ON ([Figure 6-18](#)).

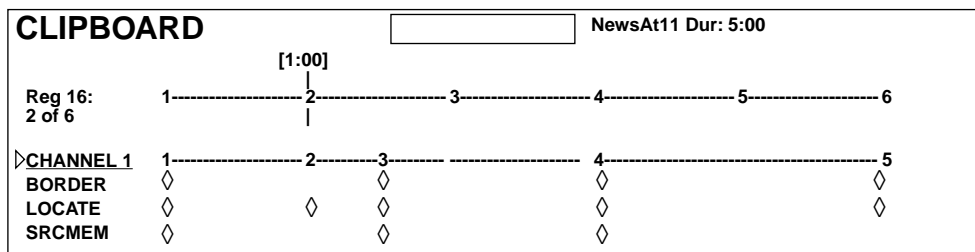


Figure 6-18. Clipboard With Const. Dur ON

The time between the blocks is maintained.

Cutting a Marked Block

Cut operations on marked blocks places the same information on the clipboard as the Copy operation, but the information is then removed from the effect. For example, suppose you have marked a multiple channel block as shown in [Figure 6-19](#).

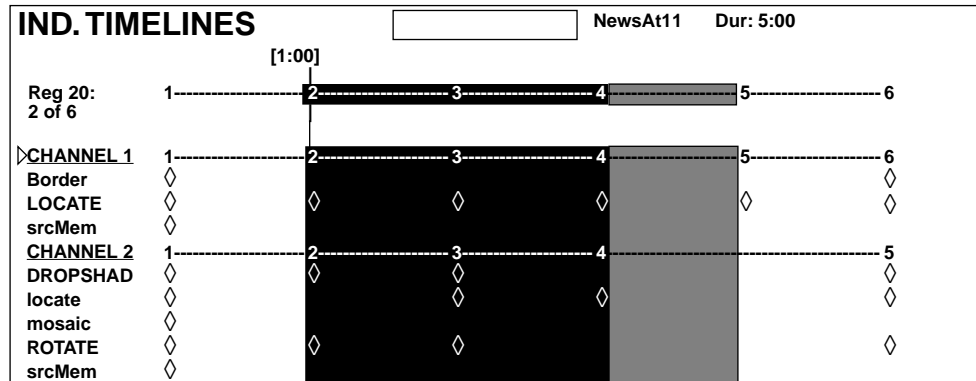


Figure 6-19. Multiple Channel Marked Block

Now press Cut and go to the Clipboard display ([Figure 6-20](#)).

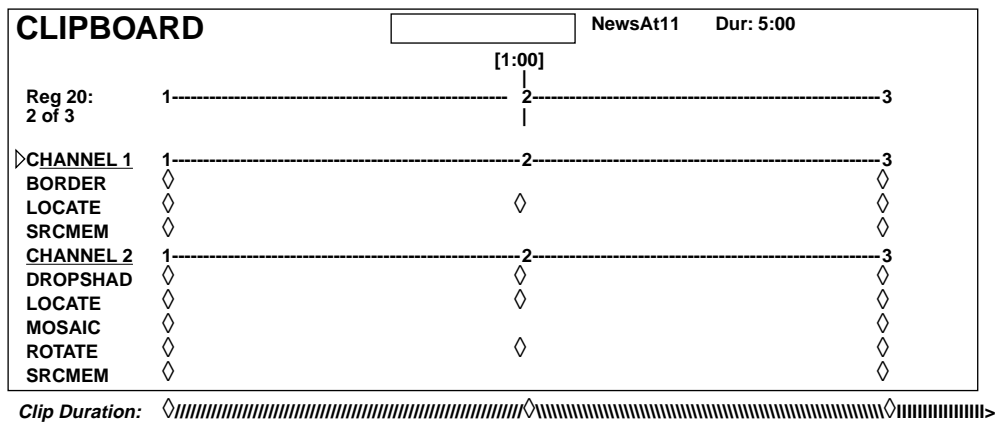


Figure 6-20. Clipboard After Marked Multiple Channel Cut

Information from both channels is copied to the clipboard. When Constant Duration Mode is OFF, a portion of time equal to the marked block (including the gray portion) is cut from each channel. Information on the

other side of this cut area slides over to fill the gap. Figure 6-21 shows the timeline display has been updated to reflect the new sequence of keyframes:

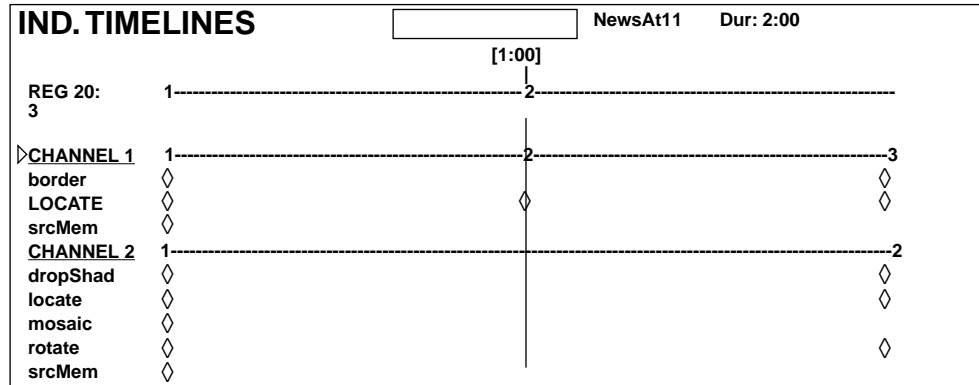


Figure 6-21. Effect After Marked Multiple Channel Cut

Cutting in Constant Duration Mode

When Constant Duration is ON, only the function keyframe data will be removed. The effect will retain its original duration. The keyframes preceding the cut block will be extended in duration to fill the gap. Figure 6-22 shows the result of the above Cut operation with Constant Duration ON.

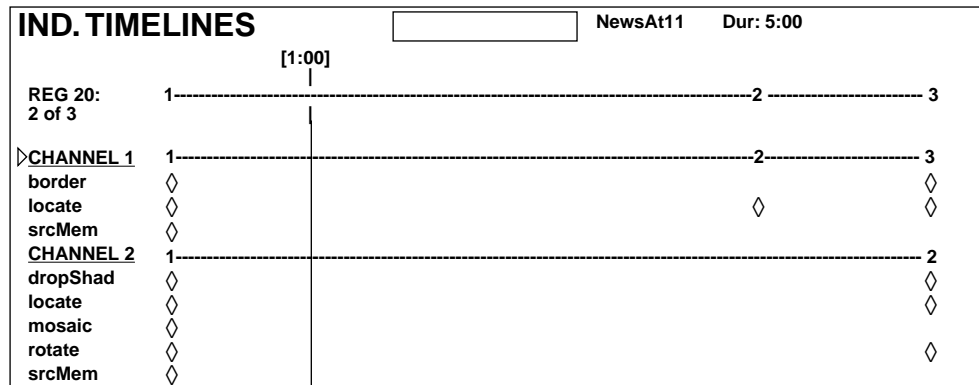


Figure 6-22. Effect After Cut with Cons. Dur ON

Deleting a Marked Block

Delete acts the same on marked blocks as Cut, but the information is not saved to the clipboard.

Pasting Into a Marked Block

When a block of time has been marked on the Master Timeline, the Paste operation is applied to the block rather than the current position in the effect. Press the Paste button to replace a marked block with the information in the clipboard. The clipboard information is pasted at what was the beginning of the marked block. The clipboard can only be pasted into one block, so the Paste button is turned off when there are multiple marks.

For example, suppose some information has been copied into the clipboard (Figure 6-23).

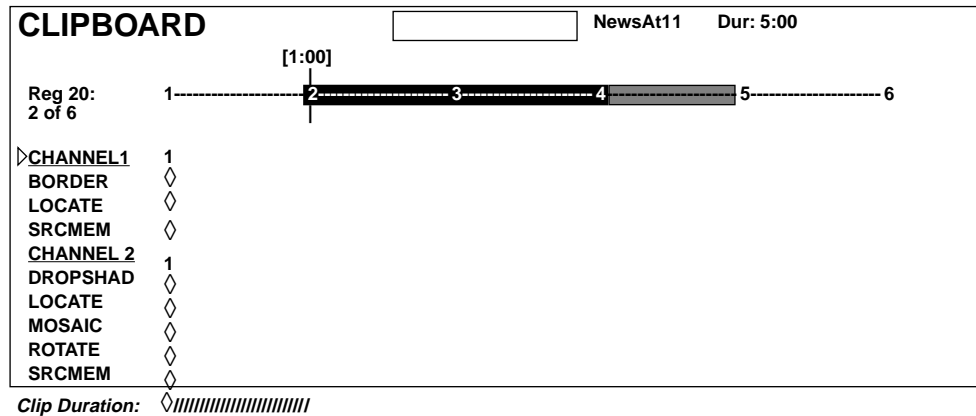


Figure 6-23. Clipboard Information and Marked Block

Suppose also that you have marked the current effect the same as the previous example (Figure 6-24).

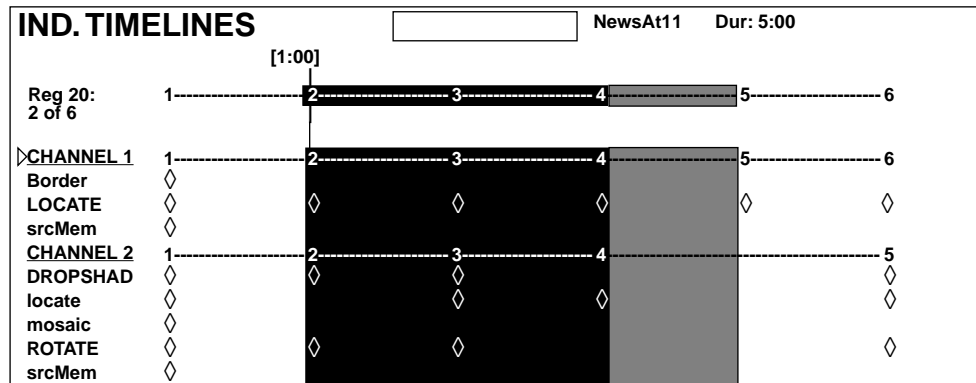


Figure 6-24. Marked Block in Current Effect

When you press PASTE, function keyframes and their keyframe durations corresponding to the marked block are first deleted from the effect (same process as the Delete operation). The clipboard is then pasted into the effect

starting at the beginning of the marked block. Figure 6-25 shows the result of this Paste operation. Note that the effect duration and the number of keyframes on the Channel and Master Timelines has changed.

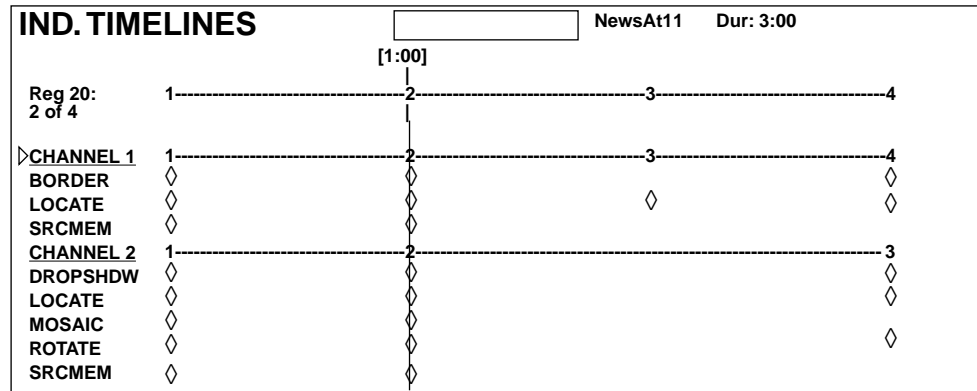


Figure 6-25. Effect After Marked Block Paste

Selecting Items in an Effect

So far in this manual editing operations have been applied to every delegated channel and each active function in those channels. Edit operations acted on either the entire effect, or on marked blocks of the effect, but every function of every delegated channel in the designated time range was affected.

Krystal editing operations can work at a more detailed level of control by selecting items, which restricts the editing operations to only the selected items. While marking blocks chooses ranges of time along the horizontal direction of an effect on the Ind. Timelines display, selecting items chooses channels and functions along the vertical axis of the display.

Selection Overrides Delegation

An important principle of Krystal system operation is the fact that selections have precedence over delegations. If several channels are delegated, and only some of them have been selected, editing operations will only apply to the selected channels. It is also possible to select undelegated channels, and/or select individual functions of undelegated channels. In these cases, the selected items *will* be affected by edit operations, even though they are not delegated. Also, if any channel has a selection, any other channels that are delegated that do not have selections will *not* be affected by edit operations.

Selecting Channels

To select a single channel:

1. Use the Scroll Knob to move the scroll arrow next to the desired channel name.
2. Press the SELECT soft menu button beneath the list of channel and function names. The channel will be highlighted. (Figure 6-26).

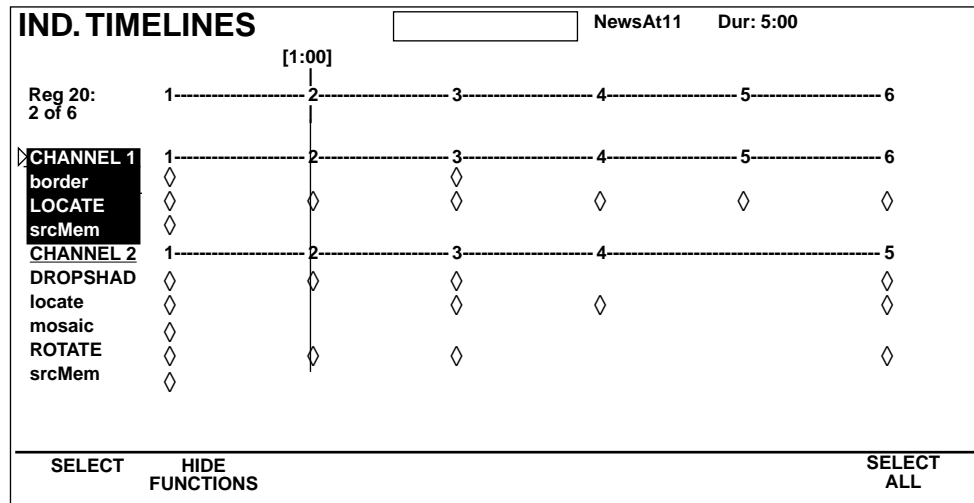


Figure 6-26. Channel 1 Selected

Note that selecting the channel also selects every active function in the channel. What has actually been selected is all the functions for the second keyframe of Channel 1 (the cursor location). Pressing SELECT again deselects the channel.

To select all the channels, press the SELECT ALL soft button. All the channels and all their functions will be highlighted. In this state you have selected all the functions for all the channels at that cursor location. If SELECT ALL is pressed when all the channels are selected, all the channels will be deselected.

Selecting Functions

Rather than selecting entire channels, individual functions may be selected from one or more channels.

For example, to select Channel 1's Locate function and Channel 2's Locate, Rotate, and Mosaic functions:

1. Move the scroll arrow down to Channel 1's Locate function and press SELECT.

2. Scroll down to Channel 2's Locate function and press SELECT.
3. Repeat this process for all the desired functions (Figure 6-27).

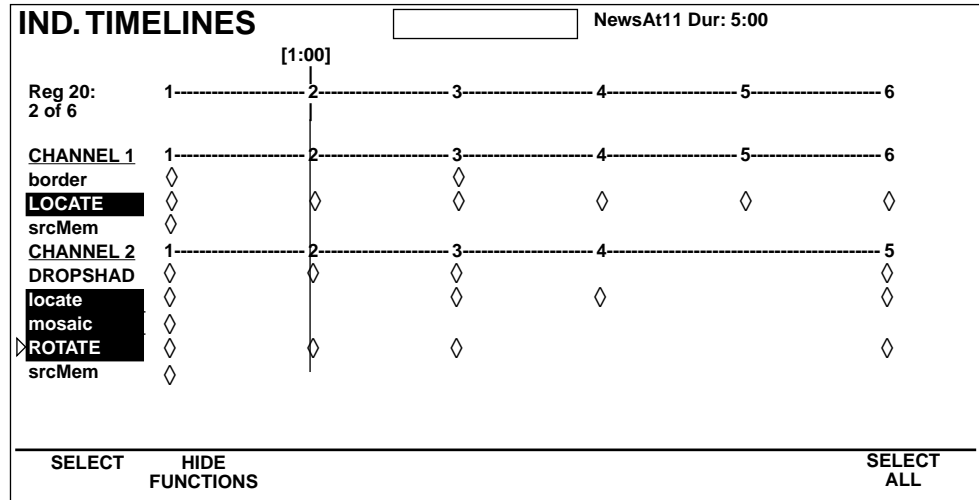


Figure 6-27. Individual Functions Selected

In this state you have selected only the highlighted functions for editing at the effect's cursor location.

Selections Across a Block of Time

When a block of time in the effect has been marked, selecting channels and functions makes subsequent editing operations affect all the selected items for the range of time marked, not just the current cursor location.

In [Figure 6-28](#), Channel 1 has been selected, and only the DropShadow and Mosaic functions of Channel 2 have been selected for the range of time spanning master keyframe two to midway between master keyframes four and five. This portion of the effect will be acted on by editing operations.

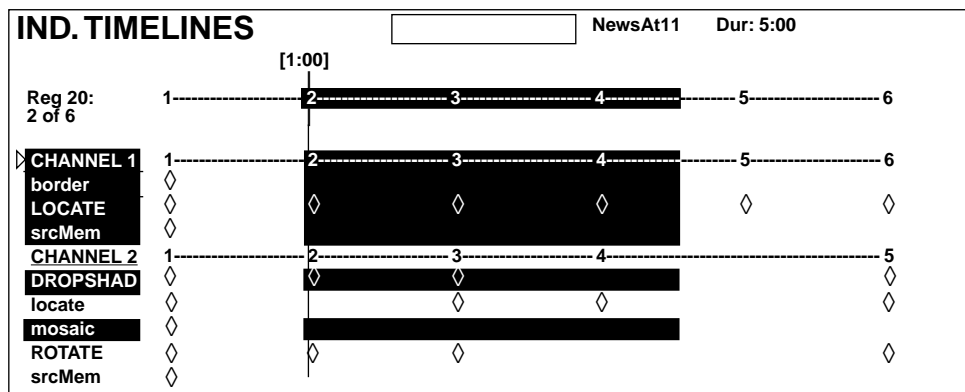


Figure 6-28. Marked Block with Selected Items

Selecting Items in the Clipboard

Items may be selected on the Clipboard display as in the other timeline displays, using the Scroll Knob and SELECT button. You can select individual functions in the clipboard, and then paste specific functions into an effect, instead of pasting all the clipboard's keyframes and time into the effect. Blocks of time cannot be marked on the clipboard. See [Pasting Selected Items](#) later in this section for more information.

Insert Operations on Selected Items

Any selection in any channel overrides all delegations. This means if an undelegated channel has a function selected, and another channel is delegated, an insert will only affect the selected channel. The delegated channel is not affected.

Insert Before and Insert After operations work the same for selected functions as for delegated channels. Insert After will insert a new keyframe containing the selected functions at the next master keyframe location. The default duration will be the time from the cursor to that next master keyframe. Insert Before also acts the same. When on a master keyframe, Insert Before will insert the new keyframe at the cursor location.

An inserted function's values are automatically set during an insert operation regardless of its change status. If two functions have been selected in a channel, and only one has been changed in the work buffer, an Insert will add keyframes to both functions even when Partial KF mode is ON.

If Partial KF is OFF, new function keyframes will be created for all the functions active in the selected channel keyframe, even if all the functions were not selected.

Insert operations ignore marked blocks, but are affected by channel and function selections as described above.

Modifying Selected Items

When items have been selected, the Modify operation is restricted to only the selected items. Unlike Insert operations, however, the Modify function can be applied to marked blocks. All the selected function keyframes included in the marked block can be changed simultaneously.

Absolute and relative and parameter changes are taken into account when the system determines how each selected function in the marked block will be modified. See *Section 4 - Basic Operation* for more information about absolute and relative changes.

Clipboard Operations on Selected Items

Copying Selected Items

In the previous section describing basic Copy operations, copies were made of all active functions in every delegated channel. Once an item has been selected, those channels or functions that have no selections are ignored by clipboard operations.

Suppose the following group of functions were selected from Channels 1 and 2 (Figure 6-29).

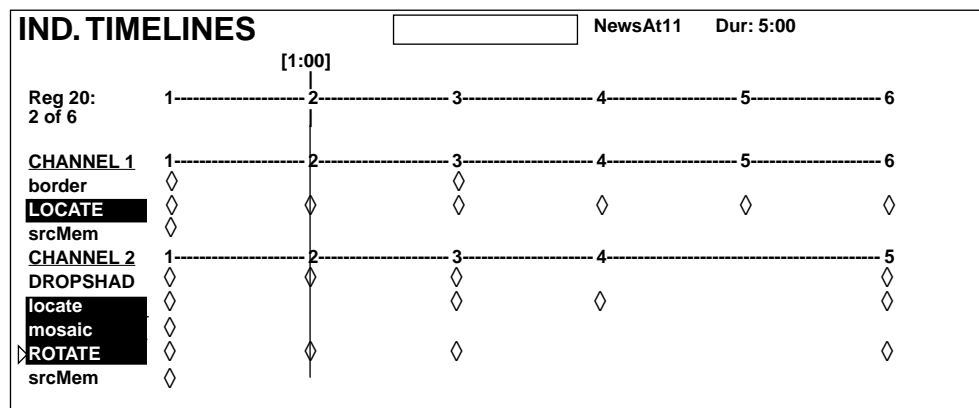


Figure 6-29. Selected Items Before Copy

Now if you press Copy the following is copied to the clipboard (Figure 6-30).

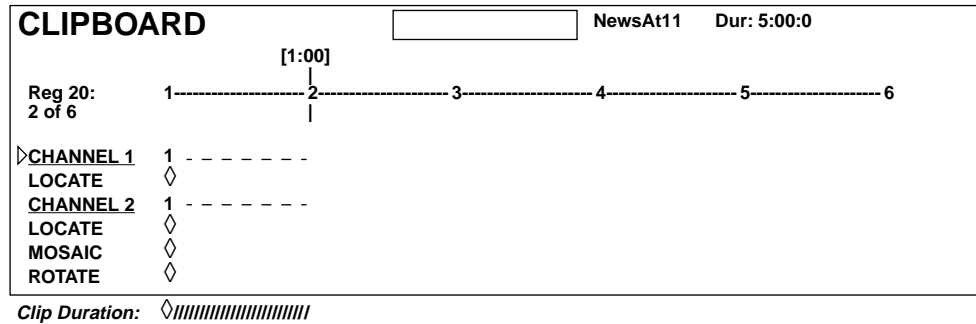


Figure 6-30. Clipboard with Copied Items

Values for each selected function are copied to the clipboard. Again, Copy makes no distinction between selected functions on interpolated values or set values, it simply copies current values for the selected functions.

The duration copied to the clipboard will be the time to the next numbered master keyframe. If different keyframe durations are involved in the copy operation, the resulting time in the clipboard may truncate longer durations of some of the copied functions.

Copying Selected Items From a Marked Block

The Copy operation copies function values for all times that a function is selected. For example, suppose you have the following block of time marked and have selected Channel 1 and Channel 2's Mosaic and Drop Shadow functions (Figure 6-31).

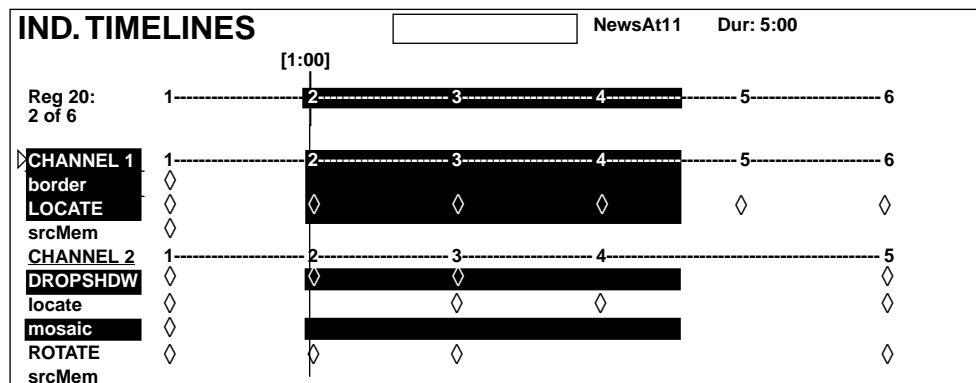


Figure 6-31. Selected Items in a Marked Block to Copy

Note how the marked block appears only on selected item timelines in this display. Now if you press Copy the following is copied to the clipboard (Figure 6-32).

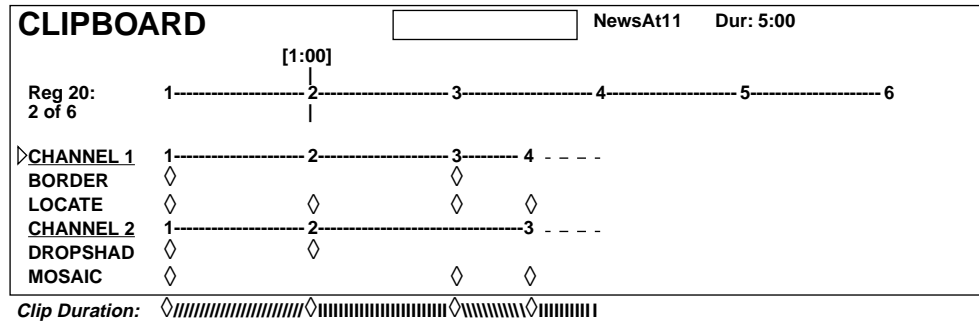


Figure 6-32. Clipboard Copied from Marked Block

All values from each selected function are copied to the clipboard. Note that the Copy operation added a set value at the beginning and end of Channel 1's Border, the beginning and end of Channel 2's Mosaic, and the end of Channel 1's Locate and Channel 2's Drop Shadow functions.

If the copied block ends on a keyframe, the duration of the function keyframes for the final keyframe in the clipboard will be the time to the next numbered master keyframe.

Cutting Selected Items

Krystal allows you to think of each function as having an independent timeline. A single function keyframe may be selected and when cut, that function entry and its duration is removed when Const Dur. is off. Entries for that function in other keyframes slide over to fill the gap unless in Constant Duration mode.

The keyframes for the selected functions are also cut out of their timelines from the cursor location in current effect (Figure 6-35).

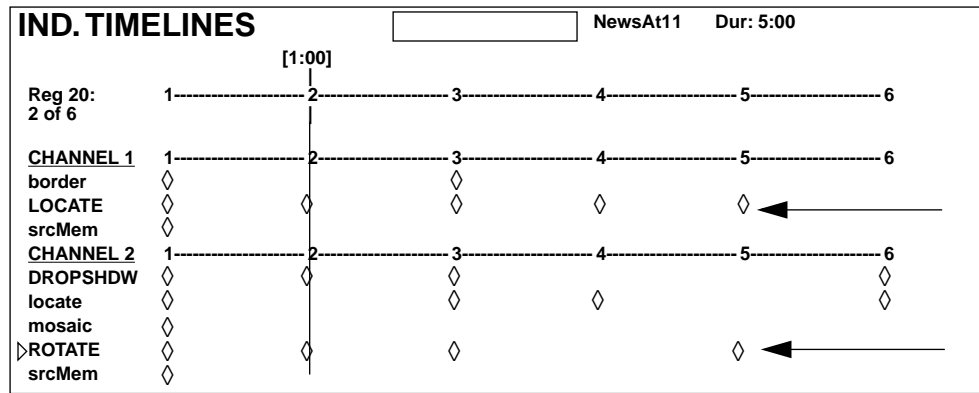


Figure 6-35. Effect After Cutting Selected Items

Note that Channel 1's Border and Channel 2's Drop Shadow functions were not affected since they were not selected. Keyframes for Channel 1's Locate and Channel 2's Rotate functions, which were selected, were removed. The remaining keyframes in the rest of the timelines for those functions moved to fill the gap.

Note also that the timeline for Channel 2's Mosaic function, which was selected but lacked a keyframe at the cursor location, was not changed. There was no keyframe to cut, and so no duration was removed from that function timeline. However, the interpolated value for the Mosaic function was copied to the clipboard, and it now contains a Mosaic keyframe.

Cutting Selected Items From a Marked Block

Suppose you marked a block of time on the Master Timeline between the first two keyframes and the third and fourth keyframes in the previous example, and then selected Channel 1's Border and Channel 2's Drop Shadow functions (Figure 6-36).

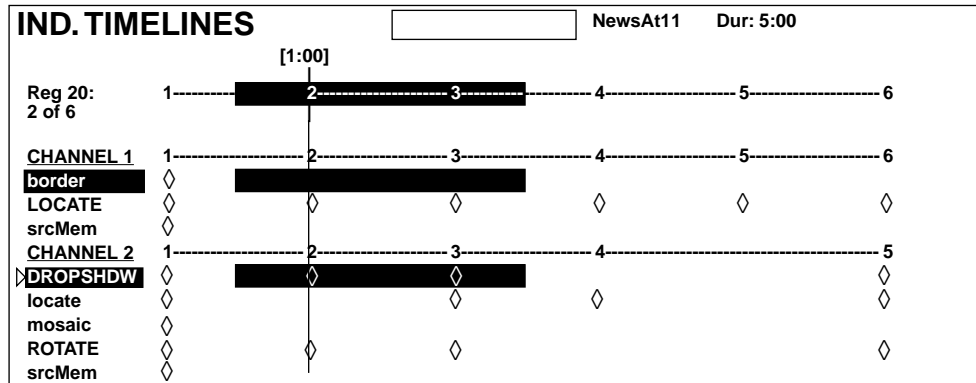


Figure 6-36. Effect With Selected Marked Blocks

Now when you press Cut the following is copied to the clipboard (Figure 6-37).

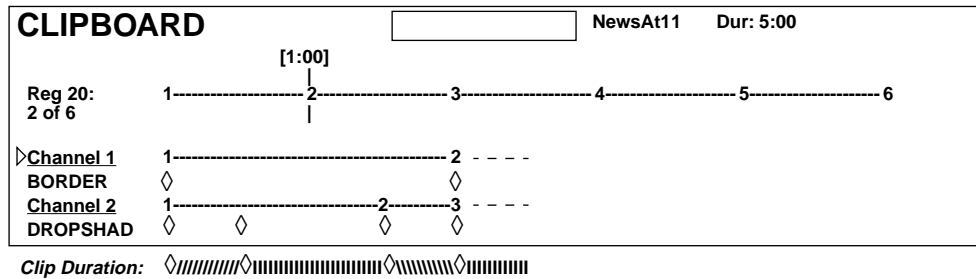


Figure 6-37. Clipboard with Cut Items

The result of the Cut (with Constant Duration OFF) is shown in [Figure 6-38](#).

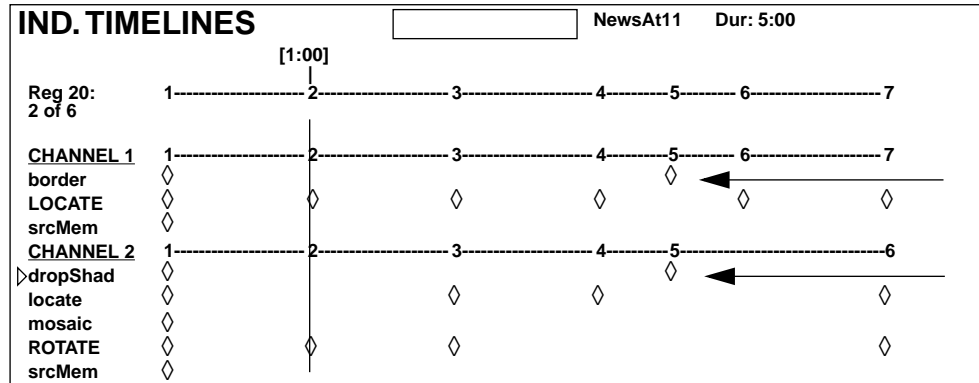


Figure 6-38. Effect After Cutting Selected Marked Blocks

Function keyframes were cut from the effect and an amount of time equal to the length of the marked block was removed from the selected function's timelines. Time was deleted from the Channel 1 Border timeline, but no keyframes were deleted. Time and keyframes were deleted from Channel 2's Drop Shadow timeline.

If Const. Dur. mode were ON, selected keyframes would have been deleted but no amount of time would have been removed. The durations of the preceding function keyframes would have increased to fill the gap.

Deleting Selected Items

Delete acts the same on selected items in an effect as Cut, but the information is not saved to the clipboard.

Pasting Selected Items

Function timelines to be pasted may be selected on either the clipboard or the effect timeline, but not in both locations simultaneously. Selecting function timelines at one location clears any current selections on the other location. For example, if Border and Crop are selected on the clipboard, and a Crop timeline is then selected in the effect, only the Crop timeline in the clipboard will remain selected for Paste. Any function timelines selected on the effect that do not exist in the clipboard will be ignored. In this example, if Crop and Locate were selected on the effect, only Crop will be pasted because Locate is not in the clipboard.

Paste is not allowed if Constant Duration mode is ON if there are marks on the timeline, unless the cursor is on the last keyframe of the effect.

Any marked areas on the timeline are deleted when a paste is done. The information from the clipboard is pasted at what was the beginning of the marked block.

Pressing Paste will paste the clipboard information for Channel 2's Locate function into Channel 1 at the cursor location in the effect (Figure 6-41).

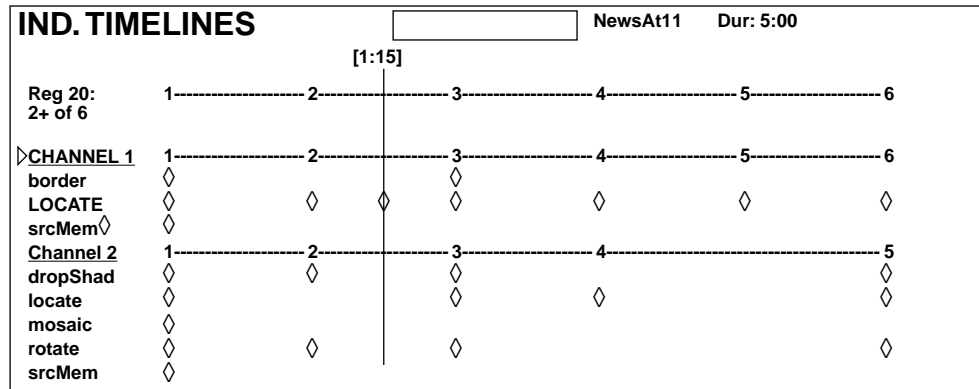


Figure 6-41. Effect After Paste From Clipboard

Note that in this example the Paste operation acts like inserting on the path and therefore does not change the overall time of the Locate function timeline, or the total duration of the original effect.

Appendix — Tips and Techniques

Introduction

This section describes some tips and techniques that experienced Krystal system operators have found particularly useful.

If you have a tip or technique you would like to share, write a detailed description and mail it to:

Tektronix Grass Valley Products
Technical Publications – Krystal DPM
P.O. Box 1114
Grass Valley, CA 95945

Creating a Solid Cube

A 3-D cube can be created using three Krystal channels (the other sides are hidden from view). To create seamless cubes, use the negative crop value from one channel as the Source Z Locate of the other channel. Use the horizontal Crop values to determine sides of a solid, and use the vertical Crop values to determine the top and bottom sides of the solid.

For example, the following procedure creates a 1/2 size three sided cube:

1. Delegate Channels 1, 2, and 3 only, press Source, Size/Locate, Z, type • 5 on the keypad and press Enter.
2. Go to the Crop Menu (Picture Frame\CROP >) press CROP MODE to select BOX, press ADJUST to select ALL SIDES, transfer the POSITION ALL SIDES soft knob control to the keypad, then type 2 • 5 Enter. This sets the crops to Left -2.5, Right +2.5, Top +2.5, Bottom -2.5.
3. Delegate only Ch 1, press Locate 3D, Z, type – 2 • 5 Enter.

4. Delegate only Ch 2, press Rotate, X, type • 2 5 on the keypad and press Enter. Press Locate 3D, Z, type 2 • 5 Enter.
5. Delegate only Ch 3, press Rotate, Y, type • 2 5 on the keypad and press Enter. Press Locate 3D, Z, type 2 • 5 Enter.

If you now Delegate only a Global channel to which all three channels are assigned and press Rotate, you can turn the cube to see all three sides. Press Target, Locate 3D and you can move the cube around on the screen. You can also turn on the Easy Cube feature (View \ EASY CUBE) to automatically translate the three channels to the opposite side as the cube rotates, forming the illusion of a complete, six sided cube.

The above example is for a cube with centered crops. For crops that are not equidistant from the edges of the picture (3-D slab), take the negative crop, add it to the positive crop, divide by two, and use this value to move the axis for the side of the cube you are working on. This centers the axis so you can use the negative crop value rule described above to build your 3-D slab. When done, move the axis back to the center of the screen using Post Xform and entering a negative of the axis value.

Creating a Slab With Drop Shadow

You can simulate a 3-D slab effect using the Border and Drop Shadow features. First make the colors of both the Border and Drop Shadow the same in Saturation, Brightness, and Hue, and give the Drop Shadow a 100% opacity. By changing the Brightness value of either matte, the appearance of 3-D shading can be created. Shifting the Drop shadow (with 100% Opacity) behind a picture when it is rotated through a small angle simulates a slab, and uses only a single Krystal channel.

Creating an Outside Border With Drop Shadow

Borders act on the inside of the picture, and so cut away at the video as the border is increased in size. To create borders outside the picture, use the Drop Shadow function with 100% Opacity and Size greater than 1.

Inverting Transform Values

Use the +/- button on the keypad to invert the X, Y & Z transform parameters. Entering a numeric value from the keypad is much more accurate and easier to repeat than trying to duplicate a position using the Joystick or Soft Knobs. Simply highlight the X, Y or Z button in the transform area, which

brings the numeric value of that function to the keypad, and press the +/- button, followed by Enter. This will invert the number, moving or rotating an image to the opposite side in relationship to its current position, depending on which of the three buttons has been selected.

Using 3-D and Post Transform Space

As a general rule of thumb, if you are flying pictures around inside of the active screen area (e.g. zooming a picture from infinity to full size), you will get smoother motion if you use either the Post Xform or Size/Locate transforms for the Z axis.

If you are going to fly pictures outside of the active screen area (e.g. zooming a picture towards you, past your field of view), you will get smoother and more realistic motion if you use the Locate 3D transform.

Path Control Techniques

General Curve Tips

Although adjusting the Curve path type Tension, Continuity, and Bias controls can feel like a guessing game, here are some general tips to help you build desired effects in a timely manner:

- Tension in the minus direction (up to -100) creates bigger, looser curves.
- Continuity at +100 is the same as S-Linear motion.
- Continuity in the plus direction gives a bigger bounce, with +200 a good value.
- Bias in the plus direction makes the curve happen after the keyframe.
- Bias in the minus direction makes the curve happen before the keyframe.

Cutting and Pasting Path Values

Being aware of how Curve values may change during editing can help you successfully fine tune the paths of edited effects.

- When keyframes are cut and pasted to and from the clipboard, the path type (Curve, Linear, S-Linear) is retained for each keyframe.
- When a block of Curve path keyframes are cut and pasted, the first and last keyframes in the block are given Tension = 100, Continuity = 0, and Bias = 0 values. This helps merge the path with neighboring path settings, since the Curve path requires three keyframes for proper calculation. Intermediate Curve path keyframes in the marked block retain their original values, since the neighboring keyframes required for the calculation exist.
- Cutting or copying a single keyframe with a Curve path type is handled the same as a first or last keyframe, and so this keyframe is given Tension = 100, Continuity = 0, and Bias = 0 values.
- If you paste a keyframe with a Curve path into the middle of an effect, reset Tension values to zero.

Controlling Smooth Path Windup

Effects with a curved transform path may move back slightly in the opposite direction when the move begins or ends. This “windup” is a characteristic of Curve path control, which is the factory default path type applied to new effect keyframes. Curve requires three keyframes for proper interpolation, so values for the previous (or next) keyframe affects the path through the next (or previous) keyframe.

There are several ways to change an effect so moves begin and end without any windup.

- Change the Path Type on the function keyframe to S-Linear.
- Set the Curve path Tension value on the function keyframe to 100.
- Set a Path Control menu Hold for the function on the previous keyframe.

Corner Pinning Techniques

The Corner Pinning feature allows you to move the corners of a source image relative to the background. Corner pinning is key-frameable, with all standard path control functions. The new corner locations need not form a rectangle. Corner pinning is accomplished by distorting the source image to fit into its newly defined corners. The modified image remains in its orig-

inal source plane, and is not “bent” along the Z axis (Figure 1 and Figure 2). Corner pinning does not change the location of the axis of rotation or spin of the source image.

Corner Pinning includes the ability to temporarily adjust the opacity of the source image, using the VIEW THROUGH soft button and knob. This allows you to look through the image to align the corners precisely with the background.

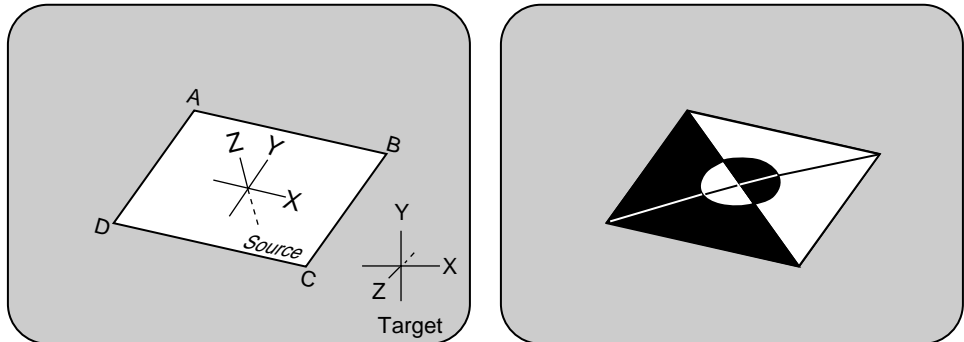


Figure A-1. Original Image

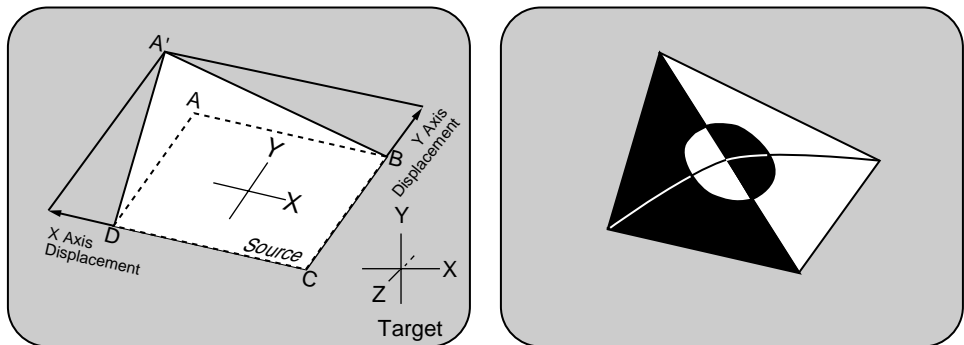


Figure A-2. Source Space Corner Pinned Image

Source vs. Target Space Corner Pinning

Corners are moved to new positions defined by the source (not target) space coordinates.

If the local, global, and camera channels are set to defaults, the source and target spaces will be the same and corner pinning works the same as a target space 2-D corner pin. However, if these channels are not at defaults, the “upper right” corner of a source image you wish to relocate may not appear at the upper right of target space if the image has been transformed by Rotate or Spin. Once you understand the principle, manipulating images with source space corner pinning is quick and easy, and source space corner pinning has distinct advantages.

Corner Pinning As a Cropping Tool

Corner Pinning has been designed to work in conjunction with cropping. After pinning the corners of an image you can crop it to select the exact portion of the source video to display in the corner pinned area. This offers new functionality for corner pinning.

For example, your source video could contain two people, but you may want to fly the image of only one person. Build a normal effect, turn on Corner Pinning and set its CROP MODE to USER, and leave the corners at the defaults. If you now move the crops maintaining the original aspect ratio (4 x 3 or 16 x 9) you can position these crops so that only the desired person is shown. If the person or the camera moves, you can adjust the user crops to keep the person centered between the edges of the crops. This will result in the person being centered in the video that can be flown around the screen (Figure 3). This functionality is not possible with target based corner pinning.

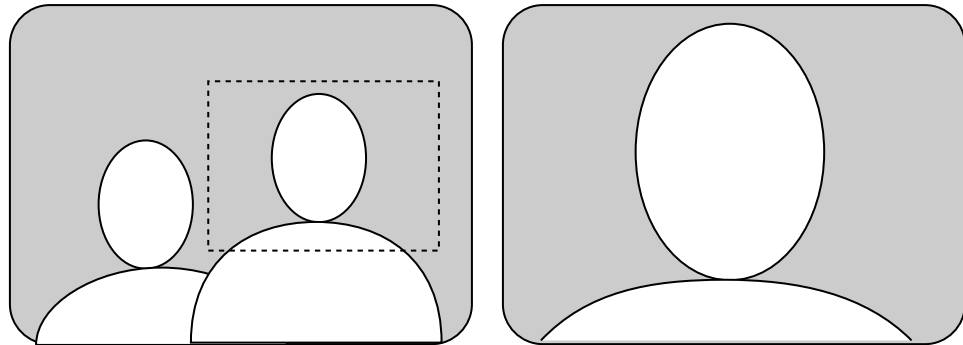


Figure A-3. Corner Pinned Area Selected with User Crops

Graphic Display Techniques

Off Line Editing

If the Graphic Display mezzanine is installed, you can work off-line to plan effects for later use. Wireframes of channels can be displayed on the screen to represent the manipulated pictures. You can build multi-channel effects on a single-channel system, to be run later on a multi-channel system. You can also build effects off-line on a multi-channel system when some or all the Video Processor channels required for the effect are not available.

To build effects off-line:

1. Acquire an Effect Manager.

2. Acquire Wireframe channels in place of Krystal channels.
3. Activate the Wireframe setting in the Graphic Display menu.

You can now build and save effects with the Krystal Control Panel using the wireframes as visual reference.

Off Screen Positioning

When using the Graphics Display feature, it is often helpful to shrink the size of the Graphics page. This allows you to fly your images outside of the active picture area and still see their position. The top Soft Knob controls size, which can be set to a minimum of 50% of normal size. Turning on the Grid setting displays the actual viewing area of the screen, so you can see the position of the manipulated pictures relative to the edges of the screen.

Insert Before The First Keyframe with Partial KF Off

If you use Insert Before on the first channel keyframe in an effect, make sure Partial KF mode is OFF so keyframes for all the active functions are created. Using Insert Before with Partial KF OFF can leave some function keyframes undefined. The undefined keyframes will revert to factory default values when the effect is rewound, and these settings may not match the values that were formerly used for the first channel keyframe in the effect.

It is generally a good idea to define all the functions at the beginning of an effect, but it is not necessary to do so. Krystal effects can run with functions that are initially undefined, and this feature can have practical applications (see below).

Running an Effect with Modified Inactive Functions

Very few effects built on the Krystal system will use every function. Once an effect has been created, the system has a list of those functions which are used during the effect. When an effect is rewound, every inactive function in every enabled channel's working buffer is set to its factory default. Each Video Processor channel in the effect then updates its working buffer according to each active function's keyframe information. Inactive functions are not updated when the effect is run ([Figure 4](#)).

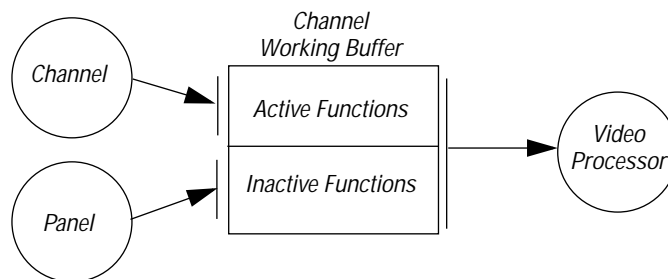


Figure A-4. Running Active and Inactive Functions

Unlike other DPMs, Krystal does not disable the panel during an effect run. The panel may be used to update functions that are not being used in the current effect. You can use this capability to preview a change to an inactive function in an effect prior to committing the change to the effect.

For example, you can change the rotation (if inactive) without inserting or modifying a keyframe, then run the effect. The effect retains the new work-buffer rotation value during the run. Rewinding the effect will restore the default rotate value. Note that even in these modes, the effect may not be edited while running (the Clipboard and Edit operations are disabled)

Useful Macros

Macros can be created to help streamline repetitive functions.

Resetting All Menu Parameters To Default Values

Build the following macro to reset all the parameters on the currently selected menu to their default values.

1. Go to the Macro Control menu, select a macro from the list, and begin recording.
2. Press the #4 Transfer Button (bottom), then press • Enter.
3. Press the #3 Transfer Button, then press • Enter.
4. Press the #2 Transfer Button, then press • Enter.
5. Press the #1 Transfer Button (top), then press • Enter.
6. Press the Top Transfer Button one more time.
7. Press the Macro top menu button to end the recording.

When played back, this macro will restore default values for each Transfer Button from bottom to top, and then turn off the top Transfer Button.

Clearing All Channel Work Buffers

Currently, pressing the Clear Work Buffer button twice clears out Delegated channel(s). If you had previously built an effect with multiple channels, to ensure Unity KF values you would have to go through this process for all of the affected channels, or else delegate all the channels before pressing Clear Work Buffer twice.

Build the following macro to quickly clear all the work buffers for all the channels.

1. Go to the Macro Control menu, select a macro from the list, and begin recording.
2. Press the Deleg. button for the Camera channel, then press Clear Work Buffer twice (this will also Enable the channel).
3. Repeat the above step for the remaining channels, moving backwards (G2, G1, Ch 4, Ch 3, Ch 3, Ch 1).
4. Press the Camera Channel Enable button to turn it OFF.
5. Repeat the above step to turn off all the remaining channels except Channel 1, moving backwards (G2, G1, Ch 4, Ch 3, Ch 3, Ch 2).

Playing back this macro will, in the span of about one second, guarantee a Unity Keyframe on all of your channels, and leave only Channel 1 delegated and enabled.

Glossary

A

Appearance:

The “look” of the picture image itself, independent of any picture transformation.

Aspect

The ratio between the width and the height of an object such as a wipe pattern or a video screen.

Axis

The point in 3-D space around which a picture rotates. See Source Axis and Target Axis.

B

Background

- (1) External video that forms a background scene into which a key may be inserted.
- (2) Black or colored Mattes generated by the DPM for use as background video in key effects.

Bias

In path control, determines whether the path will be “pulled” towards the previous or the following keyframe.

Border

Adding matte to the edges of the holes cut by the key signal. On Krystal systems the border fills in from the outside edge of the key.

Brightness

The relative intensity of light determined by the sum of responses of the eye to the component wavelengths. Directly related to Luminance.

B-Y

The designator used to describe the Blue minus Luminance color portion of a component video signal.

C

CG

See Character Generator.

Camera Channel

Control channel that mathematically manipulates pictures to represent an observer’s viewpoint. The camera channel performs transforms and translations, and controls some Combiner functions.

Channel

A digital effects processing path for video and key signals. On Krystal systems, the term is used for several different types of channels. See Camera Channel, Control Channel, Global Channel, Logical Channel, Physical Channel, Wireframe Channel.

Combiner

Optional Krystal hardware that combines multiple sources into composite video/key signals with control of picture layering (over, under mix, etc.).

Control Channel

Control point on the Krystal Control Panel used to direct the processing of Krystal's Logical, Global, and Camera channels.

Character Generator (CG)

A computer used to generate text and graphics for video titles.

Chrominance

The colorimetric difference between any color and a reference color of equal luminance. Directly related to saturation.

Clip

A threshold level adjustment to which the key source attribute (luminance, chrominance, etc.) is compared for generating the internal key signal. The clip control sets the switching point between the background and the fill.

Clipboard

Used to store information cut, copied, or deleted from an effect. Clipboard information is overwritten when a clipboard copy or cut operation is performed.

Continuity

In path control, this adjustment determines the angle of the path into and out of the keyframe.

Contrast

Effect accomplished by adjusting the gain and offset of incoming luminance as well as control of incoming chroma levels.

Control Panel

Krystal system operator interface comprised of buttons, knobs, lever arm, joystick, menu display, and disk drive.

Coring

The threshold level below which video is replaced by black.

Corner Pinning

Method used to manipulate the edges of an image by relocating its corners. The resulting image is processed to fill the newly defined edges. Krystal corner pinning is based on source, not target, space.

Crosspoint

An electronic switch, usually part of an array of switches, that allows video or audio to pass when the switch is closed.

Current Effect

The effect in the register that was last recalled. The current effect number is displayed on the Krystal menu screen and Keypad display.

Current Time

The current position in the current effect. This time is the "glue" which binds multi-channel effects, i.e., all channels in the effect always have the same current time. The current time is expressed in terms of seconds, frames, and fields (odd or even) from the start of the effect. Negative current time values indicate times before the start of the effect.

Cursor

An indicator on a timeline representing a particular time in that effect. See Time Cursor and Mark Cursor.

CW

Clockwise.

CCW

Counter-clockwise.

D

Delegate

The Control Panel, or a section of it, is delegated to a channel or function if Control Panel changes affect parameters associated with that channel or function. For example, a control channel is delegated for control by the panel by lighting the **Deleg.** button for that channel. The joystick is delegated to a transform function by lighting a transform button.

Detent

A system defined increment of position, size, angle of rotation, or amount of perspective (usually based on screen or picture size). Pressing the **Center** button once sets the delegated transform to the closest evenly divisible detent value. For example, the spin transform detent is 0.25, resulting in detent values of 0.0, 0.25, 0.50, 0.75, 1.00, 1.25, etc.

Duration

The length of time expressed in seconds, frames, and fields (odd or even) that a particular effect or keyframe lasts.

DPM (Digital Picture Manipulator)

A video effects system which can digitally manipulate a video picture to change its size, shape, rotation in space, etc.

DPOP

Double Press Open. Double pressing a panel button to “pop” to another menu.

E

Effect

A sequence of one or more keyframes. An effect can reside in either a disk effect file or an effect register, and may be either single or multiple channel.

Effect Register

An area in memory representing one complete effect. Effect registers are referenced by a two digit number from 00 through 99.

Effect Manager

The electronics that calculates all of the parameters needed to produce an effect. These parameters are delivered to the Video Processors (up to four) which perform the actual image processing.

Enabled Channel

Channels that run as part of the current effect and can be edited. Channels are enabled by pressing the associated Control Panel **Enable** button.

Enhanced Image Fidelity

This option provides cleaner resolution by changing the way in which the luminance, chrominance, and key signals are processed.

Enhanced Video

See Enhanced Image Fidelity.

E-MEM (Effects Memory)

A Grass Valley proprietary effects-memory system capable of storing and recalling DPM and Switcher effects.

External Key

An input signal to Krystal used exclusively as a key source.

F

Field

One complete scan of the TV screen by the electron beam. In the NTSC standard, two interleaved fields of 262 and 263 raster lines make up a frame. In the PAL standard, two interleaved fields of 312 and 313 raster lines

make up a frame. The duration of a field is approximately 1/60 of a second in NTSC or 1/50 of a second in PAL (625 lines).

Flag

Control used to turn a timeline function on or off.

Frame

One complete video picture consisting of two interleaved fields. In the NTSC system, one frame makes up a complete TV scanning cycle (1/30th of a second). In the PAL system, two frames (at 1/25th of a second) are required to make up a complete TV scanning cycle.

Freeze Frame

The recording or display of a single frame of video.

Function

Data for an individual component of a digital effect. The data can contain several related parameters that specify different aspects of the function (crop, border, locate, etc.).

Function Timeline

A series of keyframes that appear along a timeline that represents a particular function (crop, border, locate, etc.).

G

Gain

An amplification adjustment of the key source attribute (chrominance, hue, luminance, etc.) to be used for keying. The gain control affects the sharpness of the key edge.

Global Channel

Control channel that mathematically manipulates one or more assigned logical channels in 2-D and 3-D space. Global channels only perform transforms and translations.

GPI (General Purpose Interface)

An electronic device containing electronic switches that can be activated by a remote data signal. GPIs allow external devices to control system components.

Gray Scale

Range of luminance levels from black to white.

H

High Tally

Buttons on the Control Panel at their brightest illumination. (When slightly dimmed they are low tally.)

Hue

The attribute of light (wavelength, frequency) which determines the color perceived (red, blue, green etc.). Specified by phase relationship to color burst in composite video. Any saturated color which is not one of the three primaries may be treated as a combination of two primaries.

I

Independent Timeline

A series of keyframes that appear along a timeline that represent a particular function (e.g., crop, border, locate, etc.) Independent timelines can be modified separately from other timelines.

Insert Key

A key in which a portion of the background signal is replaced with an insert (fill) signal.

Interpolation

Creation of intermediate values for functions between keyframes. Also known as "in-betweening".

K

Key

- (1) An effect in which a portion of the background video picture is replaced by another picture or title
- (2) The signal which is used to pass or block portions of the background and fill video signals.

Keyboard

A panel with pushbutton keys (generally alphanumeric) that provides the human interface into an electronics system.

Keyframe

A point in time during an effect where the placement and appearance of the manipulated picture is completely defined. This “frame” (or minimum unit of time) is the “key” to the make-up of the picture (and motion) at and about this instant in time. A keyframe defines all possible parameters to the system for that effect time, including: picture size and position, sources, recursive effects, background, borders, etc.

Key Fill

In a key effect, the video signal that “fills the hole” cut in background video by the key source. Key fill may be the key video or modified key video (also see Matte Fill).

Key Invert

- (1) A key mode which inverts the polarity of the key to allow dark areas of the source video to cut holes in background.
- (2) a chroma key mode which inverts the foreground and background fill positions.

Key Video

The video selected on a key bus which may be the key fill, the key source, or both.

Kurl

Special non-linear Krystal transformations that include Page Turn, Page Roll, Ripple, Slits, Sphere, Pos Mod, Size Mod, Rings, and Splash.

L

Linear

In path control, denotes a linear interpolation between keyframes; no acceleration or deceleration is applied— change is mechanical having a constant velocity.

Linear Key

A key which is processed at or near unity gain by the switcher. Clip and gain control have very small adjustment ranges, and keying is performed using the luminance values of the linear key source. Normally used when the source’s key signal has already been properly shaped.

Logical Channel

Control channels (numbered 1-4 on the panel) assignable to control Krystal physical channels.

Low Tally

Buttons on the Control Panel at lowered illumination. (When fully illuminated they are high tally.)

Luminance

The quantitative attribute of light, measured as luminous intensity. Directly related to brightness.

M

Macro

A function where sequences of button presses may be defined and recalled with a single button push.

Mark Cursor

Allows moves to be made across timeline without changing the work buffer, thus permitting you to move keyframe work buffer information from one point on the timeline to another. The mark cursor appears on timelines as a dashed vertical line.

Mask

A pattern or shape used to restrict some video processing of a selected area of the input video. For example, you can use a mask to select a portion of the source video to defocus.

Master Timeline

A series of keyframes that appear along a timeline that represents all the currently delegated channels of the current effect.

Matte

An internally-generated flat or multiple color signal which is adjustable for luminance, hue, and saturation. Mattes may be used to fill areas of keys and borders.

Matte Fill

Using matte to “fill the hole” cut in background video by the key source.

Matte Key

See Matte Fill.

Menu Display

That part of the Krystal Control Panel where menus and timelines are viewed.

Monitor

A device used for viewing video signals.

N

Noise

Interference present in a video or audio signal.

Non-Additive Mix (NAM)

A transition between two video signals in which only the signal with the largest instantaneous amplitude at any point in the picture is visible.

NV RAM

Non-volatile memory. Computer memory that persists after power to the unit has been interrupted.

O

Opacity

Degree of transparency of an image. 100% opacity is solid. 0% opacity is fully transparent.

P

Parameter

A numerical value used by a function.

Partial Keyframing Mode

A Grass Valley proprietary type of keyframing that gives greater effect control on a function by function basis, and provides improved path control. When ON, keyframes are only inserted into the timeline for functions that have changed. When OFF, traditional keyframing that inserts keyframes on all active timeline functions occurs.

Path

Refers to the manner in which interpolated values change between two keyframes. For transforms it can correspond to the “path” which the image on the screen takes to move from one keyframe to the next. The path may include size changes, picture rotation, etc., depending on the type of channel used in building the effect. Matte, softness, and other changes which do not have trajectories also

have paths. In these cases, the path determines the rate of change of the interpolated parameters.

Pattern Modulation

An oscillation or modulation of the vertical and/or horizontal dimensions of a pattern edge.

Perspective

The apparent distortion of an image as it moves toward or away from the viewer. Related to the location of the vanishing point.

Physical Channel

A Video Processor frame able to receive, manipulate, and output processed video and key sources. A physical channel can be controlled by a Logical Channel on the Krystal Control Panel.

Picture

The video image displayed on the monitor.

Posterization

Changing the appearance of the video image by modifying the luminance quantization levels.

R

R-Y

The designator used to describe the Red minus Luminance color portion of a component video signal.

RAM (Random Access Memory)

A computer memory system that allows rapid storage and retrieval of information. It is (usually) considered volatile in that the information is lost if power is interrupted. Also see NV RAM

Recursive Loop

Refers to the part of the Video Processor used to build special effects such as: Mosaic, Montage, Strobe, etc.

Register

See Effect Register.

Resource Manager

A module that routes control data from each Effect Managers to the Video Processors acquired by each Effect manager.

RGB

Red, green, blue; the three primary colors used in video transmission/reception, often referring to the three (unencoded) color component outputs of a color camera.

S

S-Linear

In path control, applies a linear or straight change between keyframes, with acceleration and deceleration applied at the beginning and end of each keyframe, respectively.

Screen

The surface of the monitor on which images are viewed.

Safe Action Area

Markers that define the area of the screen visible on most home television sets.

Safe Title Area

Markers that define the area where text can be placed and remain legible on most home television sets.

Saturation

The intensity of a color; the degree by which the eye perceives a color as departing from a gray or white scale of the same brightness. A saturated color does not contain any white.

Self Key

A key effect in which the same video signal serves as both the key source and the fill source.

Shotbox

Using the Auto Run button to provide the keypad with one button access to effect recalls and runs.

Soft Button

A Control Panel button that changes its function depending on the current menu selection. Soft buttons generally control function flags (on or off).

Soft Knob

A Control Panel knob that changes its function depending on the current menu selection. Soft knobs generally control function parameters (values).

Solarization

Changing the appearance of the video image by modifying the chrominance quantization levels.

Source

The origin of picture information. A source is composed of a video component, and generally also has a key component.

Source Axis

The point in 3-D space around which a picture rotates. The source axis is referenced to the picture itself.

Source ID

This feature identifies the source being displayed on the visible side of a wireframe.

Source Memory

The area in memory set aside for source parameters, such as Key Source, Mask, Key Clips, etc. Source memory and Unity Keyframe data is independent from one another.

Source Reference

Allows moves to be made relative to a picture's own reference axes.

Source Selection

The selection of the source material that feeds a physical channel.

System Controller

An additional frame required for multiple-channel Krystal system operation. Contains a Resource Manager module and at least one Effect Manager module used for system control communications.

T

Target Reference

allows channel transformations to be made relative to its assigned global; when not assigned to global, transformations are made relative to the Camera reference axis.

Target Axis

The point in 3-D space around which a picture rotates. The target axis is referenced to the target, or next higher, control level (Global and Camera channels).

Tension

In path control, determines the length of the tension vector.

Time Cursor

Changes the current time position in the effect; when moved, the work buffer of each channel in the effect is changed to reflect effect values at the current time. The time cursor appears on timelines as a solid vertical line.

Timeline

A series of keyframes along a line representing time in an effect. See Master Timeline, Function Timeline.

Transfer Buttons

These buttons function to copy the parameter assigned to the adjacent soft knob to the Keypad. Transfer buttons are located to the right of the menu display next to their associated soft knobs.

Transform

Picture manipulation that includes translation, and also may include rotation, perspective changes, size changes, and aspect and key manipulations in 2-D and/or 3-D space.

Translate

Movement of the picture or screen along an X, Y, or Z axis.

Transition

An operation which changes backgrounds and/or adds or removes titles. A transition can be in the form of a wipe, mix, or cut.

U

Unity Keyframe

A part of memory used to retain user-defined parameter values, like background color, keyframe duration, etc. Unity keyframe data can be recalled to the work buffer at any time for repeated use. Unity Keyframe and Source Memory data is independent from one another.

V

Video

An electrical signal used to carry visual information.

Video Key

A self key or chroma key in which the fill signal is video from the video key source.

Video Processor

The Krystal system frame that contains all of the video processing hardware required to manipulate an individual image in 3D space.

W

Wireframe Channel

A graphical representation of a physical channel that can be used for off-line effects design when physical channels are unavailable.

Waveform Shaping

Controls the softness of the transition between the key and the video.

Work Buffer

Values for all the active functions in the current effect at the current run time of the effect.

Y

Y

The luminance (brightness) portion of a component video signal.

Y, R-Y, B-Y (Y, CR, CB)

A set of color component video signals with separate luminance and chrominance.

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