

Installation and Service



Grass Valley Krystal 4300 Digital Picture Manipulator Software Release 3.1

071-0439-00

Contacting Tektronix

| | | Voice | Fax | Addresses | Web Site |
|--|---------------|---|--------------------|---|---|
| Customer Support | North America | (800) 547-8949 | (530) 478-3181 | Tektronix, Inc. | http://www.tektronix.com |
| | Elsewhere | Distributor or sales office from which equipment was purchased. | | Tektronix Grass Valley Products P.O. Box 1114 Grass Valley, CA 95945, USA | |
| Product, Service, Sales Information | North America | (800) 547-8949 | (503) 627-7275 | Tektronix, Inc. | http://www.tektronix.com |
| | Europe | 44 (10) 1628 40 3300 | 44 (0)1628 40 3301 | Video and Networking Division P.O. Box 500 | |
| | Asia | (852) 2585-6688 | (852) 2802-2996 | M.S. 58-965 | |
| | Japan | 81 (3) 5992 0621 | 81 (3) 5992 9377 | Beaverton, OR 97077-0001, USA | |
| | Latin America | (305) 477-5488 | (305) 477-5385 | | |

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Preface

About This Manual

The *Krystal Installation and Service Manual* provides installation, configuration, and service information for the Grass Valley Model 4300 Krystal Digital Picture Manipulator (DPM). This manual is designed for technical personnel responsible for installing and maintaining the Krystal DPM.

Documentation Set

The standard Krystal DPM user documentation set consists of:

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

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

The *Krystal Reference 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 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 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.

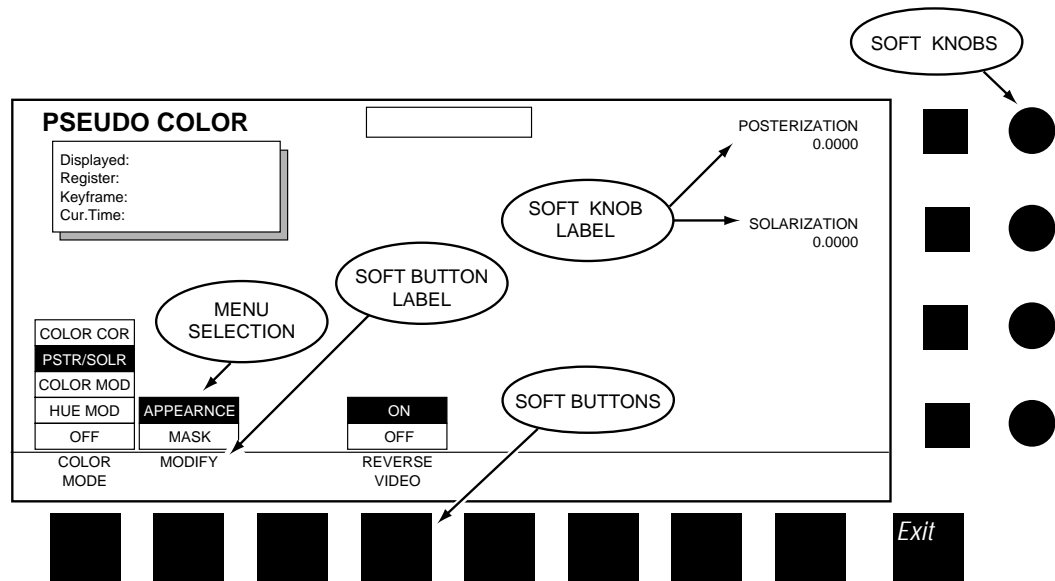
In the text, Control Panel buttons are shown in the following type:

- 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.

Safety and Regulatory Notices

Read and follow the important safety information below, noting especially those instructions related to risk of fire, electric shock or injury to persons. Additional specific warnings not listed here may be found throughout the manual.

WARNING Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Safety Terms and Symbols

Terms in This Manual

Safety-related statements may appear in this manual in the following form:

WARNING Warning statements identify conditions or practices that may result in personal injury or loss of life.

CAUTION Caution statements identify conditions or practices that may result in damage to equipment or other property.

Terms on the Product

The following terms may appear on the product:

DANGER — A personal injury hazard is immediately accessible as you read the marking.

WARNING — A personal injury hazard exists but is not immediately accessible as you read the marking.

CAUTION — A hazard to property, product, and other equipment is present.

Symbols on the Product

The following symbols may appear on the product:



Indicates that dangerous high voltage is present within the equipment enclosure that may be of sufficient magnitude to constitute a risk of electric shock.



Indicates that user, operator or service technician should refer to product manual(s) for important operating, maintenance, or service instructions.



This is a prompt to note fuse rating when replacing fuse(s). The fuse referenced in the text must be replaced with one having the ratings indicated.



Identifies a protective grounding terminal which must be connected to earth ground prior to making any other equipment connections.



Identifies an external protective grounding terminal which may be connected to earth ground as a supplement to an internal grounding terminal.



Indicates that static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Warnings

The following warning statements identify conditions or practices that can result in personal injury or loss of life.

Dangerous voltage or current may be present — Disconnect power and remove battery (if applicable) before removing protective panels, soldering, or replacing components.

Do not service alone — Do not internally service this product unless another person capable of rendering first aid and resuscitation is present.

Remove jewelry — Prior to servicing, remove jewelry such as rings, watches, and other metallic objects.

Avoid exposed circuitry — Do not touch exposed connections, components or circuitry when power is present.

Use proper power cord — Use only the power cord supplied or specified for this product.

Ground product — Connect the grounding conductor of the power cord to earth ground.

Operate only with covers and enclosure panels in place — Do not operate this product when covers or enclosure panels are removed.

Use correct fuse — Use only the fuse type and rating specified for this product.

Use only in dry environment — Do not operate in wet or damp conditions.

Use only in non-explosive environment — Do not operate this product in an explosive atmosphere.

High leakage current may be present — Earth connection of product is essential before connecting power.

Dual power supplies may be present — Be certain to plug each power supply cord into a separate branch circuit employing a separate service ground. Disconnect both power supply cords prior to servicing.

Double pole neutral fusing — Disconnect mains power prior to servicing.

Use proper lift points — Do not use door latches to lift or move equipment.

Avoid mechanical hazards — Allow all rotating devices to come to a stop before servicing.

Cautions

The following caution statements identify conditions or practices that can result in damage to equipment or other property

Use correct power source — Do not operate this product from a power source that applies more than the voltage specified for the product.

Use correct voltage setting — If this product lacks auto-ranging power supplies, before applying power ensure that the each power supply is set to match the power source.

Provide proper ventilation — To prevent product overheating, provide equipment ventilation in accordance with installation instructions.

Use anti-static procedures — Static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Do not operate with suspected equipment failure — If you suspect product damage or equipment failure, have the equipment inspected by qualified service personnel.

Ensure mains disconnect — If mains switch is not provided, the power cord(s) of this equipment provide the means of disconnection. The socket outlet must be installed near the equipment and must be easily accessible. Verify that all mains power is disconnected before installing or removing power supplies and/or options.

Route cable properly — Route power cords and other cables so that they are not likely to be damaged. Properly support heavy cable bundles to avoid connector damage.

Use correct power supply cords — Power cords for this equipment, if provided, meet all North American electrical codes. Operation of this equipment at voltages exceeding 130 VAC requires power supply cords which comply with NEMA configurations. International power cords, if provided, have the approval of the country of use.

Use correct replacement battery — This product may contain batteries. To reduce the risk of explosion, check polarity and replace only with the same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Troubleshoot only to board level — Circuit boards in this product are densely populated with surface mount technology (SMT) components and application specific integrated circuits (ASICs). As a result, circuit board repair at the component level is very difficult in the field, if not impossible. For warranty compliance, do not troubleshoot systems beyond the board level.

Power Cord Notices

North American Power Supply Cords

This equipment is supplied with a molded grounding plug (NEMA X-XXX) at one end and a molded grounding receptacle (IEC 320-C13) at the other end. Conductors are color coded white (neutral), black (line) and green or green/yellow (ground).

Operation of this equipment at voltages exceeding 130 Vac will require power supply cords which comply with NEMA configurations.

International Power Supply Cord

This equipment is supplied with a molded grounding receptacle (IEC 320-C13) at one end and stripped conductors (50/5 mm) at the other end. Conductors are CEE color coded, light blue (neutral), brown (line) and green/yellow (ground). Other IEC 320 C-13 type power supply cords can be used if they comply with the safety regulations of the country in which they are installed.

EMC Regulatory Notices

Federal Communications Commission (FCC) Part 15 Information

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received including interference that may cause undesirable operations.

89/336/EEC EMC Directive

EN50081-1

EN55022 Class A Radiated and Conducted Emissions

WARNING This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

EC Declaration of Conformity

We

Tektronix Holland N.V.
Marktweg 73 A
8444 AB HEERENVEEN
THE NETHERLANDS

declare under sole responsibility that the

Model Krystal 4300 Video Processor

manufactured by the Grass Valley Group, a Tektronix Company
meets the intent of Directive 89/336/EEC for Electromagnetic
Compatibility and the Low Voltage Directive 73/23/EEC.

89/336/EEC EMC Directive

EN 50081-1

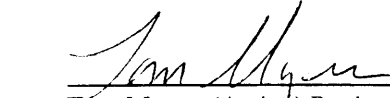
EN55022 Class B Radiated and Conducted Emissions

EN 50082-1 Immunity

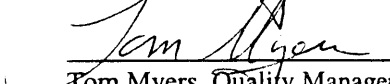
IEC 801-2 Electrostatic Discharge Immunity
IEC 801-3 RF Electromagnetic Field Immunity
IEC 801-4 Electrical Fast Transient/Burst Immunity
IEC 801-5 Power Line Surge Immunity

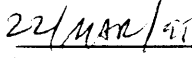
73/23/EEC Low Voltage Directive

EN 60950 "Safety of Information Technology Equipment"



Tom Myers, (Acting) Product Line Manager


Date


Tom Myers, Quality Manager


Date


Jaap Meijer, EC Representative


Date

EC Declaration of Conformity

We

Tektronix Holland N.V.
Marktweg 73 A
8444 AB HEERENVEEN
THE NETHERLANDS

declare under sole responsibility that the

Krystal Control Panel

manufactured by the Grass Valley Group, a Tektronix Company
meets the intent of Directive 89/336/EEC for Electromagnetic
Compatibility and the Low Voltage Directive 73/23/EEC.

89/336/EEC EMC Directive

EN 50081-1

EN55022 Class A Radiated and Conducted Emissions

EN 50082-1 Immunity

IEC 801-2 Electrostatic Discharge Immunity

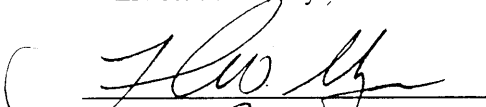
IEC 801-3 RF Electromagnetic Field Immunity

IEC 801-4 Electrical Fast Transient/Burst Immunity

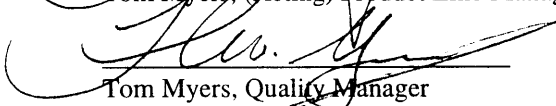
IEC 801-5 Power Line Surge Immunity

73/23/EEC Low Voltage Directive

EN 60950 "Safety of Information Technology Equipment"


Tom Myers, (Acting) Product Line Manager


Date


Tom Myers, Quality Manager


Date


Jaap Meijer, EC Representative


Date

Declaration of Conformity

Tektronix, Inc., Video and Networking Division, declares on February 21, 1997 under our sole responsibility that Krystal System Controller Model 4300 to which this declaration relates, is in conformity with the following standard(s) or other normative documents:

EMC Directive 89/336/EEC

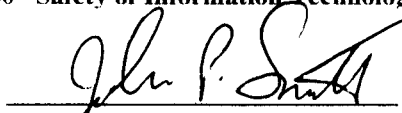
EN55022 Limits and Methods of measurement of radio interference characteristics of Information Technology Equipment Class A level

EN50082-1 Electromagnetic compatibility Generic immunity standard Part 1 Residential, commercial and light industry.

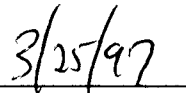
| Environmental Phenomena | Test Specifications | Basic Standard |
|---|---|-------------------------------|
| Radio-Frequency Electromagnetic Field | 27-500 Mhz 3V/m (unmodulated) | IEC 801-3 |
| Electrostatic Discharge | 8 kV (charge voltage) | IEC 801-2 |
| Fast Transients common mode on Signal lines | 0.5 kV (peak) 5/50 Tr/Th ns 5kHz Rep. Frequency (for cables > 3 meters) | IEC 801-4 capacitive clamp |
| AC mains ports | 1.0kV (peak) 5/50 Tr/Th ns 5 kHz Rep. Frequency | |

73/23/EEC Low Voltage Directive

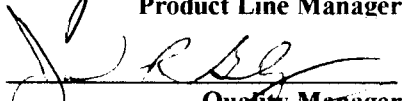
EN60950 "Safety of Information Technology Equipment"



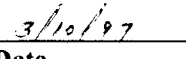
Product Line Manager



Date



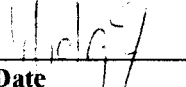
Quality Manager



Date



Jaap Meijer, EC Representative



Date

Declaration of Conformity

Tektronix, Inc., Video and Networking Division, declares on 28 July, 1997 under our sole responsibility that :

**Model: Krystal Large System Controller,
4300 - 264 (w/4300-221 & 4300-4XI)**

to which this declaration relates, is in conformity with the following standard(s) or other normative documents:

EMC Directive 89/336/EEC


EN55022 Limits and Methods of measurement of radio interference characteristics of Information Technology Equipment Class A level

**EN50082-1 Electromagnetic compatibility Generic immunity standard Part 1
1992 Residential, commercial and light industry.**


| Environmental Phenomena | Test Specifications | Basic Standard |
|--|--|-------------------------------|
| Radio-Frequency Electromagnetic Field | 27-500 Mhz 3V/m (unmodulated) | IEC 801-3 |
| Electrostatic Discharge | 8 kV (charge voltage) | IEC 801-2 |
| Fast Transients common mode on Signal lines | 0.5 kV (peak) 5/50 Tr/Th ns 5kHz Rep. Frequency (for cables > 3 meters) | IEC 801-4 capacitive clamp |
| AC mains ports | 1.0kV (peak) 5/50 Tr/Th ns 5 kHz Rep. Frequency | |

73/23/EEC Low Voltage Directive

EN60950 "Safety of Information Technology Equipment"



Regulatory Compliance



Quality Engineering

10/2/97
Date

10/2/97
Date

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

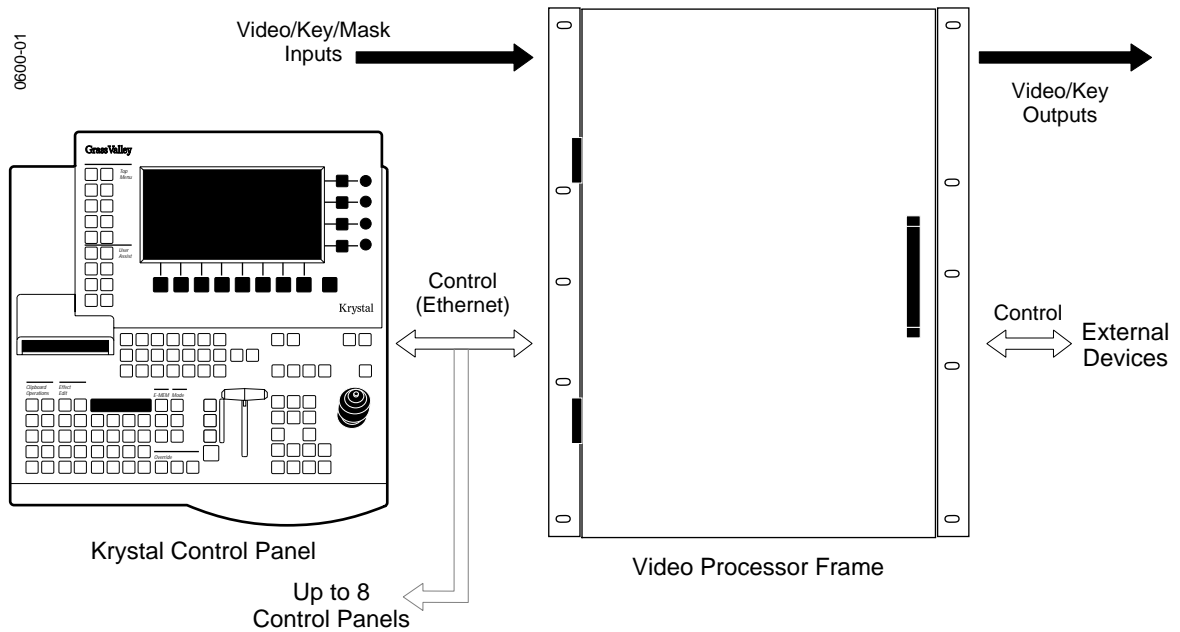


Figure 1-1. Krystal Single Channel System

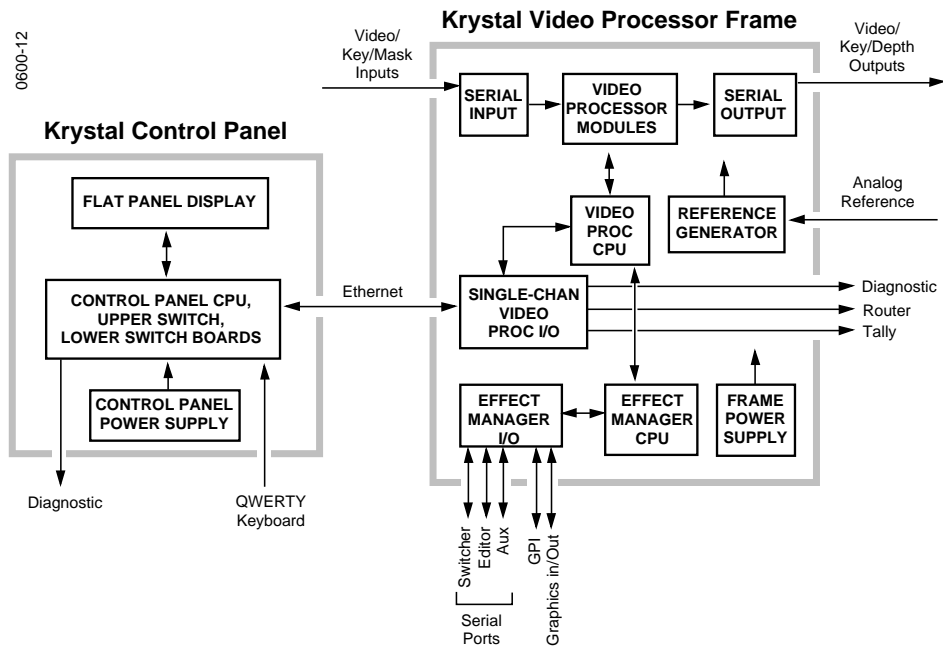


Figure 1-2. Krystal Single Channel System Simplified Block Diagram

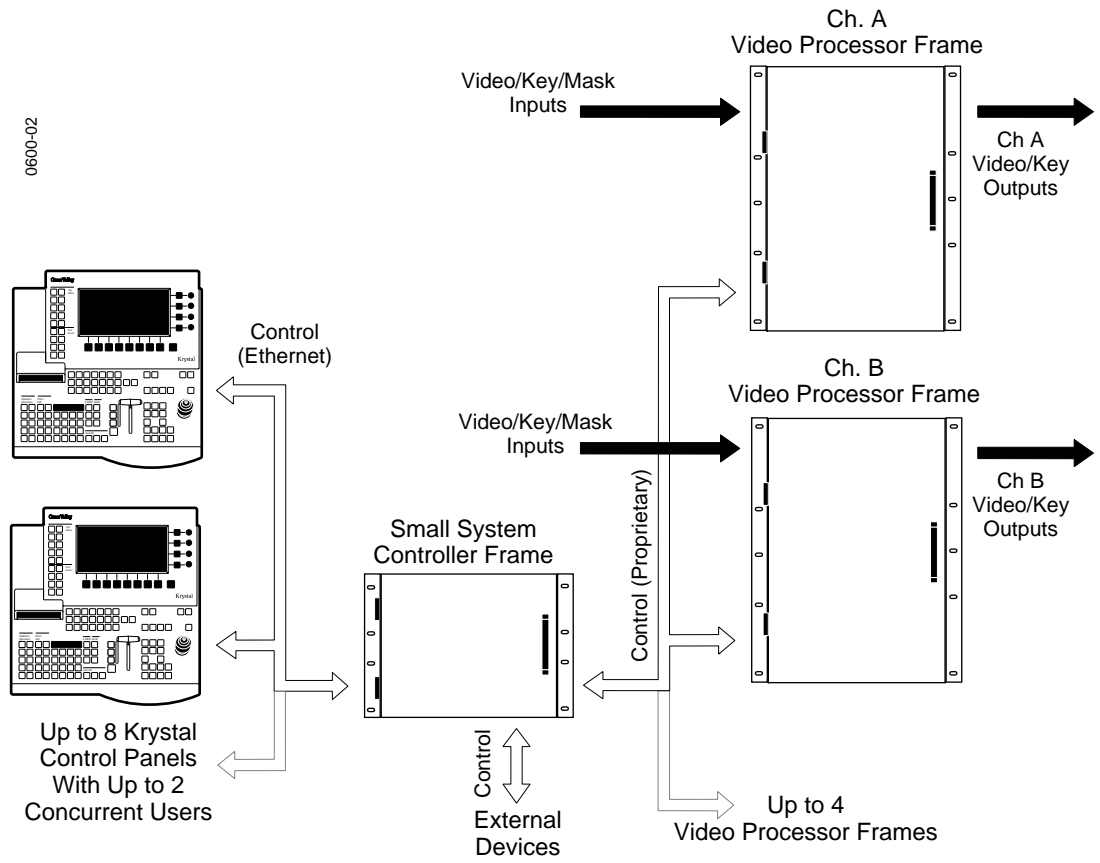


Figure 1-3. Krystal Multi-Channel System, Small System Controller

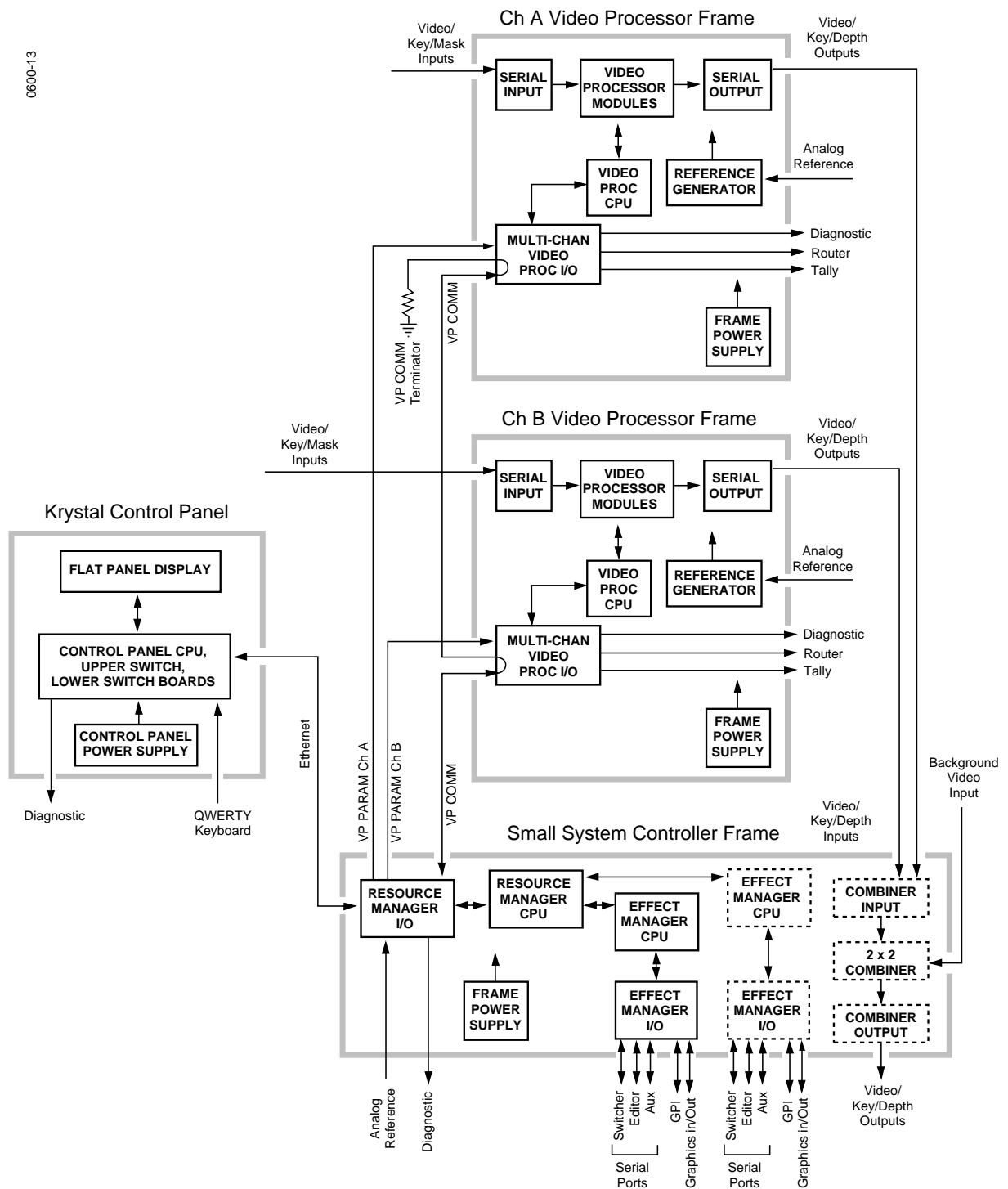


Figure 1-4. Krystal Dual Channel System Simplified Block Diagram

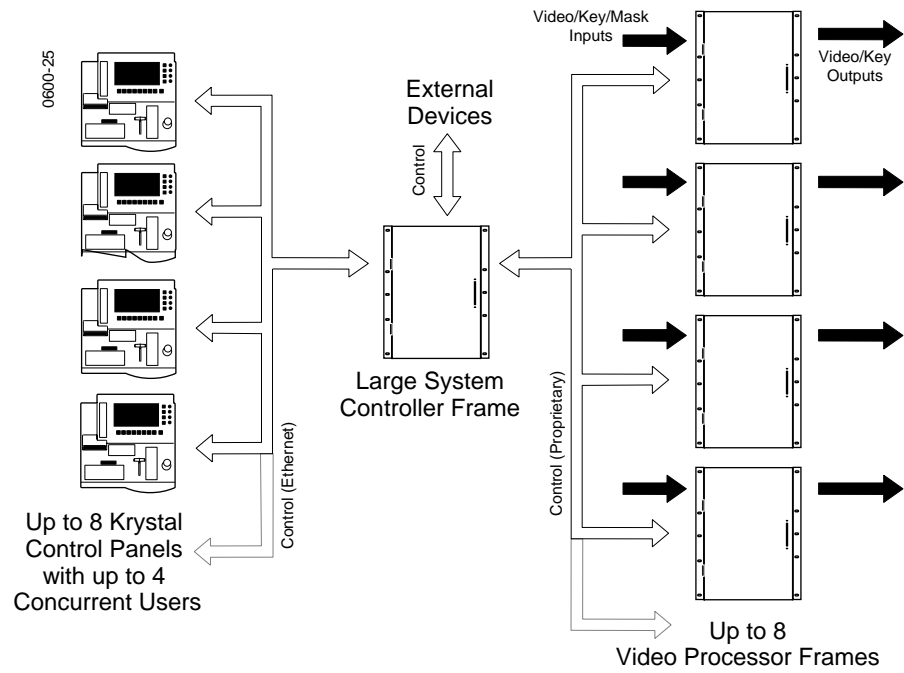


Figure 1-5. Krystal Multi-Channel System, Large System Controller

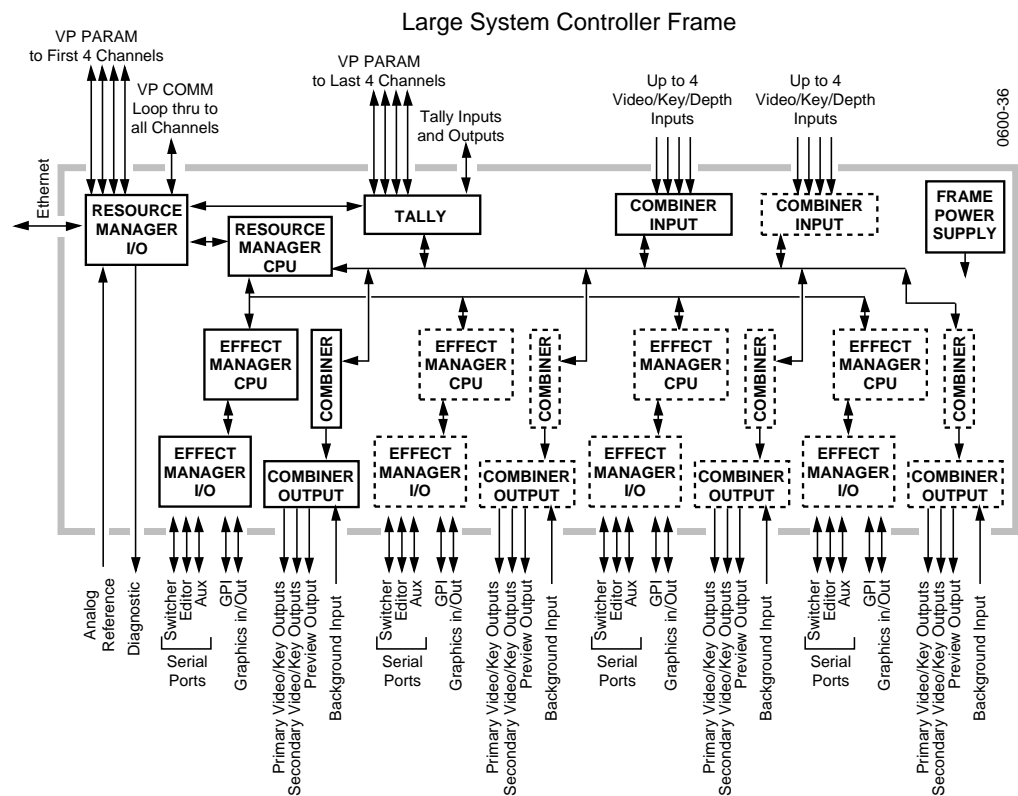


Figure 1-6. Large System Controller Simplified Block Diagram

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

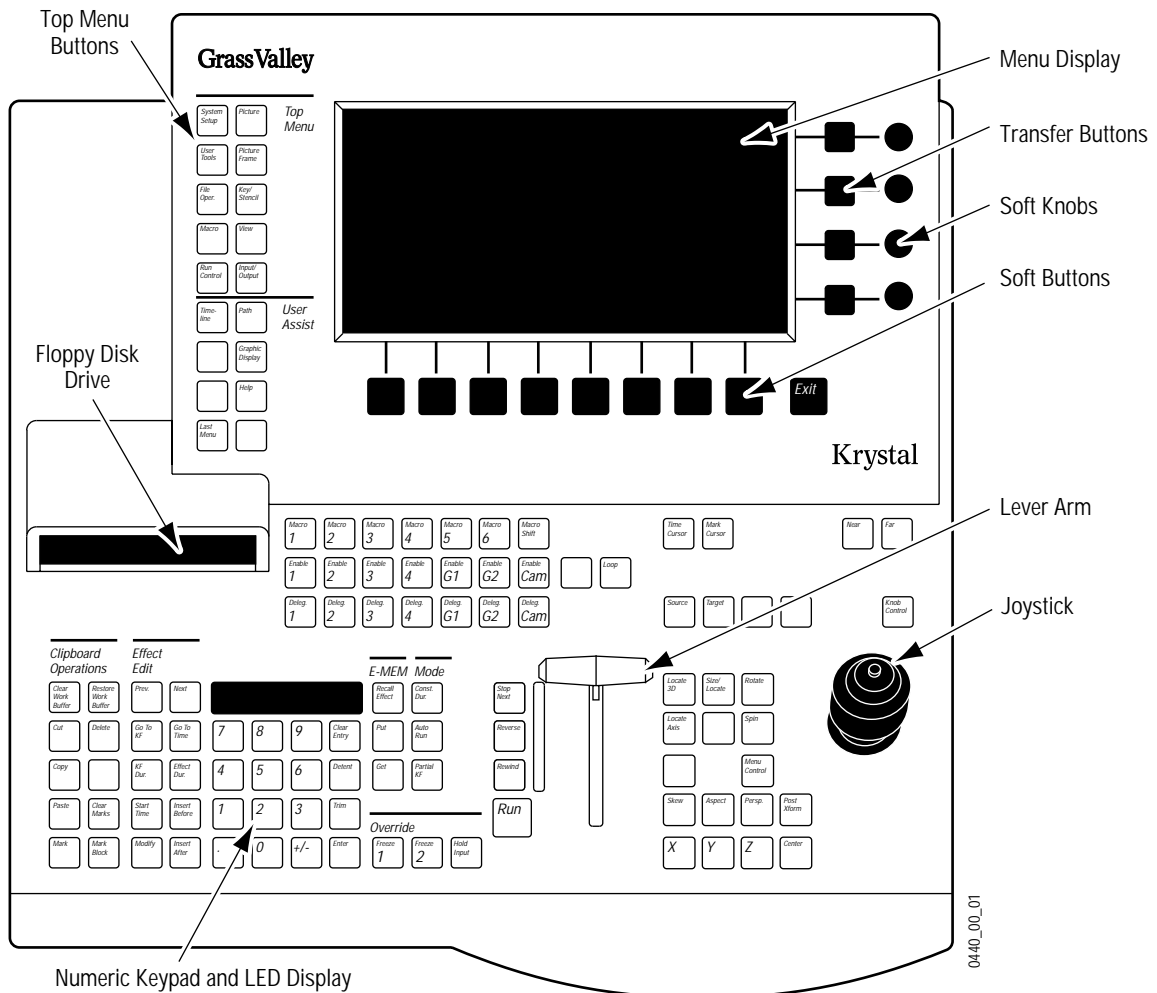


Figure 1-7. Krystal Control Panel

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).

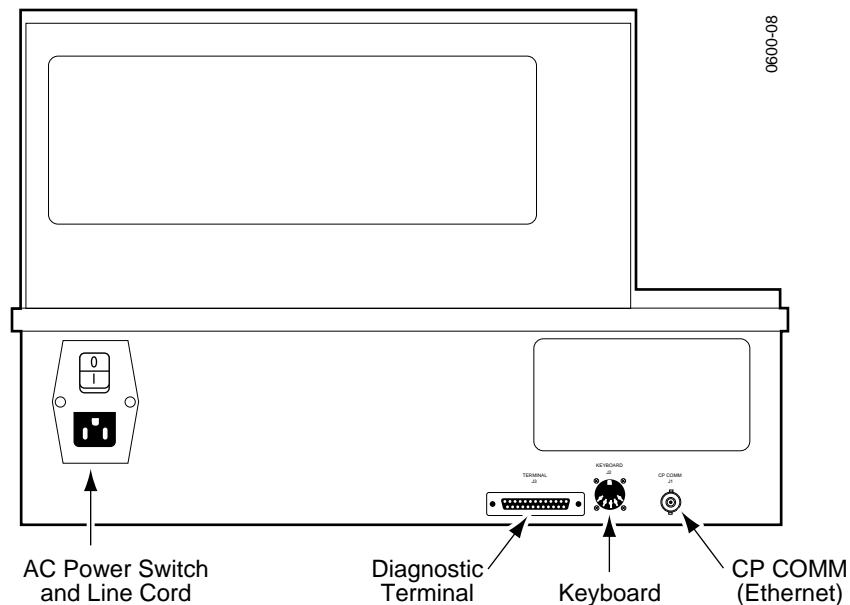


Figure 1-8. Krystal Control Panel, Rear View

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).

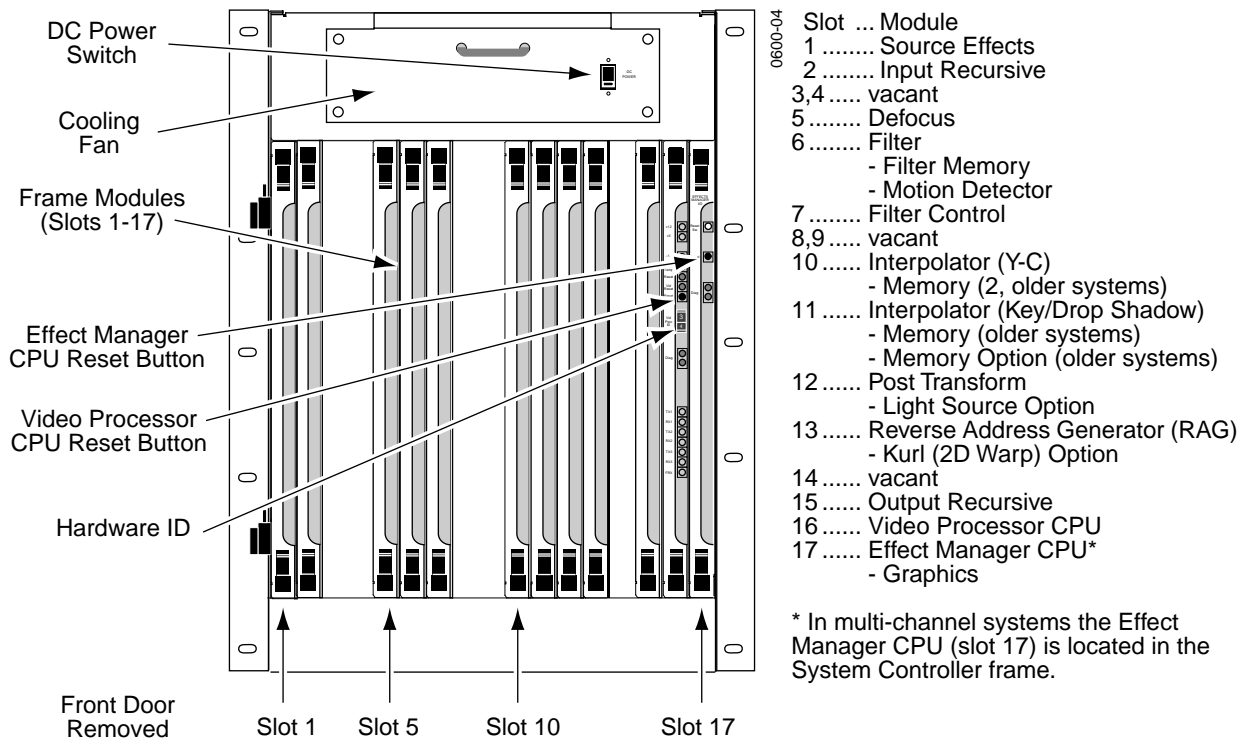


Figure 1-9. Video Processor Frame, Front View

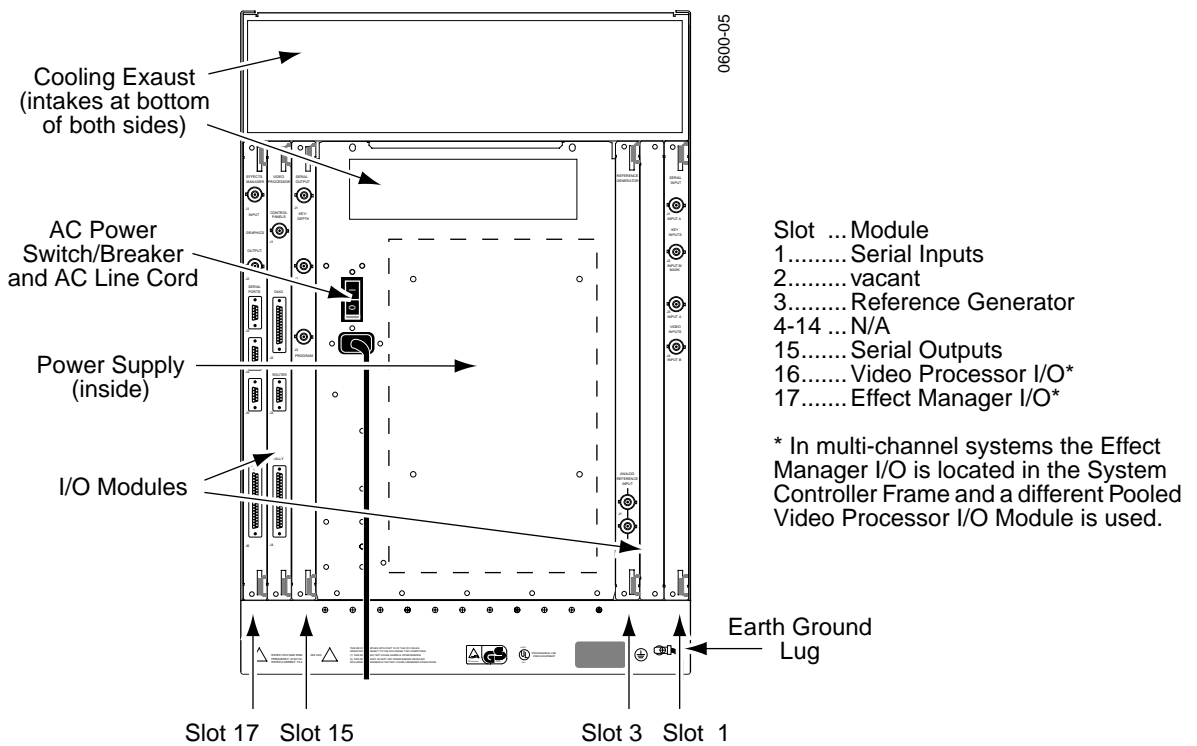


Figure 1-10. Video Processor Frame, Rear View

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](#)).

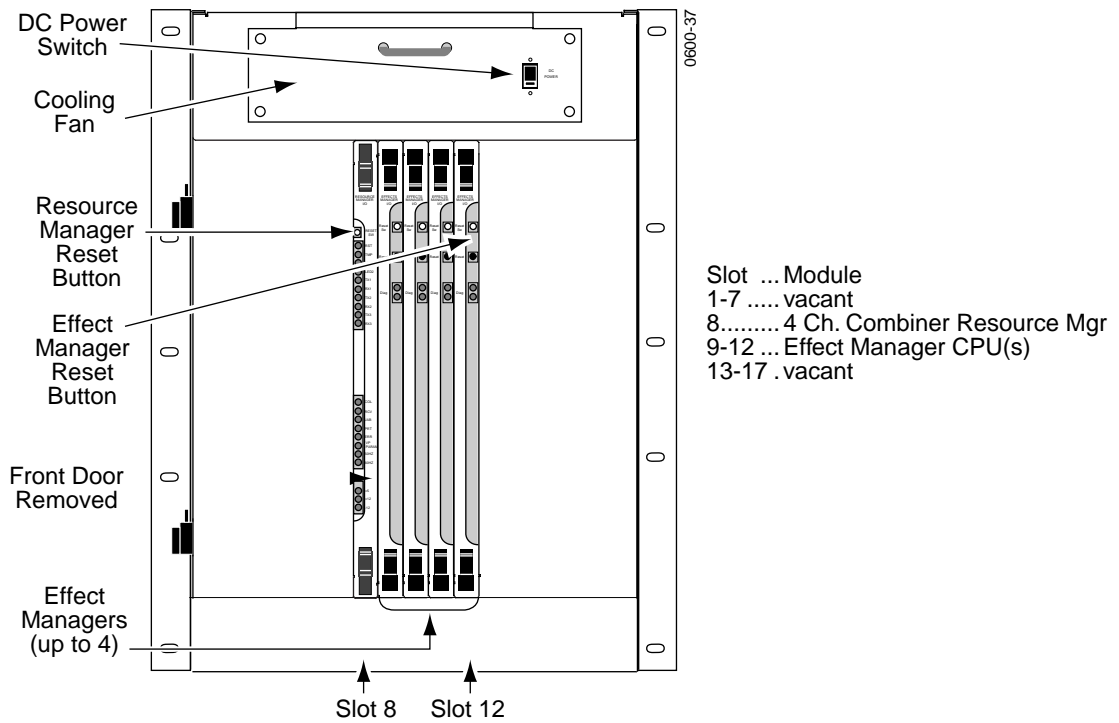


Figure 1-11. Large System Controller Frame, Front View

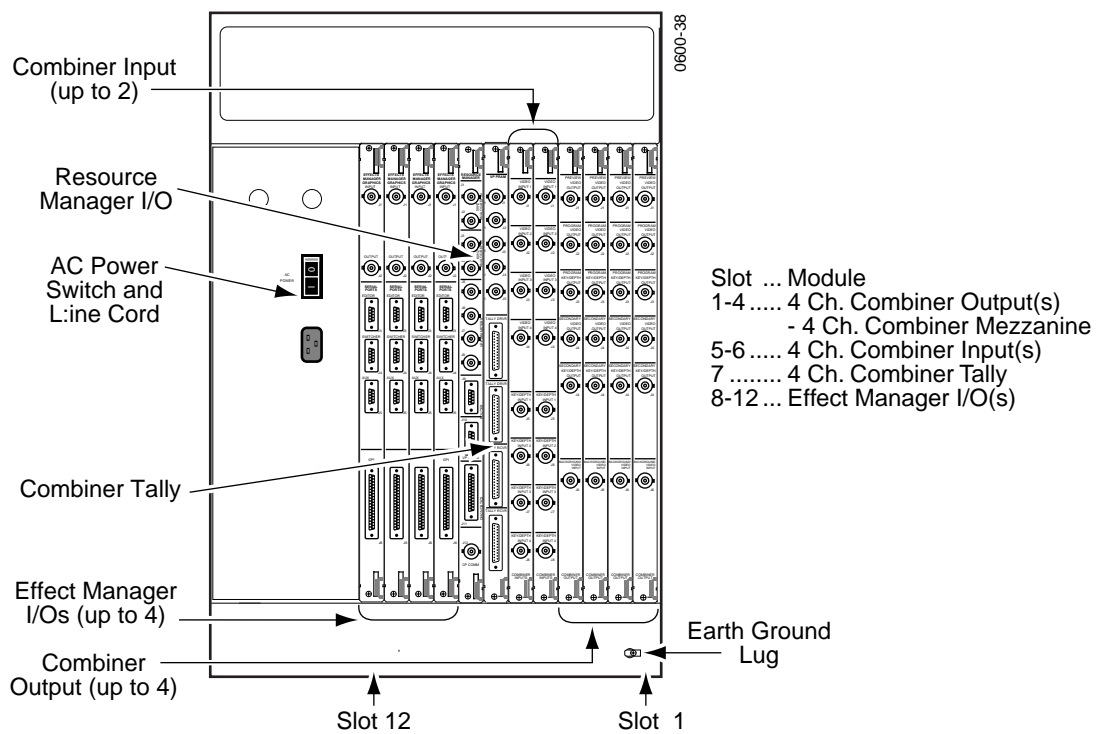


Figure 1-12. Large System Controller Frame, Rear View

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).

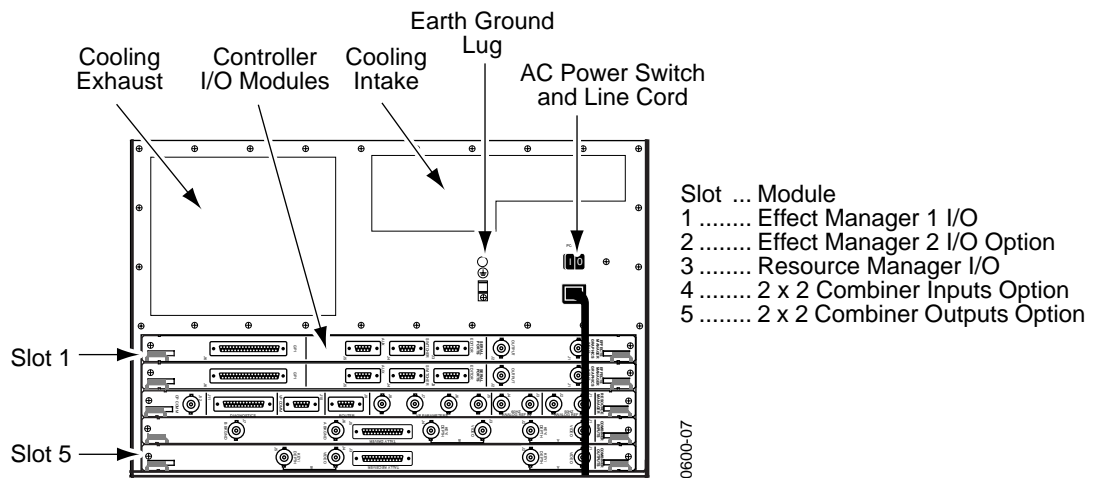


Figure 1-13. Small System Controller Frame, Rear View

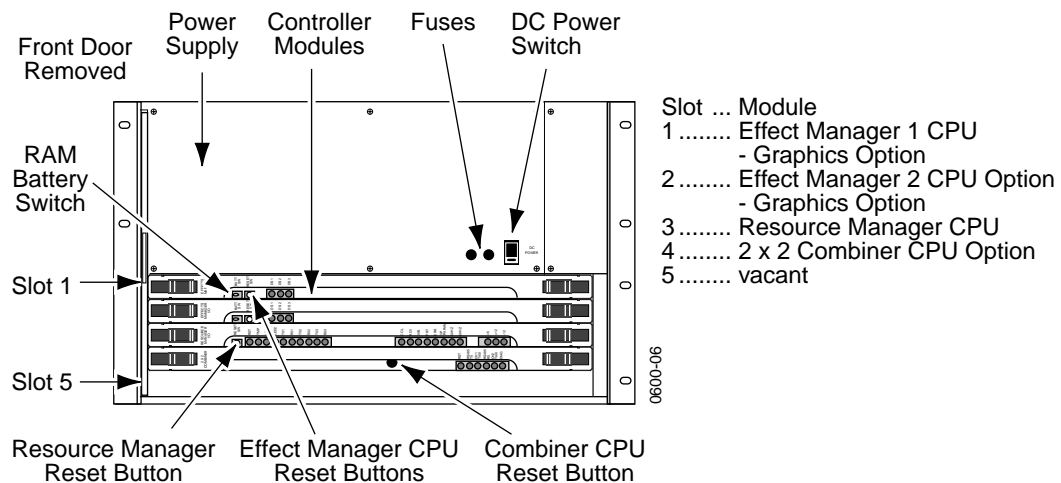


Figure 1-14. Small System Controller Frame, Front View

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.

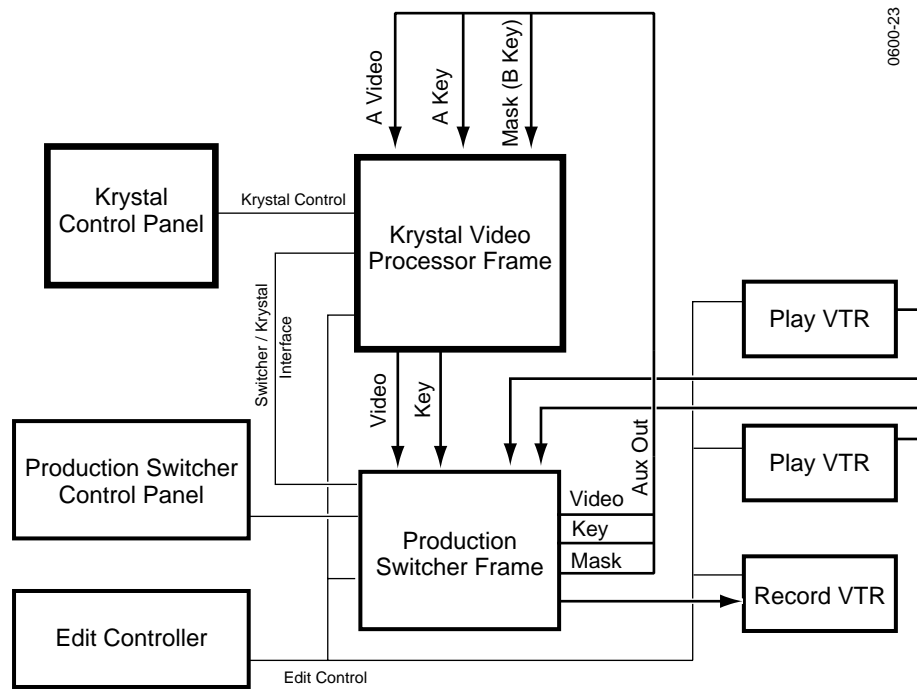


Figure 1-15. Single Channel Krystal Edit Facility, External Routing

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.

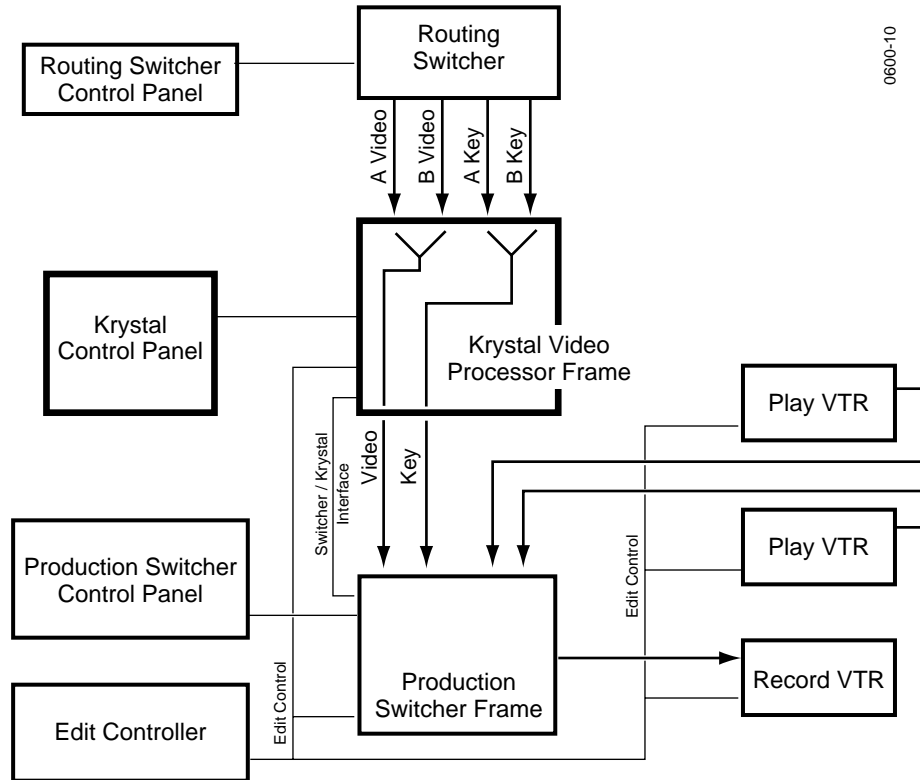


Figure 1-16. Single Channel Krystal Edit Facility, Internal Switching

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.

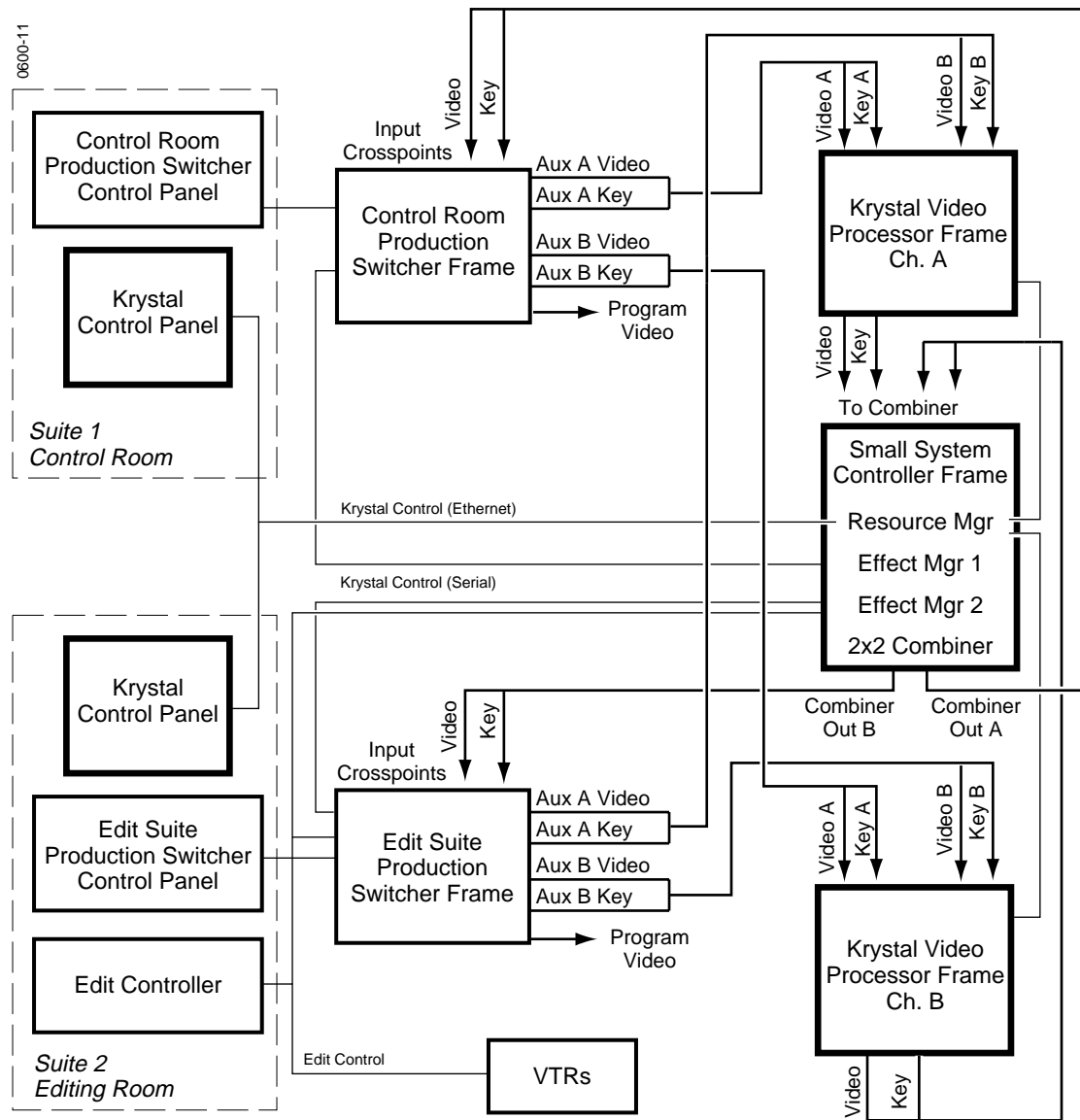


Figure 1-17. Two User Dual-Channel Krystal Facility Example

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.

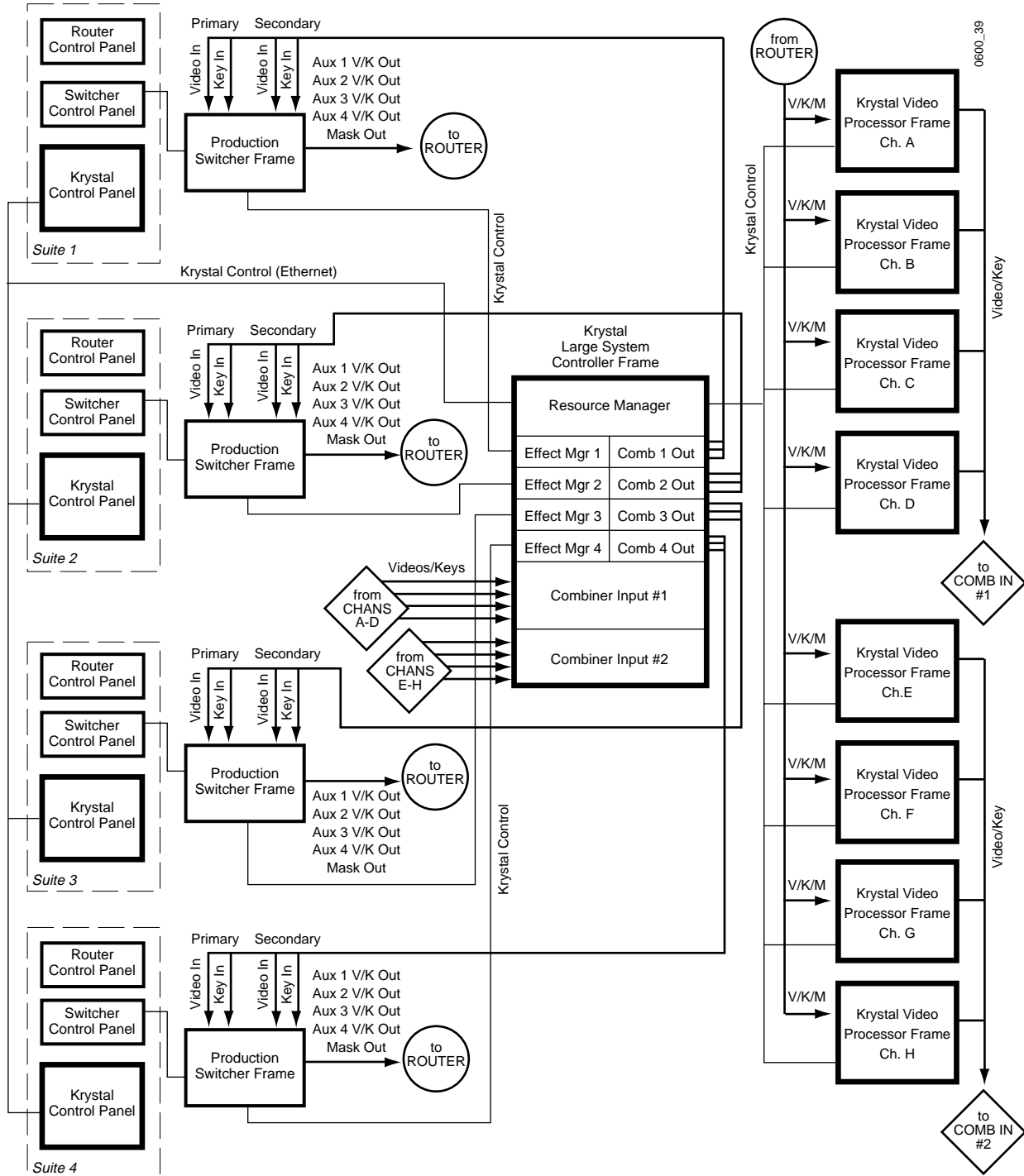


Figure 1-18. Eight Channel, Four User Krystal Facility Example

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.

Specifications

Complete system specifications are provided in the following tables. Specifications are subject to change without prior notice.

Table 1-3. Power Requirements

| Component | Power Consumption (Power factor corrected) | Voltage Requirements | Frequency Range |
|--------------------------------------|---|----------------------------|-----------------|
| Control Panel Power Supply | 50 Watts | 90-240 VAC (Auto-Ranging) | 50/60 Hz |
| Video Processor Power Supply | 400-800 Watts (Depending on Options) | 90-240 VAC (Auto-Ranging) | 50/60 Hz |
| Small System Controller Power Supply | 300 to 500 Watts (Depending on Options) | 90-240 VAC (Auto-Ranging) | 50/60 Hz |
| Large System Controller Power Supply | 300 to 500 Watts (Depending on Options) | 100-240 VAC (Auto Ranging) | 50/60 Hz |

Table 1-4. System Characteristics

| Video | |
|-------------------------------|--|
| Line Standard | 525 or 625 |
| Aspect Ratio | 4:3 or 16:9 |
| Sample Frequency | 13.5 MHz |
| Serial Component Format | 525 line format = SMPTE 259M and SMPTE 125M 625 Line Format = EBU Tech 3267 |
| Environmental | |
| Operating Ambient Temp. | 32 - 104° F (0 - 40 °C) |
| Relative Humidity | 95% non-condensing (maximum) |
| Analog Reference Input | |
| Connector Type | BNC |
| Input type | 525 (60Hz NTSC) or 625 (50Hz PAL) Color Black |
| Impedance | 75 Ω , BNC, bridging |
| Return loss | >40 dB to 5 MHz |

Table 1-5. Mechanical Characteristics

| Component | Height | Width | Depth | Weight ^a |
|-------------------------|------------------------------------|----------------------|-------------------|------------------------|
| Control Panel | 12 in (305 mm) | 17.25 in (438 mm) | 16 in (406 mm) | 25 lb. (11.34 kgs) |
| Video Processor | 22.75 in (578 mm) 13 rack units | 19.0 in (483 mm) | 22.25 in (565 mm) | 167 lb. (75.75 kgs) |
| Small System Controller | 12.25 in (311 mm) 7 rack units | 19.0 in (483 mm) | 23.0 in (584 mm) | 80 lbs (36 Kg) |
| Large System Controller | 22.75 in (578 mm) 13 rack units | 19.0 in (483 mm) | 22.25 in (565 mm) | 150 lbs (68 Kg) |

^a Weight is with standard modules only installed (allow additional weight for options).

Table 1-6. Number of Video Inputs and Outputs

| Component | Inputs (all serial digital) | Outputs (all serial digital) |
|------------------------------|--|--|
| Video Processor | 2 Video and 2 Keys, OR 1 Video, 1 Key, 1 Mask | 1 Pww Video, 1 Pgm Video, 1 Key/Depth |
| 2 x 2 Combiner Option | 2 Video, 2 Key/Depth, 1 Bkgnd Video | 1 Primary Video, 1 Pr. Key/Depth, 1 Secondary Video, 1 Sec. Key/Depth |
| Four Channel Combiner Option | Each Input Module: 4 Video, 4 Key/Depth per input module, (support for 2 modules for up to 8 Video and 8 Key/Depth inputs) Each User (Output Module): 1 Video Bkgnd | Each User (Output Module): 1 Primary Video, 1 Pr. Key/Depth, 1 Secondary Video, 1 Sec. Key/Depth, 1 Pww Video |
| Graphics Option | 1 Video | 1 Video |

Table 1-7. Serial Digital Characteristics

| Specification | Input | Output |
|--------------------------|--------------------------------------|-------------------------------|
| Connector type | BNC | BNC |
| Impedance | 75Ω, Terminating | 75Ω |
| Return loss | > 15 dB from 5 MHz to 270 MHz | > 15 dB from 5 MHz to 270 MHz |
| Number of bits | 10 | 10 |
| Auto timing range | ±18.9 μs @ 13.5 MHz | NA |
| Maximum cable length | 250 meters (820.2 feet) ^a | NA |
| DC level on output | NA | < ±50 mV |
| Output Sync Adjust Range | NA | ± 5 Horizontal Lines |

^a Using Belden 8281 cable.

Installation

Introduction

This section describes how to install a Krystal system into your facility. This section covers basic installation of a single channel system or smaller multi-channel system. Information for installing larger Krystal systems and integrating Krystal systems into your facility is presented in Section 3 - Configuration.

The basic smaller system installation steps include:

- Hardware Installation (Control Panels, Video Processors, and System Controller frames)
- Basic System Cabling
- Option Installation and Cabling
- External Interfaces
- Power Connection, Power Up, and Preliminary Diagnostics

After completing the above installation, the system must be configured for your facility.

Before you begin your installation, read through this entire section and the following section on configuration. This allows you to choose the procedures that apply to your system, will help make the installation proceed quickly, and can prevent potential problems.

Note 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.

Hardware Installation

Safety

To reduce the potential for injury or equipment damage, before you unpack your equipment read and follow the following installation safety precautions.

WARNING During installation and until secured in the rack, an appropriate lifting device should be used to lift and support the Video Processor Frame and Controller Frame. Failure to follow this precaution can result in injury to personnel and damage to equipment.

Do not lift the Control Panel by the lid. The Control Panel is not designed to be lifted by its lid, and doing so may cause the panel to open abruptly which could cause equipment damage or personnel injury.

The Control Panel lid does not have a strut for support when open. Use caution when working in an open Control Panel.

WARNING Suppressing EMI to meet required standards causes high leakage currents in power supplies. To ensure safety and proper grounding, Control Panel and frame power supplies must be connected to earth ground via the grounding lugs, where provided, and the ground wire in AC input cords.

CAUTION To avoid static damage to sensitive electronic devices, protect Krystal components from static discharge. Avoid handling modules in a high static environment. Touch the (installed and properly grounded) electronics frame before you install or remove any modules to reduce the chance of static discharge. Use a grounding wrist or heel strap.

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

Unpacking

Your equipment may be shipped in several different boxes, depending upon order size and configuration.

Check the contents of each box against the packing slip to ensure your order is complete. If equipment is missing or damaged, contact the shipping company immediately.

Installing the Control Panel

CAUTION Do not lift the panel by its controls.

The Control Panel may be installed either by placing it on a flat (10° inclination or less) counter top, or in a cutout.

- If installed on a counter top, the rear power switch used to turn on and reset the Control Panel will remain accessible. In this case you can tighten the screws located under the front lip of the panel to secure the top portion of the panel to the base, preventing unauthorized access to the interior.
- If installing the panel in a cutout, use the dimensions shown in [Figure 2-1](#). Leave a minimum of 8.0 in (200 mm) of clear space inside the console behind the Control Panel for control, signal, and power cables. In a cutout installation, you may wish to remove the screws securing the top of the panel to the base, to allow opening the Control Panel to access the reset switch.

CAUTION Proper ventilation must be provided if the panel is mounted in a cutout. Ensure that there is sufficient air flow within the console, and that both the front and rear panel vents are unobstructed.

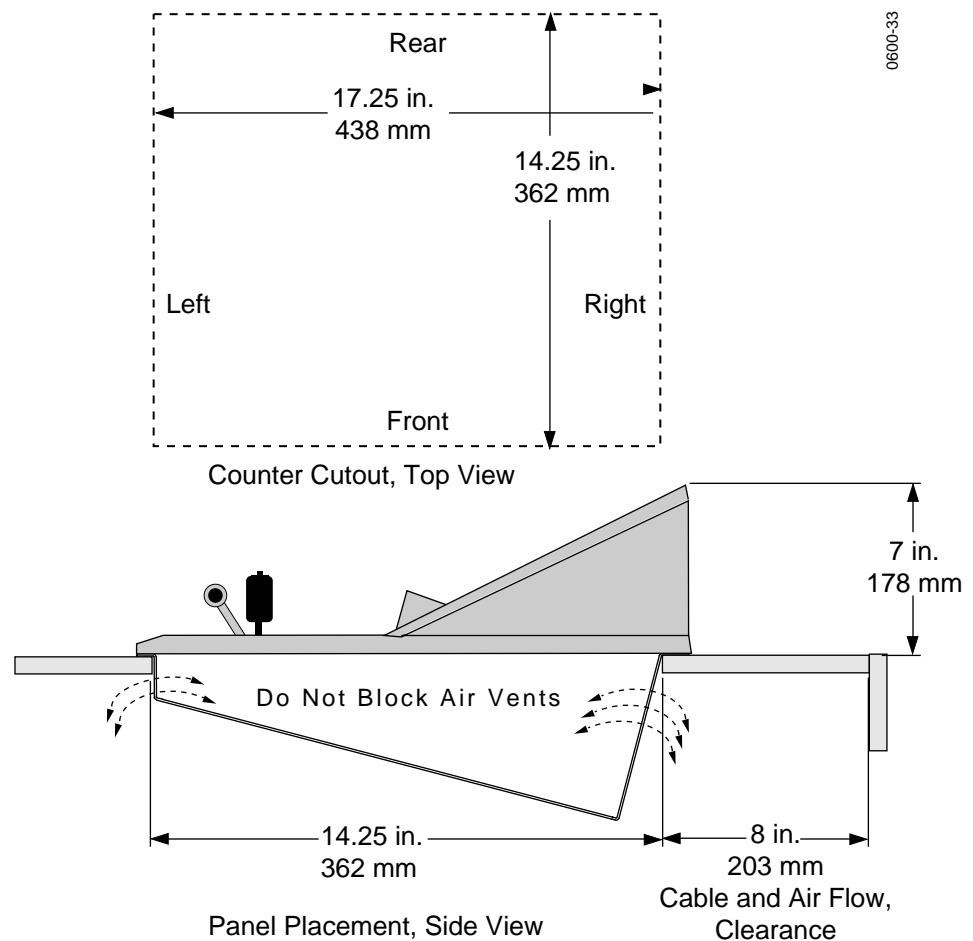


Figure 2-1. Krystal Control Panel Console Mounting Dimensions

Installing the Video Processor Frame

The Video Processor frame is 13 rack units high (22.75 in, 577 mm), 19 in. wide (482 mm), and 22.25 in. (565 mm) deep.

1. Mount the frame in a standard 19-inch equipment rack using the bolts recommended by the rack manufacturer (Figure 2-2).

WARNING During installation and until secured in the rack, use an appropriate lifting device to lift and support the frame. Failure to follow this precaution can result in injury to personnel and damage to equipment.

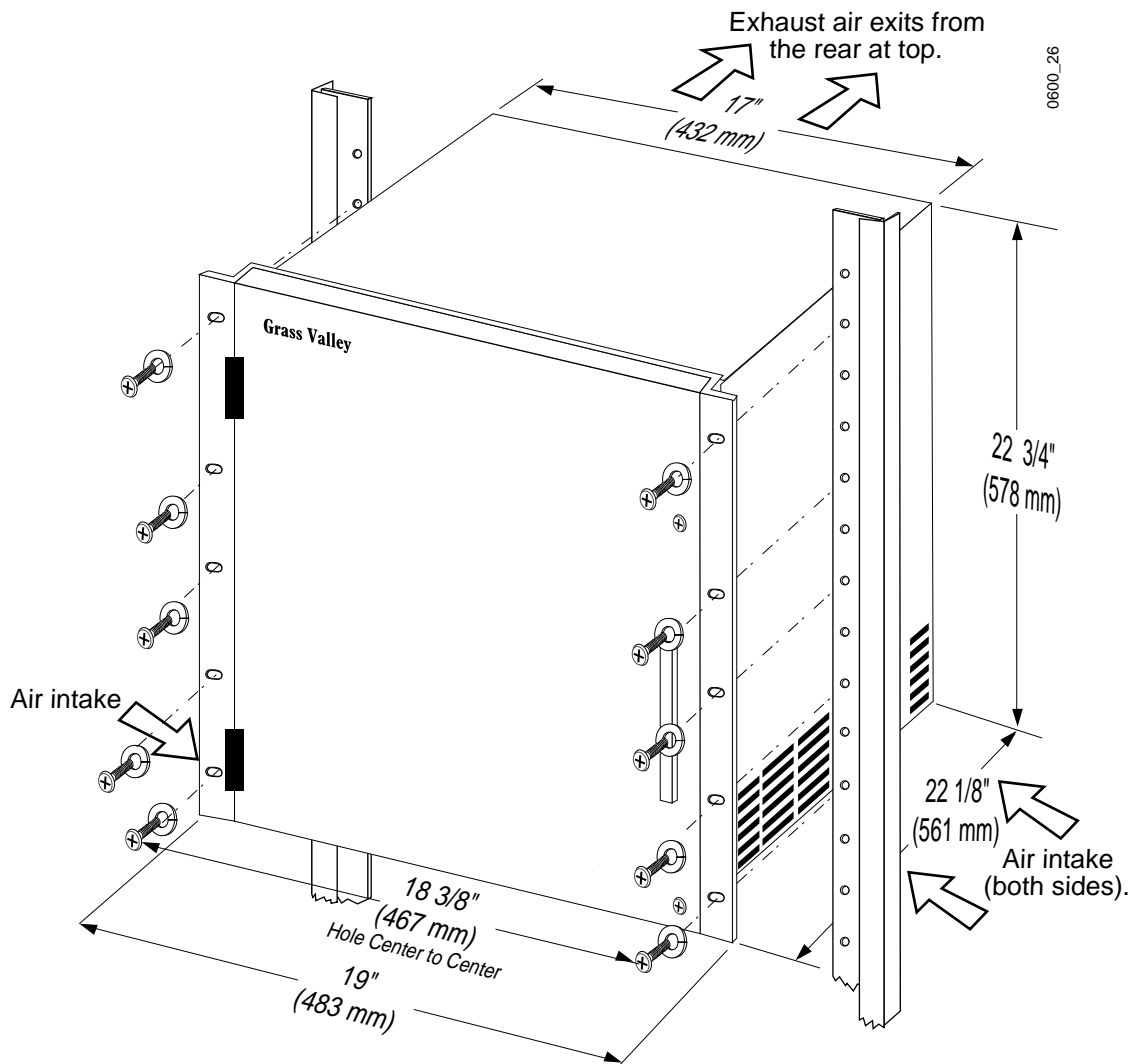


Figure 2-2. Video Processor Frame Installation

The front door is an integral part of the Video Processor frame cooling air flow design. Keep the door closed during normal operation.

System Ground Connection

The Video Processor frame must be grounded to a good earth ground using a wire as specified by the local electrical code. This wire is attached to the ground connector in the lower right corner of the Video Processor frame.

1. For safety and static protection, install the ground connection immediately after installing the frame in the rack.

Video Processor CPU Hardware ID

The Video Processor hardware ID is set using the dial switch (S1) located on each Video Processor CPU module (Figure 2-3).

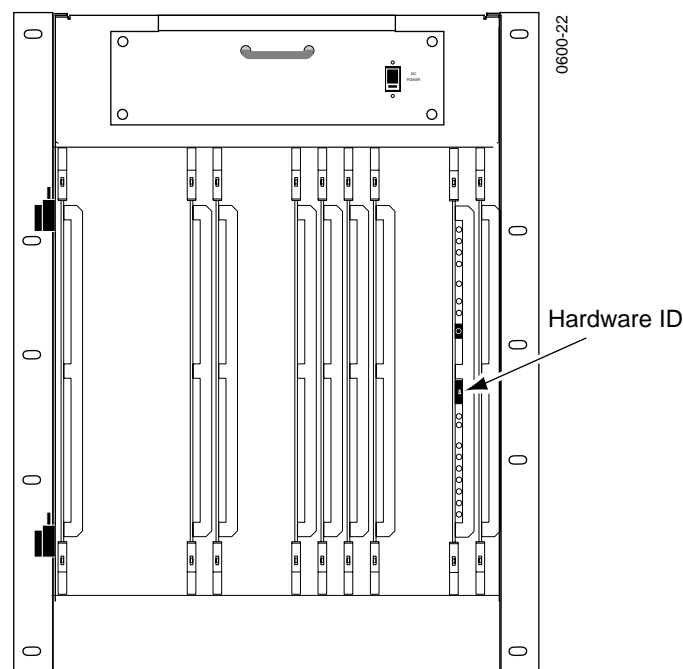


Figure 2-3. Video Processor CPU Hardware ID

1. The hardware ID is set using a screwdriver dial adjustment located on the right side of the switch (Figure 2-3). You may need to remove a module from the frame to reach this switch.

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

- a. In a single-channel system the Video Processor CPU hardware ID must be set to zero (0). This is the default setting as shipped from the factory. However, you should check and confirm it is correct when you install the frame.

- b. In a multi-channel system, each Video Processor CPU module must have a different hardware ID. The dial switch is numbered 0–7. Setting 0 corresponds to the Video Processor module in the frame identified as Channel 1 in the Physical Channel Configuration menu (default name “A”). Setting 1 corresponds to the Video Processor CPU module in the frame identified as Channel 2 (default name “B”), and likewise for the remaining channel assignments. The settings must be correct for the system to work properly.

Installing the System Controller Frame

A System Controller frame is included in multi-channel Krystal Systems only.

Note If more than one System Controller is installed on the same network, you will need to change IP Addresses of the extra System Controller devices during system configuration. See Section 3 - Configuration for more information.

Large System Controller

The Large System Controller uses the same basic frame as the Krystal Video Processor. The frame installation procedure for the Large System Controller is the same as installing a Video Processor (see *Installing the Video Processor Frame* [on page 2-4](#)), except there is no Hardware ID to set.

Small System Controller

The Small System Controller frame is 12.25 in. (311 mm) or 7 rack units high, 19 in. wide (482 mm), and 22.12 in. (562 mm) deep.

1. Mount the frame in a standard 19-inch equipment rack using the bolts recommended by the rack manufacturer ([Figure 2-4](#)).

WARNING During installation and until secured in the rack, use an appropriate lifting device to lift and support the frame. Failure to follow this precaution can result in injury to personnel and damage to equipment.

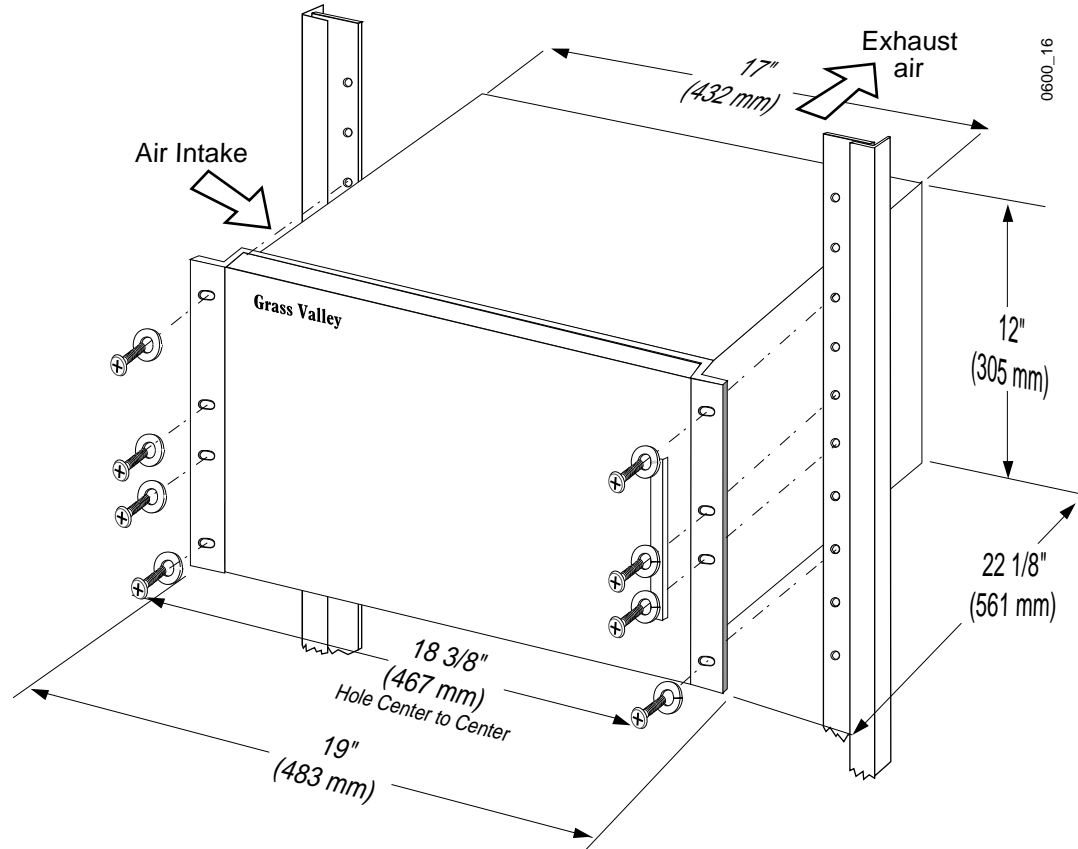


Figure 2-4. Small System Controller Frame Rack Installation

System Ground Connection

The System Controller frame must be grounded to a good earth ground using a wire as specified by the local electrical code. This wire is attached to the ground connector located near the power cord connector of the System Controller frame.

For safety and static protection, install the ground connection immediately after installing the frame in the rack.

Basic System Cabling

Overview

In general, cabling a Krystal system involves connecting the following items:

- Analog Reference Video (60Hz NTSC or 50Hz PAL)
- Video/Key/Mask Inputs and Outputs
- Control Panel
- Krystal Internal Control Cables (multi-channel systems only)
- Tally, GPI, and Diagnostic ports (if used)
- External Serial Control ports (if used)
- Some options (Keyboard, Graphics, or Combiner)
- AC Power

Cabling Considerations

The following items must be considered when you cable your system:

Facility Configuration

Basic system cabling in a facility varies depending on these factors:

- Single or multi channel Krystal system
- Single or multiple user Krystal system
- Dedicated or pooled resource Krystal system

Cabling for optional features are discussed later in this section.

See Section 3 - System Configuration for more information about facility configuration.

Reference Video

A studio reference black source (either 60Hz NTSC or 50Hz PAL) must be attached to each Video Processor frame. The System Controller frame of multi-channel Krystal systems also requires reference black. If the multi-channel system is going to be used for both 50Hz and 60Hz operation, both of these reference signals must be connected to the System Controller frame. Loop thru connectors are provided for all reference video inputs. Terminate the end of each the reference loop with 75 ohms.

Video Timing

Krystal Video Processors and Combiners have auto-timing capabilities. Video and key inputs within $\pm 18.9 \mu\text{s}$ (± 255 clocks) of reference will time successfully. If the input video is outside this window, video may be displayed one or more lines early or late. See *Timing Considerations* on page 3-24 for more information.

Video Inputs

Each Video Processor frame has two pairs of serial digital video inputs (Video A, Key A, Video B, Key/Mask B). How you connect these inputs depends on whether you use External Source Selection (switcher or router), Internal switching, or A/B Input Routing.

External Source Selection

With External Source Selection, the Krystal DPM is configured with an external system, like a production switcher. Separate outputs of the switcher are connected to the Video A, Key A, and optionally the Key/Mask B Krystal inputs (the Video B input is not used). The Krystal system is able to command the external system to select different sources at any time within an effect. Switching can be frame accurate and keyframeable, and external masking is supported with this configuration. [Figure 1-15 on page 1-18](#) illustrates an example of External Source Selection.

Internal Switching

With Internal Switching, one video source is connected to the Video A, Key A Krystal input pair, and another source is connected to the Video B, Key B Krystal input pair. You can then select either of these sources to display at any time, and can have the Krystal system automatically switch between these sources when the manipulated image rotates edge on within an effect. [Figure 1-16 on page 1-19](#) illustrates an example of Internal Switching.

A/B Input Routing

With A/B Input Routing, the Krystal DPM is typically configured with two different external Switcher systems, each residing in a separate suite. One switcher is connected to the Video A, Key A Krystal input pair, and the other switcher is connected to the Video B, Key B input pair. The Krystal DPM can be configured to use inputs A (video and key) when a channel is acquired from suite #1 and use the B inputs when the channel is acquired from suite #2. A/B Input Routing is designed for acquisition routing only and is not keyframeable. [Figure 1-17 on page 1-20](#) illustrates an example of A/B Input Routing.

Video Outputs

Each Video Processor frame has three video outputs; Key/Depth, Preview, and Program.

- Key/Depth outputs the key signal as it has been transformed by Krystal and contains z axis depth information.
- Preview outputs the source video as it has been transformed by Krystal with or without background. The preview output is always shaped.
- Program outputs the source video as it has been transformed by Krystal. The output can be configured to be shaped or unshaped.

Exactly how you connect these outputs depends on the options in your system (Graphics, Combiners), what external devices and interfaces are being used, and your specific facility configuration. Cabling for optional features and external devices is described later in this manual.

The video outputs must be terminated in 75 Ω . Most equipment that accepts serial digital video is internally terminated at 75 Ω .

Connecting Krystal Control Panels

CAUTION The Control Panel Ethernet cabling must be dedicated for use by Krystal. Non-Krystal devices connected to the same LAN cabling will cause degradation in communications and reduce Krystal system reliability.

The Control Panel uses an Ethernet LAN equipped with BNC connectors. This control cable must be 50 Ω and have 50 Ω termination at both ends.

Note If more than one Control Panel is installed you will need to change the IP Addresses of the extra panels before they are connected to the network.

To connect a Krystal Control Panel:

1. Connect from one to eight Control Panels using 50 Ω coaxial cable, BNC T-connectors, and a 50 Ω terminator (Figure 2-5).

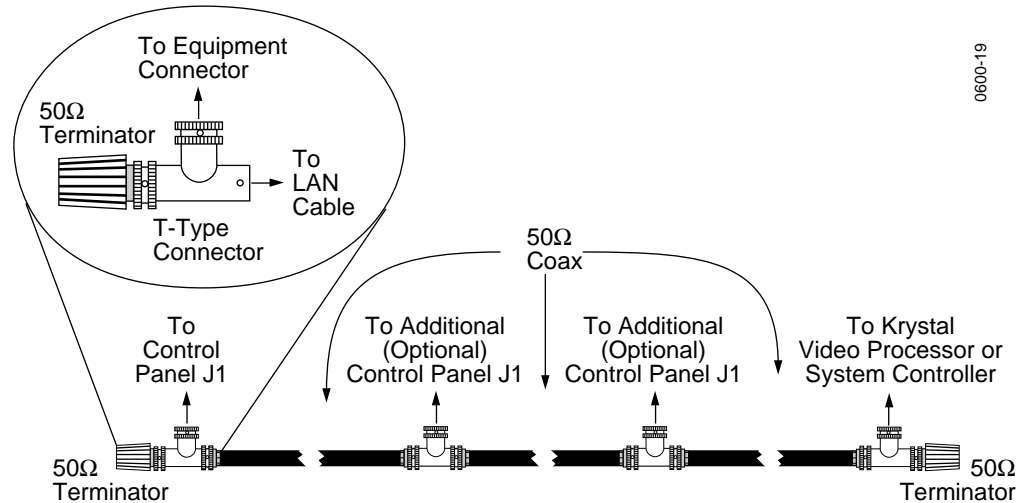


Figure 2-5. LAN Cabling Connections

2. Connect the frame end of the coaxial cable run.
 - a. On a single channel system, connect the cable to J1 CP COMM on the Video Processor I/O module and terminate the cable (Figure 2-6).
 - b. On a multi-channel system connect the cable to J12 CP COMM on the Resource Manager module in the System Controller and terminate the cable (Figure 2-8, Figure 2-7).

Single Channel Basic Cabling

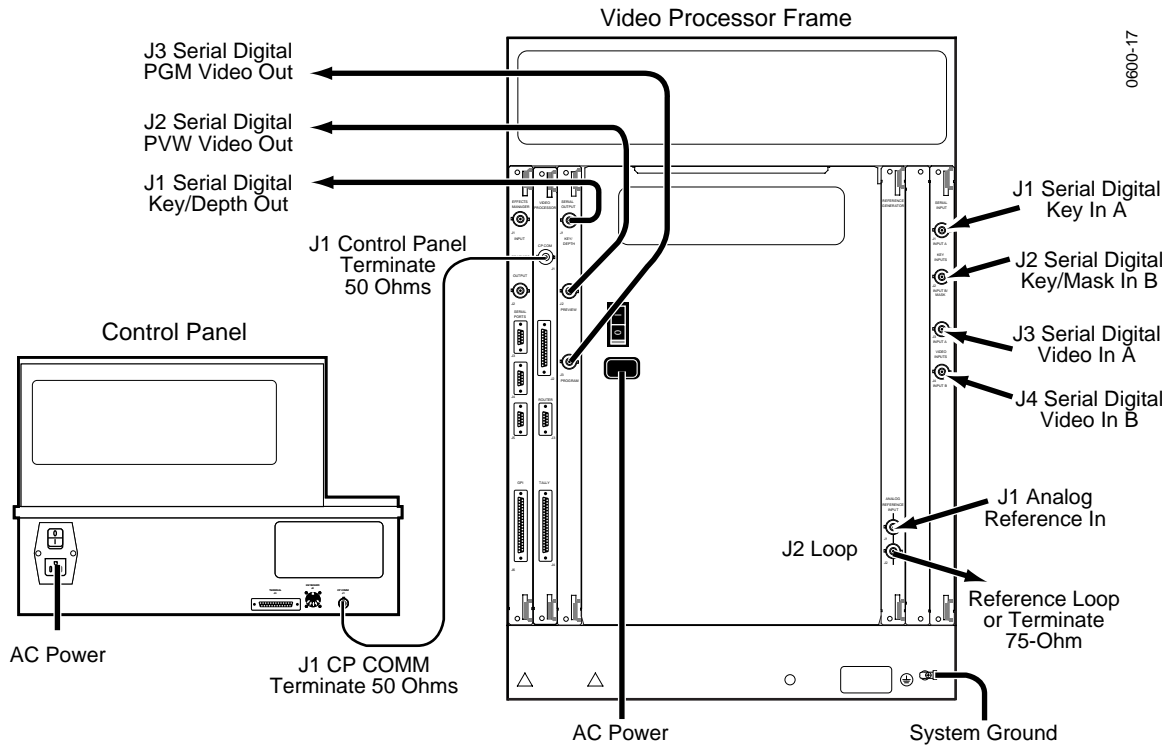


Figure 2-6. Single Channel Basic Cabling

Refer to [Figure 2-6](#).

1. Connect reference video (either 50Hz PAL or 60Hz NTSC) to the BNC connector labeled **J1 ANALOG REFERENCE INPUT** on the Reference Generator Module located at Slot 3 in the back of the Video Processor frame. Either loop thru the reference video using **J2** on the Reference Generator Module, or terminate with 75Ω .
2. Connect the desired input sources (which vary depending on your facility configuration) to the BNC connectors on the Serial Input Module located at Slot 1 in the back of the Video Processor frame. The inputs are labeled **J1 KEY INPUT A**, **J2 KEY INPUT B/MASK**, **J3 VIDEO INPUT A**, and **J4 VIDEO INPUT B**.
3. Connect the Krystal output BNCs to their desired destinations (which vary depending on your system's options and your facility configuration). The outputs are located on the Serial Output Module located at Slot 15 in the back of the Video Processor frame.

Connect the following items as needed to complete your system wiring. Information about these items is presented later in this manual.

- Connect the appropriate cables for any options (e.g. Graphic Display Option) installed in your Krystal system.
- Connect Tally, GPI, and Diagnostics as required.
- Connect any External Serial control ports as required for the external interfaces (switcher, router, editor) being used by your system.
- Connect system ground and AC power as required by your local electrical code.

Multi Channel Basic Cabling, Large System Controller

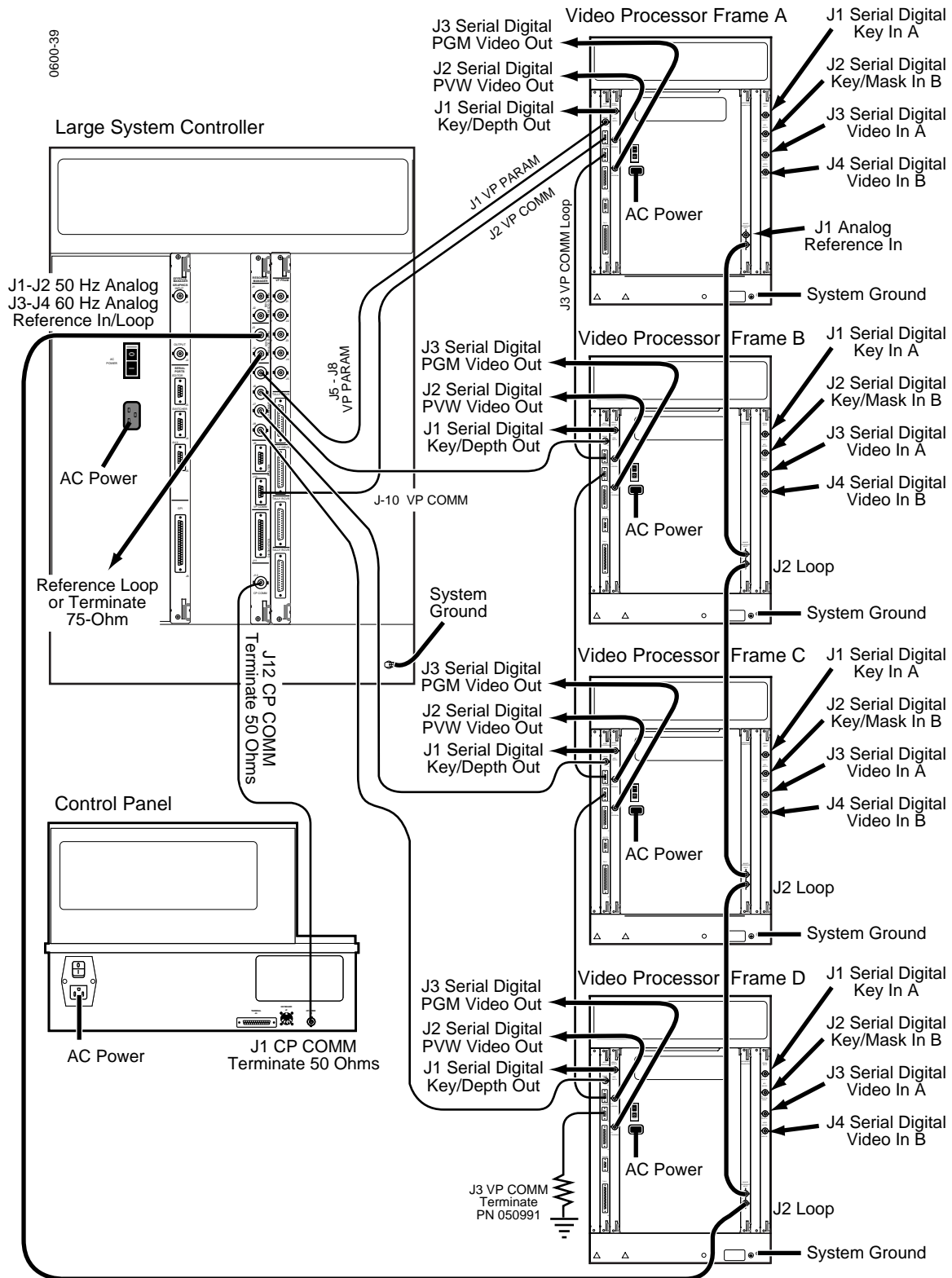


Figure 2-7. Multi-Channel Basic Cabling, Large System Controller

Refer to [Figure 2-7](#).

1. Connect reference video (either 60Hz NTSC or 50Hz PAL) to the BNC connector labeled J1 ANALOG REFERENCE INPUT on the Reference Generator Module located at Slot 3 in the back of each Video Processor frame. You can loop thru the reference video using J2 on each Reference Generator Module. The end of the run must be terminated with 75 Ω .
2. Connect reference video to the Resource Manager Module located at Slot 8 in the back of the Large System Controller frame. Two pairs of BNC connectors are available, one pair (J3,J4) for 60Hz NTSC and one pair (J1, J2) for 50Hz PAL. You can connect both reference signals if you will be using both standards in your facility. You can loop thru the appropriate reference video from the Video Processors if you wish. The end of each run must be terminated with 75 Ω .
3. Connect the desired input sources to the BNC connectors on the Serial Input Module located at Slot 1 in the back of each Video Processor frame. The inputs are labeled J1 KEY INPUT A, J2 KEY INPUT B/MASK, J3 VIDEO INPUT A, and J4 VIDEO INPUT B.
4. Connect the Krystal output BNCs from each Video Processor to their desired destinations (which vary depending on your system's options and your facility configuration). The outputs are located on the Serial Output Module located at Slot 15 in the back of each Video Processor frame.

CAUTION VP COMM and VP PARAM are proprietary high speed serial data links and must only be used for Krystal system operation.

5. Connect a VP PARAM internal Krystal control cable (coaxial 75 Ω) from the System Controller to each Video Processor in your system. BNC connectors for these cables are located on the Resource Manager Module at Slot 8 in the back of the Large System Controller, and on the Multi-Channel Video Processor I/O Module at slot 16 in the back of each Video Processor frame. Each Video Processor must be connected individually, but any Resource Manager connector (J5 to J8) can be used for any channel. The Hardware ID setting for the Video Processor channel determines the VP PARAM buss address for that channel.
6. Connect the VP COMM multi-pin internal Krystal control cable from J10 on the Resource Manager I/O Module located at Slot 8 in the back of the System Controller, to J2 VP COMM on the Pooled Video Processor I/O Module located at slot 16 in the back of the first Video Processor frame. Then loop that signal from J3 VP COMM on the first Video Processor I/O Module to J2 VP COMM on the second channel's Video Processor I/O Module. Loop thru any remaining Krystal channels in the same way. (Actually either VP COMM connector can be used for input or loop-thru).

7. Connect the special terminator (PN 050991) to the open VP COMM multi-pin connector (J2 or J3) at the last Video Processor I/O Module in the run.

Connect the following items as needed to complete your system wiring. Information about these items is presented later in this manual.

- Connect the appropriate cables for any options installed in your Krystal system. Graphics and Combiner option cabling is described in this section. Installing additional Control Panels and Effect Managers is described in Section 2 - Configuration.
- Connect Tally, GPI, and Diagnostics as required.
- Connect any External Serial control ports as required for the external interfaces (switcher, router, editor) being used by your system.
- Connect system ground and AC power as required by your local electrical code.

Multi Channel Basic Cabling, Small System Controller

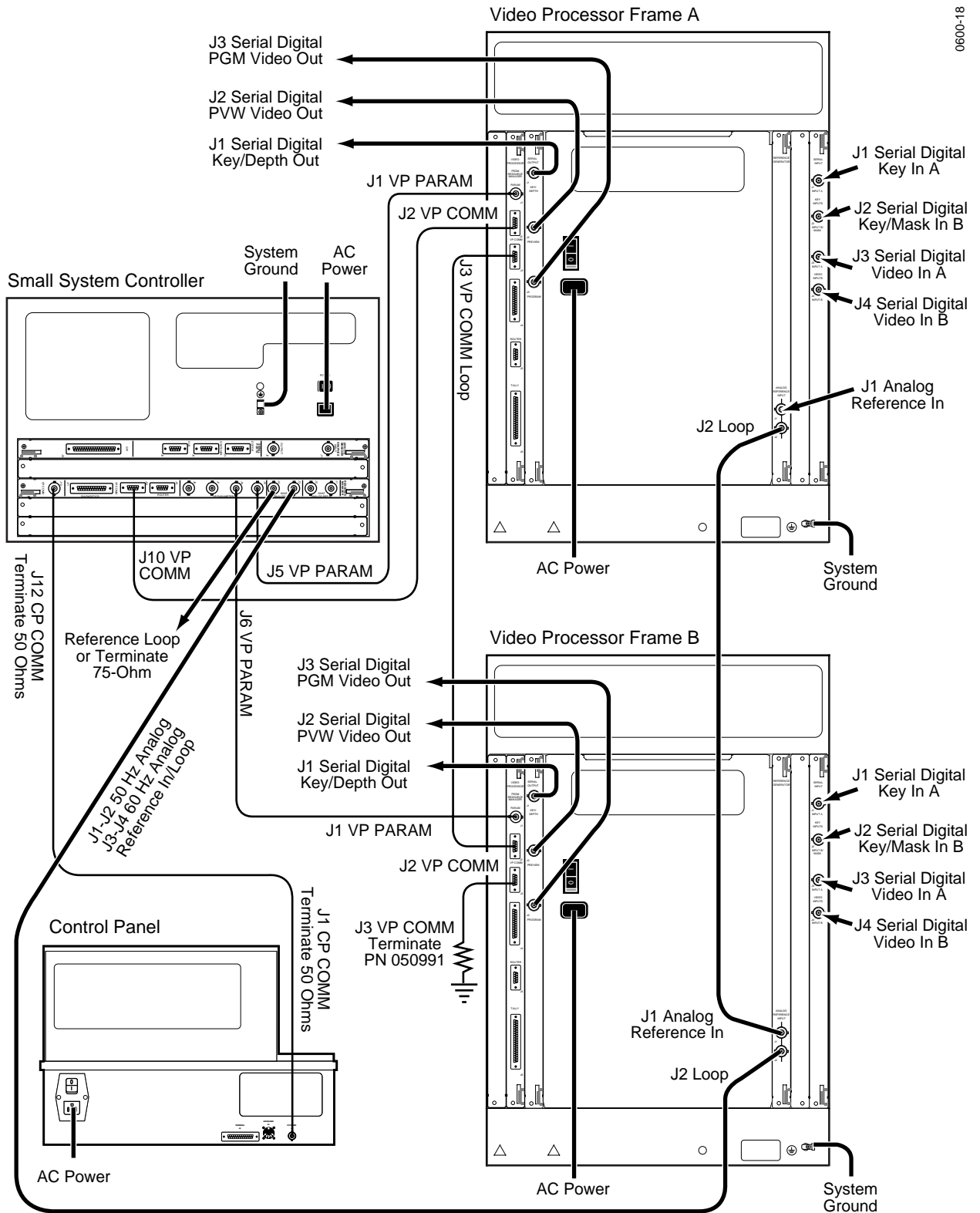


Figure 2-8. Multi-Channel Basic Cabling, Small System Controller

Refer to [Figure 2-8](#).

1. Connect reference video (50Hz PAL and/or 60Hz NTSC) to the BNC connector labeled J1 ANALOG REFERENCE INPUT on the Reference Generator Module located at Slot 3 in the back of each Video Processor frame. You can loop thru the reference video using J2 on each Reference Generator Module. The end of the run must be terminated with 75 Ω .
2. Connect reference video to the Resource Manager Module located at Slot 3 in the back of the Small System Controller frame. Two pairs of BNC connectors are available, one pair (J1, J2) for 50Hz PAL, and one pair (J3, J4) for 60Hz NTSC. You can connect both reference signals if you will be using both standards in your facility. You can loop thru the appropriate reference video from the Video Processors if you wish. The end of each run must be terminated with 75 Ω .
3. Connect the desired input sources to the BNC connectors on the Serial Input Module located at Slot 1 in the back of each Video Processor frame. The inputs are labeled J1 KEY INPUT A, J2 KEY INPUT B/MASK, J3 VIDEO INPUT A, and J4 VIDEO INPUT B.
4. Connect the Krystal output BNCs from each Video Processor to their desired destinations (which vary depending on your system's options and your facility configuration). The outputs are located on the Serial Output Module located at Slot 15 in the back of each Video Processor frame.

CAUTION VP COMM and VP PARAM are proprietary high speed serial data links and must only be used for Krystal system operation.

5. Connect a VP PARAM internal Krystal control cable (coaxial 75 Ω) from the System Controller to each Video Processor in your system. BNC connectors for these cables are located on the Resource Manager Module at Slot 3 in the back of the Small System Controller, and on the Multi-Channel Video Processor I/O Module at slot 16 in the back of each Video Processor frame. Each Video Processor must be connected individually, but any Resource Manager connector (J5 to J8) can be used for any channel. The Hardware ID setting for the Video Processor channel determines the VP PARAM buss address for that channel.
6. Connect the VP COMM multi-pin internal Krystal control cable from J10 on the Resource Manager I/O Module located at Slot 3 in the back of the System Controller, to J2 VP COMM on the Pooled Video Processor I/O Module located at slot 16 in the back of the first Video Processor frame. Then loop that signal from J3 VP COMM on the first Video Processor I/O Module to J2 VP COMM on the second channel's Video Processor I/O Module. Loop thru any remaining Krystal channels in the same way. (Actually either VP COMM connector can be used for input or loop-thru).

7. Connect the special terminator (PN 050991) to the open VP COMM multi-pin connector (J2 or J3) at the last Video Processor I/O Module in the run.

Connect the following items as needed to complete your system wiring. Information about these items is presented later in this manual.

- Connect the appropriate cables for any options installed in your Krystal system. Graphics and Combiner option cabling is described in this section. Installing additional Control Panels and Effect Managers is described in Section 2 - Configuration.
- Connect Tally, GPI, and Diagnostics as required.
- Connect any External Serial control ports as required for the external interfaces (switcher, router, editor) being used by your system.
- Connect system ground and AC power as required by your local electrical code.

Tally Connections

Video Processor Tally

Tally connector (J4) on the Video Processor I/O Module provides six dry-contact relay closure outputs and two opto-coupled inputs. For the Tally to operate, the appropriate key or video input must be selected and the opto-coupled input must be driven. See [Figure 2-9 on page 2-20](#).

There are two modes for the Tally:

- No voltage or path to ground is provided by the relay outputs and 5 to 24 volts is required to drive the Opto inputs (jumper position 2 to 3).
- 5 Volts is provided at the relay outputs and a relay closure is required to drive the Opto outputs (jumper position 1 to 2).

Both key tallys must be set the same and both video tallys must be set the same. The tallys are set using the jumpers, on the Video Processor I/O Module, that are associated with that Tally. Both Jumpers for each tally must be set in the same position. See [Table 2-1](#) and [Figure 2-10](#) for jumper information.

Section 2 — Installation

CAUTION Tally relay maximum ratings are 24 volts DC max, 100 mA, resistive load. To prevent damage to equipment, do not exceed these ratings.

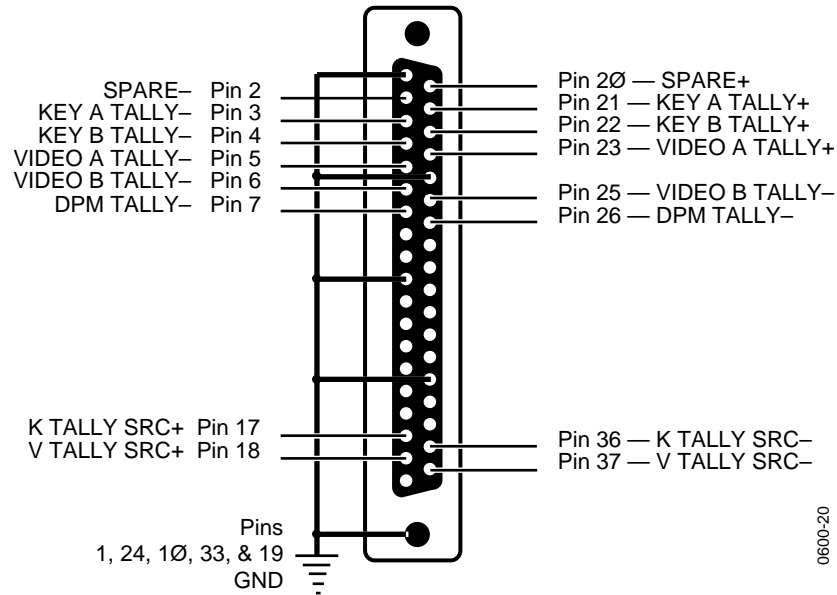


Figure 2-9. Video Processor I/O Tally Connector Pinouts

Table 2-1. Video Processor Tally Configuration

| Tally | Active Input | Opto In | Relay Pins Out | Jumpers |
|---------------|---|-------------------------------|----------------|-----------------------------------|
| Spare | For Future Use | | Pins 2 and 20 | J7 and J8 |
| Key A Tally | Key A | K Tally SRC Pins 17 and 36 | Pins 3 and 21 | Relay: J9, J10 Opto: J19, J20 |
| Key B Tally | Key B | K Tally SRC Pins 17 and 36 | Pins 4 and 22 | Relay: J11, J12 Opto: J19, J20 |
| Video A Tally | Video A | V Tally SRC Pins 18 and 37 | Pins 5 and 23 | Relay J13, J14 Opto: J22, J23 |
| Video B Tally | Video B | V Tally SRC Pins 18 and 37 | Pins 6 and 25 | Relay J15, J16 Opto J22, J23 |
| DPM Tally | When Channel is acquired by a Control Panel | | Pins 7 and 36 | J17, J18 |

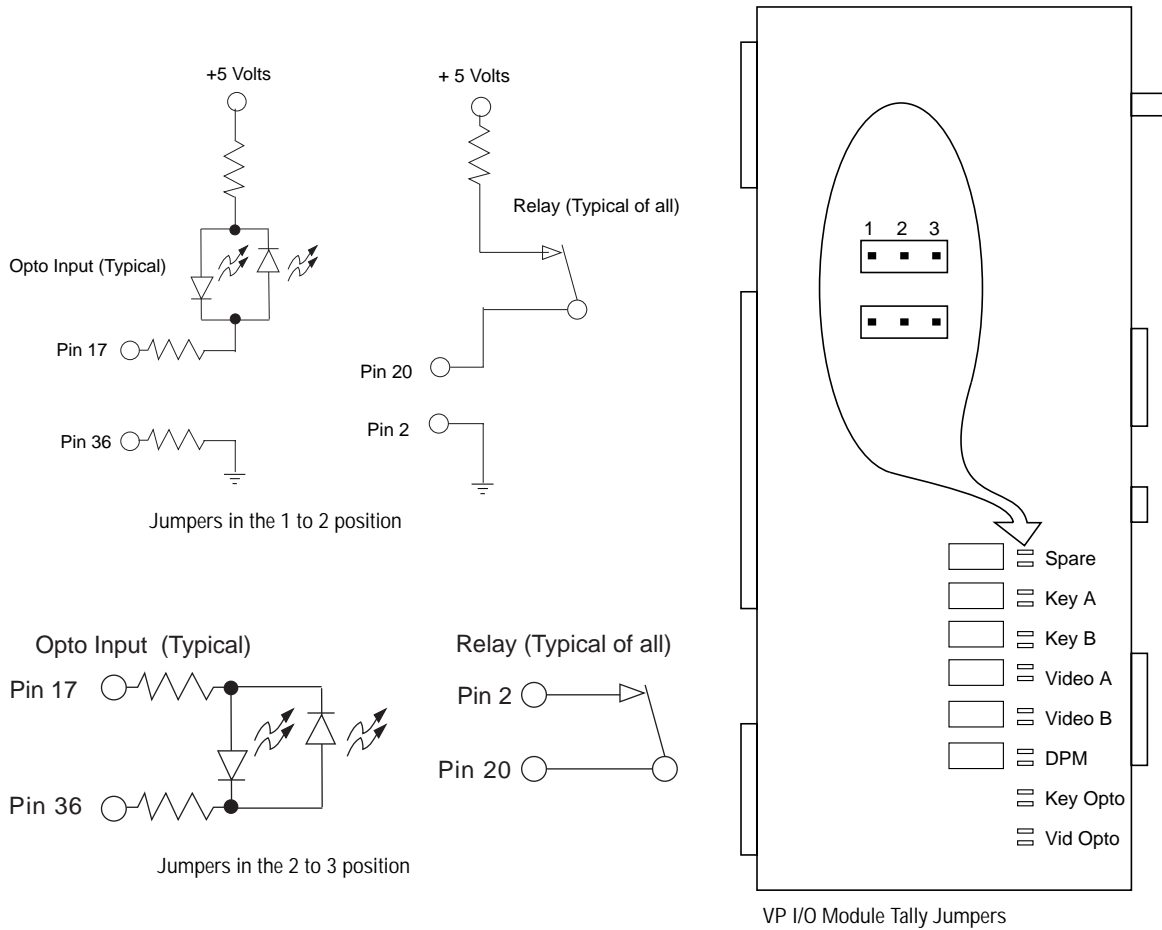


Figure 2-10. Tally Jumper Pinout Example

Large System Controller Tally

CAUTION Tally relay maximum ratings are 24 volts DC max, 100 mA, resistive load. To prevent damage to equipment, do not exceed these ratings.

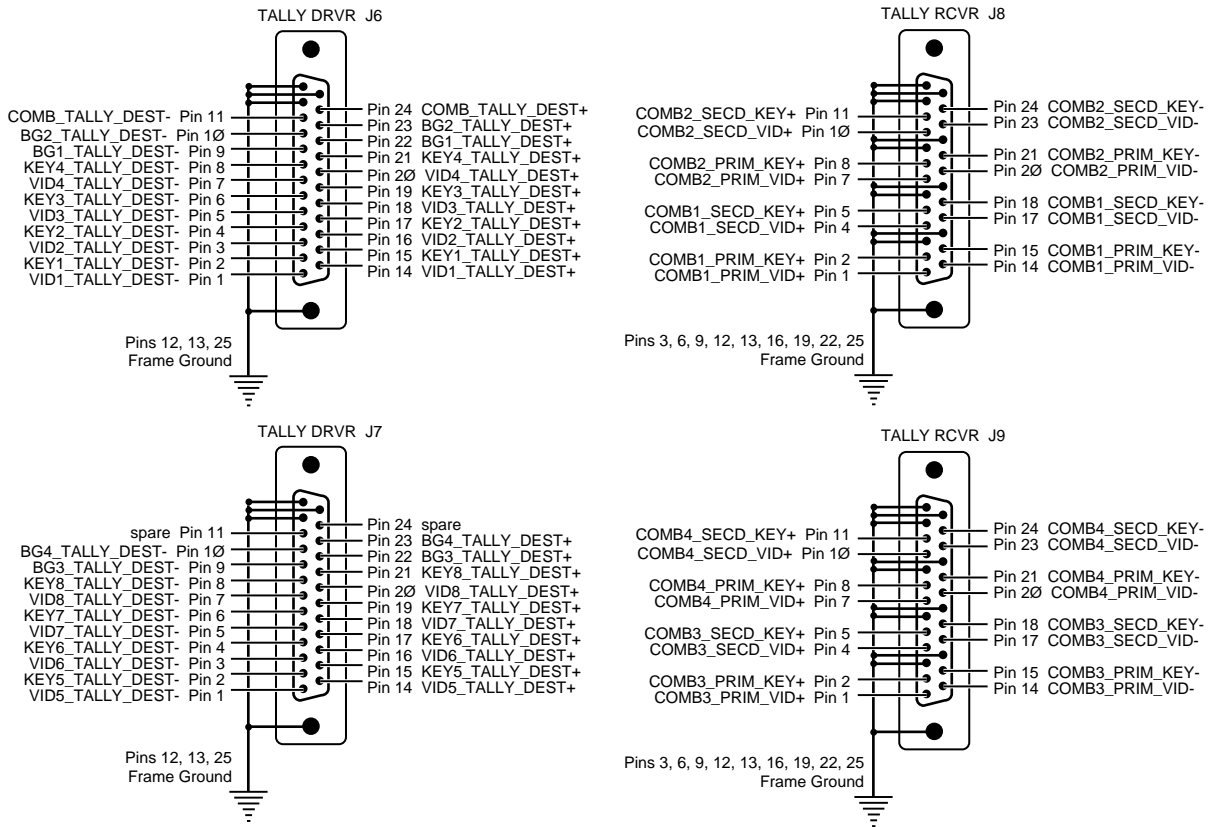


Figure 2-11. Large System Controller Tally Driver and Receiver Connectors

Small System Controller Tally

Note On 2 x 2 Combiner equipped systems, the connector labeled Tally on the Combiner Input I/O module is not operational.

GPI Connections

The GPI (General Purpose Interface) connector (J6) on the Effect Manager I/O Module provides four active opto-coupled inputs (Figure 2-12), which can be individually configured to trigger Krystal events. There is a minimum two-field delay between trigger and event.

The opto-coupled inputs have two modes. Each GPI can be set independently using the jumpers on the Effect Manager I/O Module that are associated with that GPI. See [Table 2-2](#) and [Figure 2-13](#) on page 2-24 for information about jumper settings.

- Jumper 1 to 2 requires a relay closure to drive the opto input.
- Jumper 2 to 3 requires 5 to 24 volts to drive the opto input.

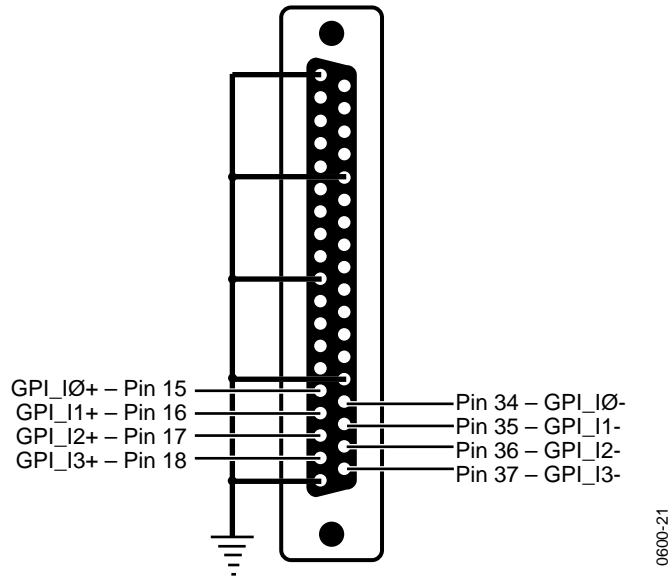


Figure 2-12. Effect Manager I/O GPI Pinouts

Table 2-2. GPI Inputs

| GPI Number | Pin Number | Pin Number | Jumpers |
|------------|--------------------|--------------------|----------|
| GPI 1 | Pin 15 (GPI In 1+) | Pin 34 (GPI In 1-) | J16, J17 |
| GPI 2 | Pin 16 (GPI In 2+) | Pin 35 (GPI In 2-) | J18, J19 |
| GPI 3 | Pin 17 (GPI In 3+) | Pin 36 (GPI In 3-) | J20, J21 |
| GPI 4 | Pin 18 (GPI In 4+) | Pin 37 (GPI In 4-) | J22, J23 |

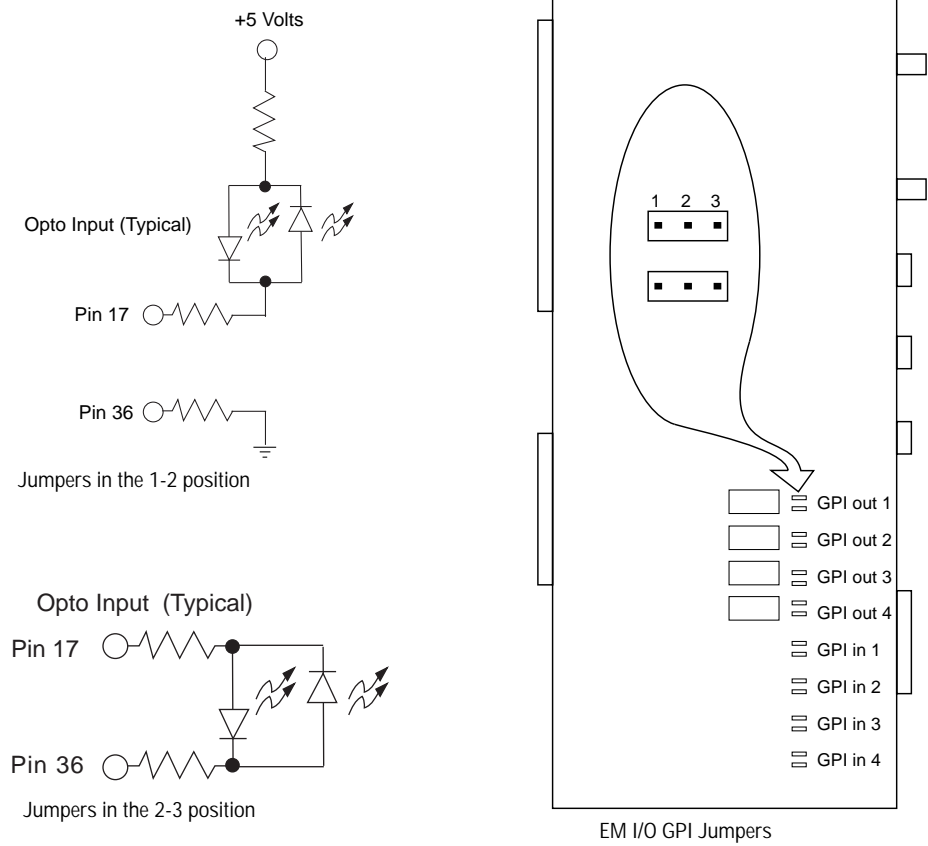


Figure 2-13. GPI Jumper Pinout Example

Note The four dry-contact GPI outputs 1-4 are currently inactive.

Serial Port Cable Connections

Four different 9-pin D-connector serial ports are available on Krystal.

Three RS-485 (SMPTE 207M Tributary) serial ports reside on the Effect Manager I/O Module (located in the Video Processor frame on single channel systems or the Controller frame in multi channel systems). These three ports are labeled:

- Editor, J3
- Switcher, J4
- Auxiliary, J5

Figure 2-14 shows the pinout of these RS-485 (SMPTE 207M Tributary) ports. These ports are intended to interface with an editor, switcher, or another serially communicating device. These ports are individually configurable from the Krystal Control Panel after the system is connected and powered-up. See *External Interfaces* on page 3-62 for more information.

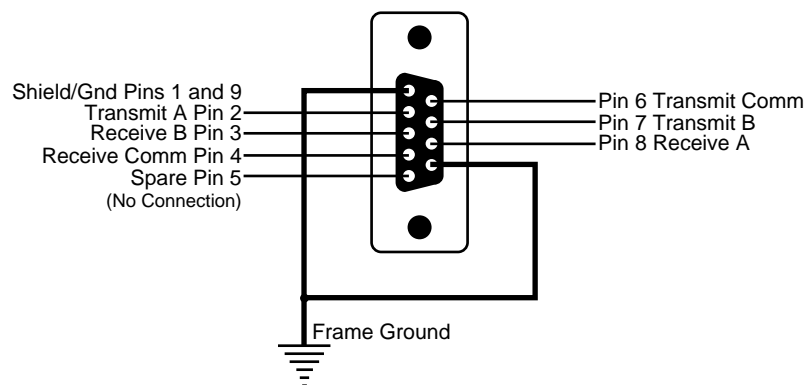


Figure 2-14. Editor, Switcher, and Aux Port Pinouts

The VP COMM port on the Video Processor I/O Module has the same pinouts as the RS-485 ports described above. This port is reserved for internal Krystal control and is not configurable. The VP COMM port at the

last Video Processor must be terminated. A special 9-pin terminator is provided with each multi-channel Krystal system. [Figure 2-15](#) shows the wiring of this terminator should you need to fabricate one.

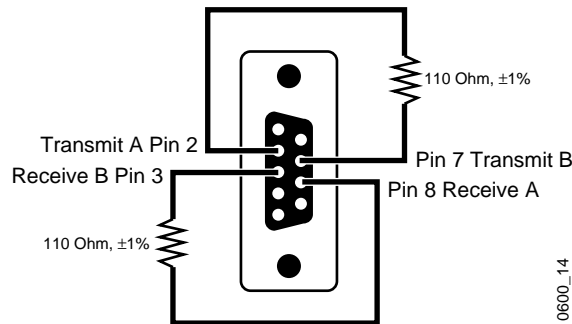


Figure 2-15. VP COMM Terminator Pinouts

One RS-485 (SMPTE 207M Controller) serial port resides on the Video Processor I/O Module in the Video Processor frame. This port is labeled:

- Router (J3 on single channel, J5 on multi-channel)

[Figure 2-16](#) shows the pinout of the Router Port. This port is intended to communicate with external routers being used as source selectors for Krystal. See CROSS REFERENCE for more information.

On a multi channel system, the VP COMM port (J10) on the Resource Manager I/O Module in the System Controller has the same pinouts. This port is reserved for internal Krystal control and is not configurable.

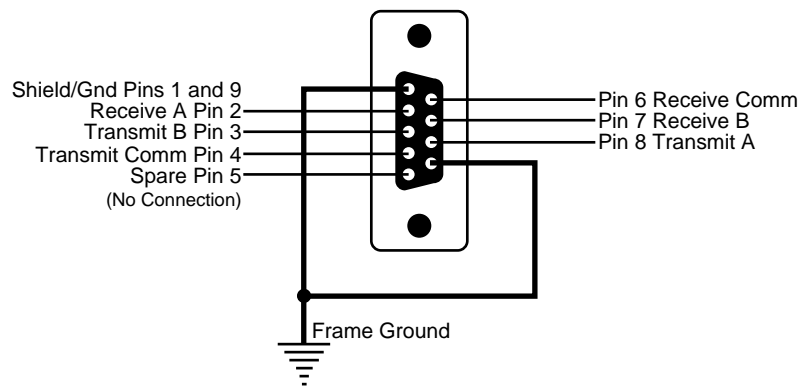


Figure 2-16. Router Port Pinouts

Note On multi-channel systems the port labeled Router (J9) on the Resource Manager I/O Module is not operational.

Diagnostics Port Cable Connections

Diagnostics ports are located on the Control Panel (DIAGNOSTICS - J3), and the Video Processor I/O Module in the Video Processor frame (DIAG J2). The Multi channel system also has a diagnostic port on the Resource Manager in the Controller frame (DIAGNOSTICS J11).

If the terminal is supplied by Grass Valley, run the cable between the appropriate connector on Krystal and the connector on the terminal. A customer supplied terminal must be VT100 and DTE (Data Terminal Equipment) compatible and use a null modem cable. [Figure 2-17](#) shows the diagnostic port pinouts.

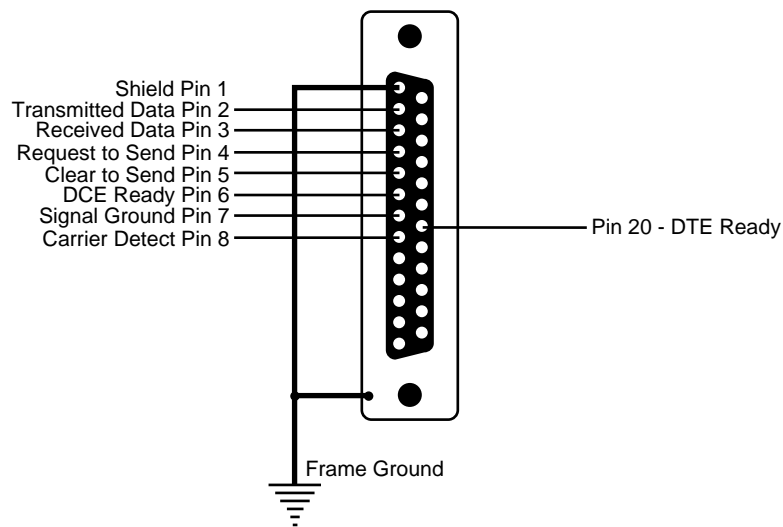


Figure 2-17. Diagnostic Port Pinouts

Cable Specifications

Most cables are provided by Grass Valley. However, your installation may require you to construct special cables. The following specifications are provided to assist you if any cable construction is necessary.

Note Turn the power off to all equipment on both ends of the cable before connecting or disconnecting any cable.

Table 2-3. Interconnecting Cable Specifications

| Cable | From | To | Type of cable | Specification |
|--|--|---|--|--|
| System Ground | Video Processor and System Controller Frames | Earth Ground Earth Ground | | Specified by local electrical code |
| Video/Key Input Cables | Video/Key Source | Krystal Inputs | Coaxial (75Ω) | Belden Cable P/N 8281 (or equivalent) |
| Video/Key Output Cables | | Krystal Outputs Video/Key Destination | Coaxial (75Ω) | Belden Cable P/N 8281 (or equivalent) |
| Effect Manager I/O Module (Editor, Switcher, & Aux serial ports) | Effect Manager (Tributary) | Switcher, Editor, etc. (Controller) | Multi-Conductor (Shielded) | ANSI/SMPTE 207M-1984 |
| Video Processor to Router | Video Processor (Controller) | Router (Tributary) | Multi-Conductor (Shielded) | ANSI/SMPTE 207M-1984 |
| LAN | Control Panel | Video Processor (Single Channel) System Controller (Multi Channel) | Coaxial (50Ω) | ANSI Standard 802.3-1985 |
| Diagnostic Terminal | Vid Proc (DTE) | Modem/Terminal (DCE) | Multi-Conductor (Shielded) | RS-232 |
| VP Param (Multi Channel Only) | System Controller | Video Processor | Coaxial (75Ω) Yellow supplied cable | Belden Cable P/N 8281 (or equivalent) 6 Meters Maximum Length |
| VP Comm (Multi Channel Only) | System Controller | Video Processor | Multi-Conductor (Shielded) | ANSI/SMPTE 207M-1984 6 Meters Maximum Length |

Option Installation and Cabling

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

New Krystal systems are shipped with all board-type options installed in the appropriate locations. You do not need to install options on new systems, though some options will require special cabling, hardware setup, and system configuration. The following basic installation instructions are given for reference should you need to install an optional feature.

Note Before installing any option, review any instructions provided with that option for the latest information.

Mezzanine Installation (General)

Some options require a mezzanine installation. [Figure 2-18](#) illustrates a typical mezzanine installation.

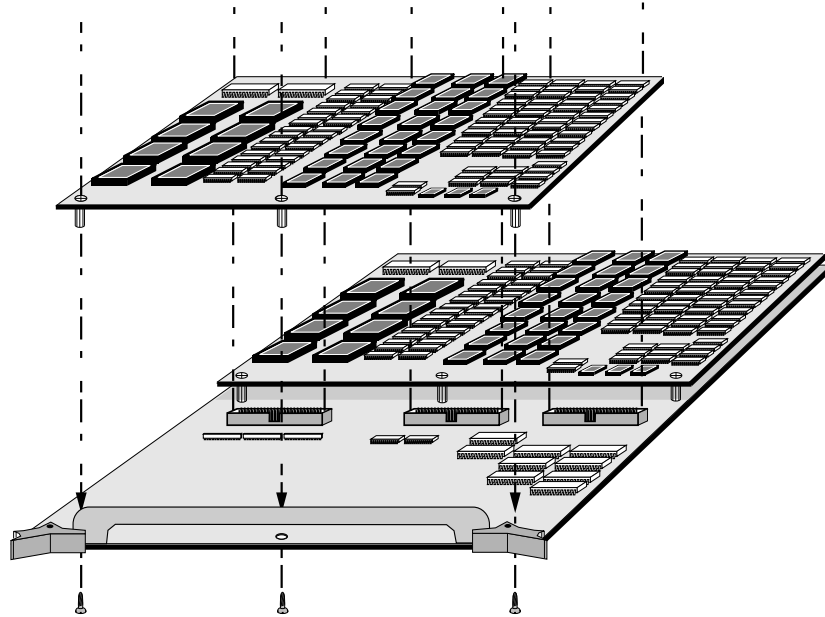


Figure 2-18. Typical Option Mezzanine Installation

QWERTY Keyboard Option Installation

1. An IBM compatible AT type QWERTY keyboard is installed by connecting the keyboard cable to the Keyboard (J2) connector on the rear of the Krystal Control Panel.

CAUTION To avoid EMI problems, use only the Tektronix/Grass Valley Products supplied keyboard and cable.

Graphics Option Installation

The Graphics option mezzanine mounts on the Effect Manager CPU Module. This mezzanine board is installed differently from other Krystal mezzanine boards. Unthreaded standoffs and nuts are used to mount the mezzanine closer to its module.

Graphic Mezzanine Installation

1. Power off the frame, and observing anti-static precautions, remove the Effect Manager CPU module and place it on a flat, anti-static surface, component side up.

- Align the boards so connectors J1, J2, and J3 on the Graphics Generator mezzanine board connect to J4, J3 and J2 of the Effect Manager CPU. Use the four nuts, bolts, and standoffs provided to secure the Graphics Generator to the Effect Manager CPU. Place a standoff on each bolt connecting the two circuit boards (Figure 2-19).

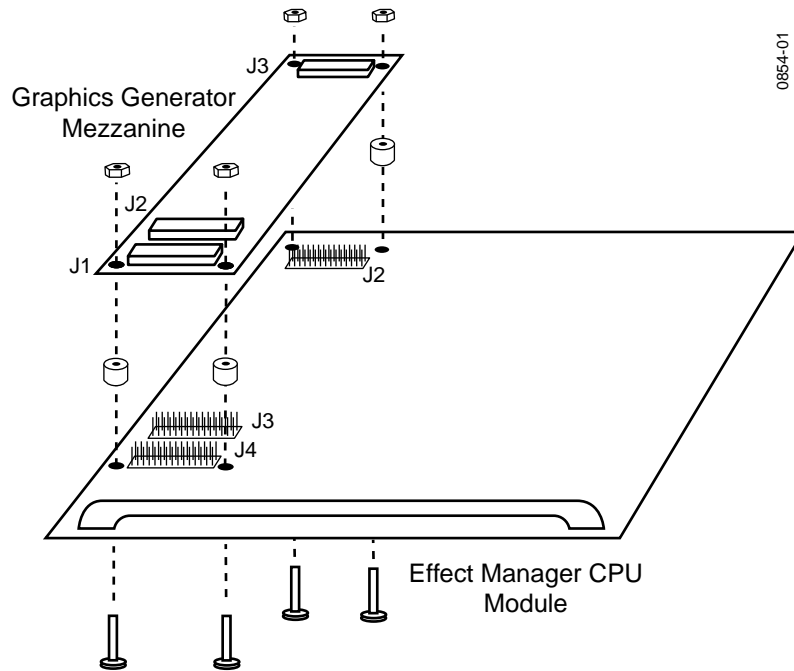


Figure 2-19. Graphics Mezzanine Installation

- Insert the Effect Manager CPU module back into the frame.

Graphics Option Cabling

The graphics input connector (J1) of the Graphics option is located at the top of the Effect Manger I/O Module. The graphics output connector (J2) is located just below the input on the same Effect Manager I/O Module.

Note For optimum results the input signal to the Graphics option should be shaped video.

Graphics option video inputs and outputs are configured differently, depending on whether the Krystal system is single channel or multi-channel. (Figure 2-20). The Graphics Output is intended for monitoring (not production) purposes only.

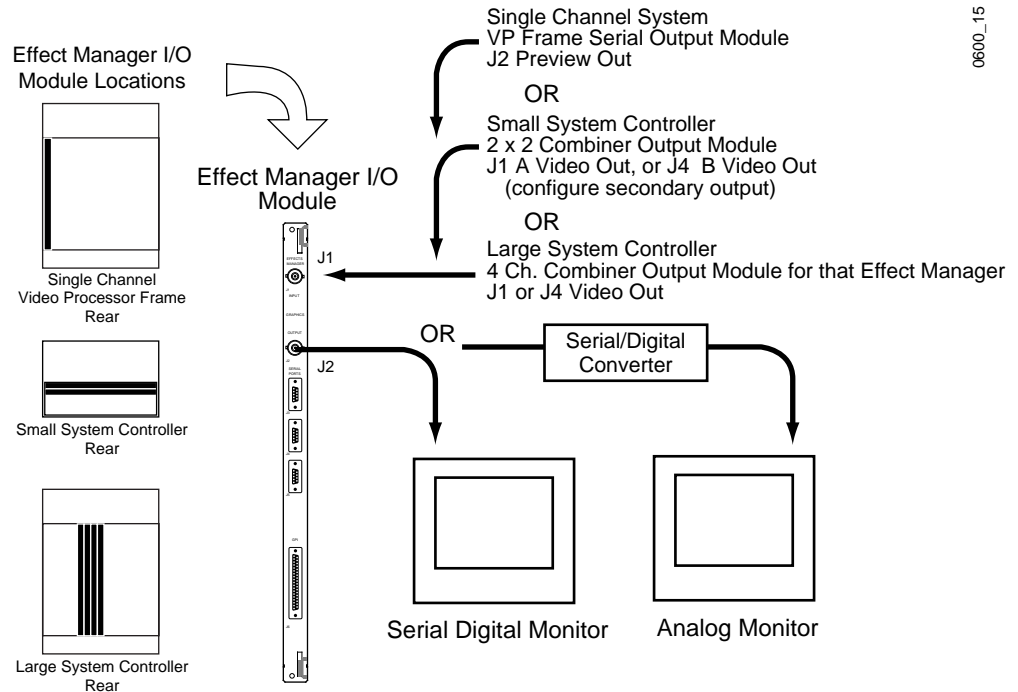


Figure 2-20. Graphics Option Cabling

Monitor Cabling

1. Connect the Graphics option video output (J2) on the Effect Manager I/O Module to a display monitor.

Note Monitors unable to accept serial digital video will need the graphics option signal converted before use.

Single Channel Cabling

1. If you wish to display the graphics over a video signal, we suggest you configure the Graphics option input by connecting preview (J2) from the Serial Output Module (which is shaped serial digital video) to the graphics input (J1) on the Effect Manager I/O Module.

Multi Channel Cabling

1. If you wish to display the graphics over a video signal and you have a Combiner option, we suggest you use a combined video output as the graphics input. For the best quality image the Krystal combined video output should be shaped. See *Setting the Combiner Output* on page 3-28 for specific procedures.
2. On a System Controller system with more than one Effect Manager, you may also want to make provisions for routing the desired signal to the appropriate Effect Manager.

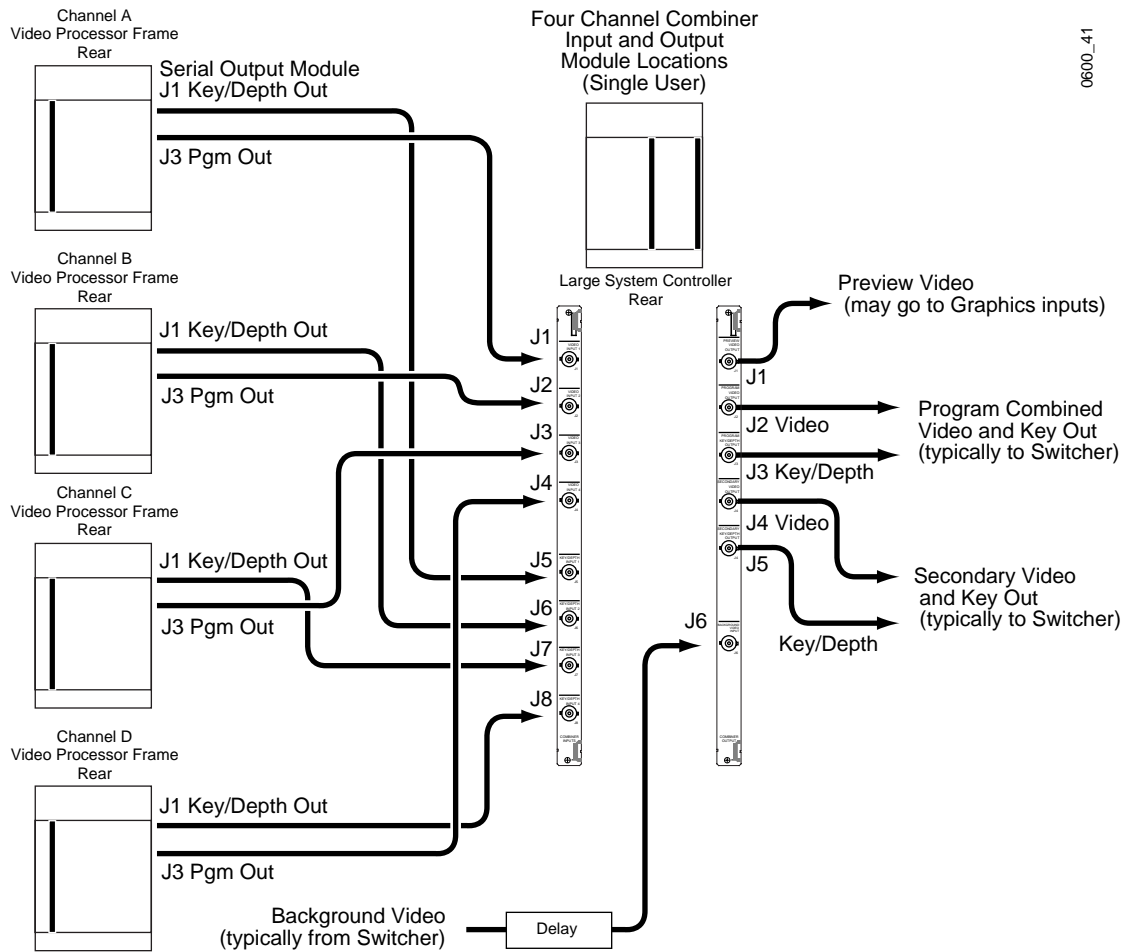
Four Channel Combiner Option Installation

Four Channel Combiner Module Installation

The Four Channel Combiner Module Set consists of a Combiner Inputs module and a Combiner Outputs module, which has a Combiner mezzanine. These modules are installed in the rear of the Large System Controller frame.

1. Power off the frame and, observing anti-static precautions, slide the first Four Channel Input module into slot 6. If a second input module is being installed, slide it into slot 5.
2. Slide the first Four Channel Combiner Output module into slot 1. Any additional output modules are installed in ascending order into slots 2 through 4.

Four Channel Combiner Cabling



0600_41

Figure 2-21. Four Channel Combiner Cabling

Video Inputs

Each Four Channel Combiner Input module has four sets of Video/Key inputs. For the combiner to work correctly, the video and key should be shaped. If these signals come from a system's Krystal channel, they will be shaped. The Krystal system automatically shapes the output of each Krystal channel when a Combiner is included as part of the system. If an external video and key are used, they must be properly shaped and, for depth combining to work the key signal must have depth information.

Background Video

A background video input is available on each Four Channel Combiner Output module. This background is only available for use by that module.

If background video is used, you may need to add a delay of one frame, minus 1-1/2 lines, plus any Krystal channel output delay that has been set to time that signal with the signals passing through the Krystal Channels.

Video Outputs

Each Four Channel Combiner Output module is associated with a single Effect Manager (EM 1- Combiner Output 1, etc.), and can only be controlled by that Effect Manager. Each Four Channel Combiner Output module has a Preview Video, Program Video, Program Key/Depth, Secondary Video, and Secondary Key/Depth outputs.

The Program and Secondary output pairs can be configured to provide a variety of signal combinations, depending on the settings of the Secondary Output and Secondary Iso parameters.

2 x 2 Combiner Option Installation

2 x 2 Combiner Module Installation

The 2 x 2 Combiner Module Set consists of a Combiner module, a Combiner Inputs module, and a Combiner Outputs module that are installed in the Small System Controller frame.

1. Power off the frame, open the front door and, observing anti-static precautions, slide the 2 x 2 Combiner module in slot 4.
2. Slide the Combiner Inputs module in slot 4 at the rear of the Small System Controller frame.
3. Slide the Combiner Outputs module in slot 5 at the rear of the Small System Controller frame.

2 x 2 Combiner Cabling

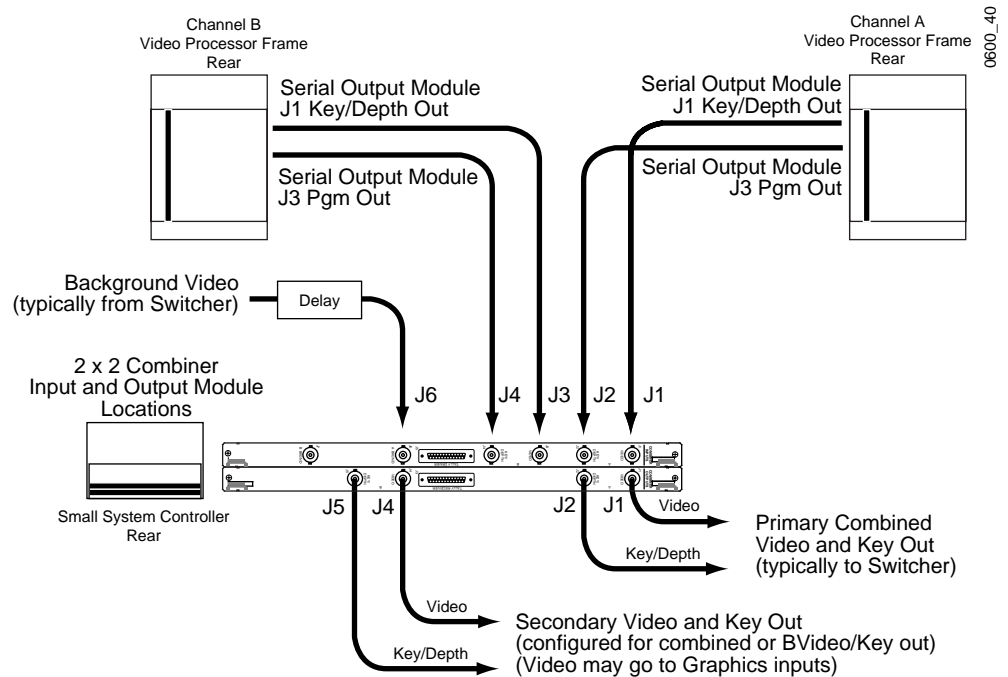


Figure 2-22. Small System Controller 2 x 2 Combiner Cabling

Video Inputs

The 2 x 2 Combiner only operates with the first two channels of a multi-channel system. If you have more than two channels, the 2 x 2 Combiner inputs should come from physical channel 1 (default name “A”, Hardware ID set to 0), and physical channel 2 (default name “B”, Hardware ID set to 1).

There are two video, two key/depth, and a background input (A) on the 2 x 2 Combiner Inputs module. The video and key inputs should be shaped. The Krystal system automatically shapes the output of each Krystal channel when a Combiner is included as part of the system. If an external video and key are used they must be properly shaped and, for depth combining to work the key signal must have depth information.

Background Video

If background video is used, add a delay of one frame, minus 1-1/2 lines, plus any Krystal channel output delay that has been set.

Note The Background B Combiner input is not operational.

Video Outputs

There are two video and two key/depth outputs on the Video Combiner Outputs module. These can be configured to have both pairs of connectors output the combined signal, or have the combined signal only be present on the A outputs, in which case the uncombined B inputs are routed to the B outputs.

Note The Tally connections on the Combiner Input I/O module are not operational.

Light Source Option Installation

This option consists of a mezzanine installed on the Post Transform Module located in slot 12 of the Video Processor frame.

1. Power off the frame and, observing anti-static precautions, remove the main module and place it on a flat, anti-static surface, component side up.
2. Carefully align the connectors and mounting posts on the mezzanine with those on the main module and seat the connectors. Secure the mezzanine with the screws provided. See [Figure 2-18](#).

Kurl Option Installation

The Kurl (2-D Warp) option consists of a mezzanine. The Kurl mezzanine mounts on the Reverse Address Generator Module in slot 13 of the Video Processor frame.

1. Power off the frame and, observing anti-static precautions, remove the main module on which the mezzanine is to be installed. Place it on a flat, anti-static surface, component side up.
2. Carefully align the connectors and mounting posts on the mezzanine with those on the main module and seat the connectors. Secure the mezzanine with the screws provided. See [Figure 2-18 on page 2-29](#).

Enhanced Video Option Installation

The Enhanced Image Fidelity option enhances transformed video images and improves drop shadow resolution. This option is installed on the Key/Drop Shadow Interpolator module in the Video Processor frame of the Krystal channel being upgraded.

1. Power off the Video Processor frame and, observing anti-static precautions, remove the Key/Drop Shadow Interpolator module from slot 11 at the front of the frame. Place the module on a flat, anti-static surface, component side up.

2. Remove IC UF6H6 (#152147) and replace it with the PAL (#050988) included with your upgrade kit (Figure 2-23).

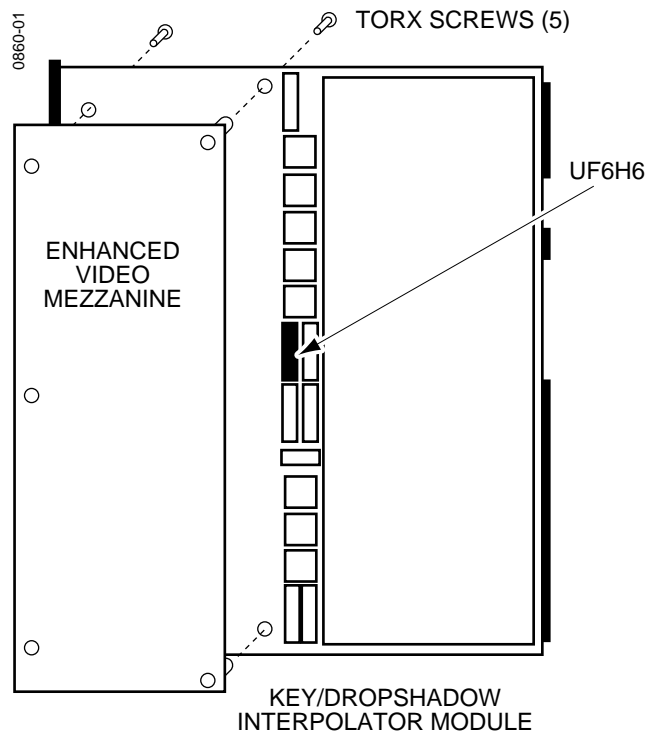


Figure 2-23. UF6H6 Location and Mezzanine Installation

3. Carefully align the connectors and mounting posts on the mezzanine with those on the Key/Drop Shadow Interpolator module and seat the connectors (Figure 2-23).
4. Turn the module over and secure the mezzanine to the module with the five screws provided.
5. Insert the module back into slot 11 of the Video Processor frame.
6. Restore power to the Video Processor frame.

Effect Manager Memory Expansion Option Installation

The expanded Keyframe option consists of two Single In-line Memory (SIMM) modules which snap into sockets provided on the Effect Manager CPU Module. This option doubles the available memory to store Keyframe data, adding an additional 0.5 Mbytes.

1. Power off the frame and, observing anti-static precautions, remove the Effect Manager Module from Video Processor frame slot 17 (single channel) or Controller frame slots 1 and 2 (multi channel). Place it on a flat, anti-static surface, component side up.
2. Insert the two SIMMs into the provided sockets (Figure 2-24).

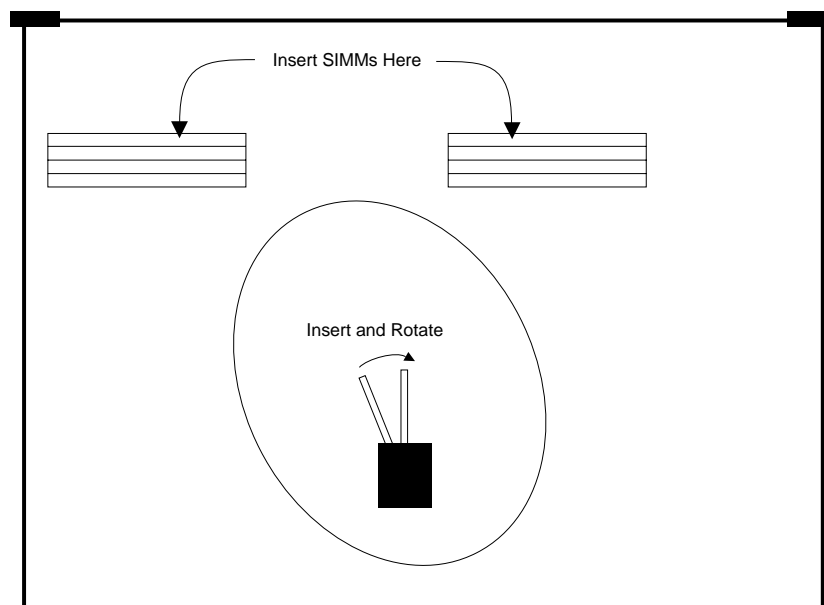


Figure 2-24. Memory Installation

Input Recursive Option Installation

This option consists of a full sized module that installs in slot 2 of the Video Processor frame. If your system was shipped without the input recursive option installed, jumpers installed on the mother board must be removed before you install the module.

CAUTION The Krystal system will not function properly if both the jumpers and the Input Recursive module are removed. After removing the jumpers, save them so you can replace them should you need to remove the Input Recursive module.

1. Power off the frame, then open the door and locate the mother board. Several jumpers reside near the bottom connector of slot 2 (Figure 2-25). These jumpers are in blocks of 10 and there are three blocks to the right of the connector and one block to the left of the connector. All of these jumpers must be removed. It may be necessary to remove other modules and use an angled prying tool to remove the jumpers. Save these jumpers in case you want to run the system without the Input Recursive module.

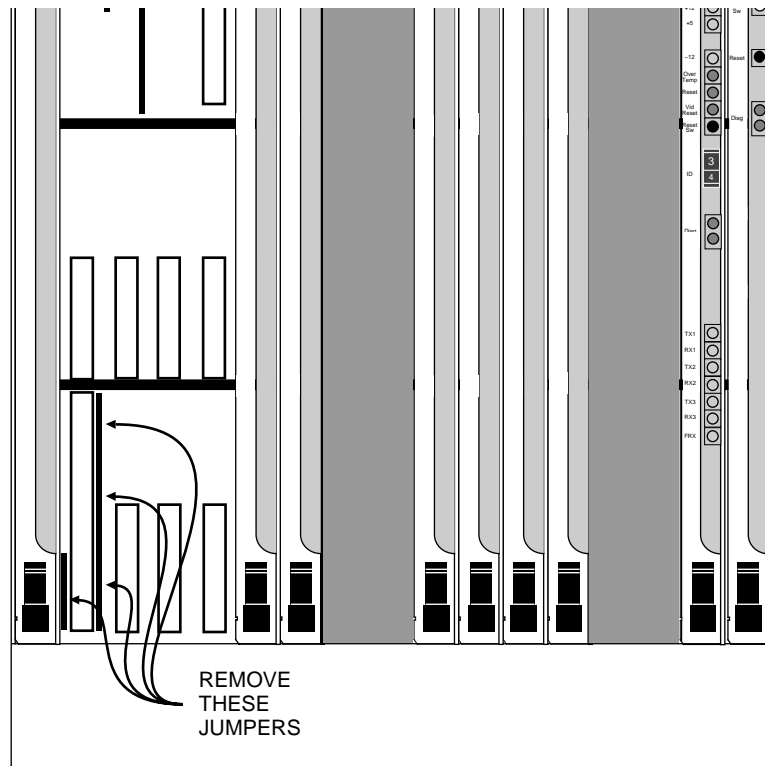


Figure 2-25. Input Recursive Jumpers

2. After the jumpers are removed, slide the Input Recursive module in slot 2.

Output Recursive Option Installation

This option consists of a full sized module which is installed in slot 15 at the front of the Video Processor frame. If your system was shipped without the output recursive option installed, jumpers installed on the mother board must be removed before the module is installed.

CAUTION The Krystal system will not function properly if both the jumpers and the Output Recursive module are removed. After removing the jumpers, save them so you can replace them should you need to remove the Output Recursive module.

1. Power off the frame, open the door, and locate the mother board. Several jumpers reside near the bottom connector of slot 15 (Figure 2-26). These jumpers are in blocks of 10 and there are three blocks to the right of the connector and two blocks to the left of the connector. All of these jumpers must be removed. It may be necessary to remove other modules and use an angled prying tool to remove the jumpers. Save these jumpers in case you want to run the system without the Output Recursive module.

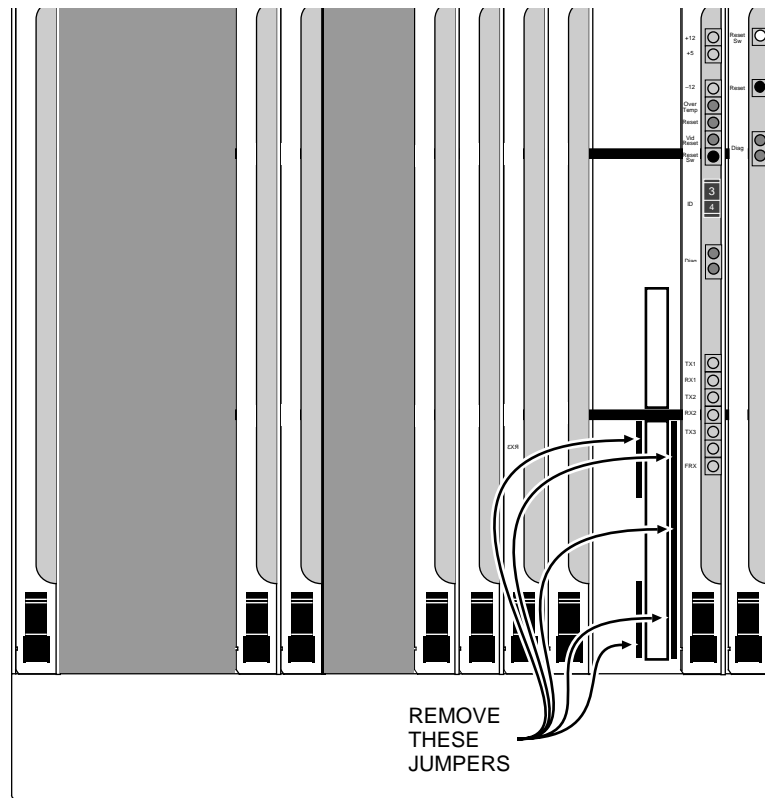


Figure 2-26. Output Recursive Jumpers

2. After the jumpers are removed, slide the Output Recursive module in slot 15.

Defocus Option Installation

The Defocus Option installs in slot 5 in the front of the Video Processor frame.

1. Power off the frame, open the front door and slide the Defocus module in slot 5, and then turn the power back on.

Note The Filter Module (#066215), located in the same frame as the Defocus Module, may also need to be upgraded. See the Field Modification Note (FM 2506-00) for specific Filter Module upgrade instructions.

Additional Effect Manager

An additional Effect Manager consists of an Effect Manager CPU module and an Effect Manager I/O module that are installed in the System Controller frame.

1. Power off the frame, open the front door, and observing anti-static precautions slide the Effect Manager CPU module into the next available EM slot (slot 2 on a Small System Controller, or slot 10, 11, or 12 on a Large System Controller).
2. To install the Effect Manager I/O module, go to the rear of the System Controller frame and slide the module into the same slot number as the new Effect Manager CPU module you must installed.

Typically, each Effect Manager is dedicated for use in a different suite. If this is the case, connect each Effect Manager's serial ports, GPI, and (if equipped) Graphics option inputs and outputs to the appropriate devices in each suite.

After installation, you will also need to:

- Check the IP Address of the new Effect Manager is not duplicated on your network, and change it if necessary.
- Configure the Effect Manager into your facility.

See Section 3 – Configuration for more information.

Power Connections

The input power for the Krystal Control Panel, Video Processor, and System Controller is auto-sensing (90-240 VAC at 50/60Hz).

Due to North American and International regulations and requirements, the AC power cords supplied with your system will vary depending on your location.

North American AC Line Cords

In North America, the Control Panel and System Controller are supplied with a 15 amp rated, 8 foot (2.44 meter) cord (Figure 2-27) with a molded connector at each end (# LB8003-00).

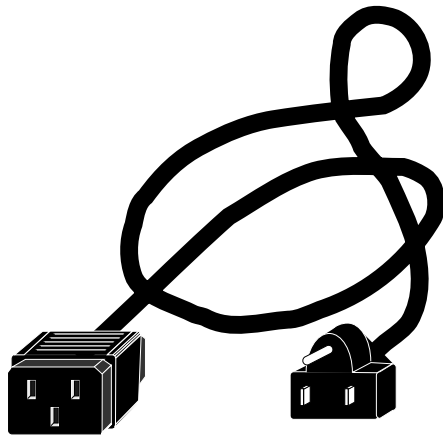


Figure 2-27. Control Panel and System Controller AC Line Cord.

In North America the Video Processor frame is supplied with an 8 foot (2.44 meter) cord (Figure 2-28) with a molded connector on one end and a 110-volt, 20 amp rated (NEMA 5-20P) plug at the other.

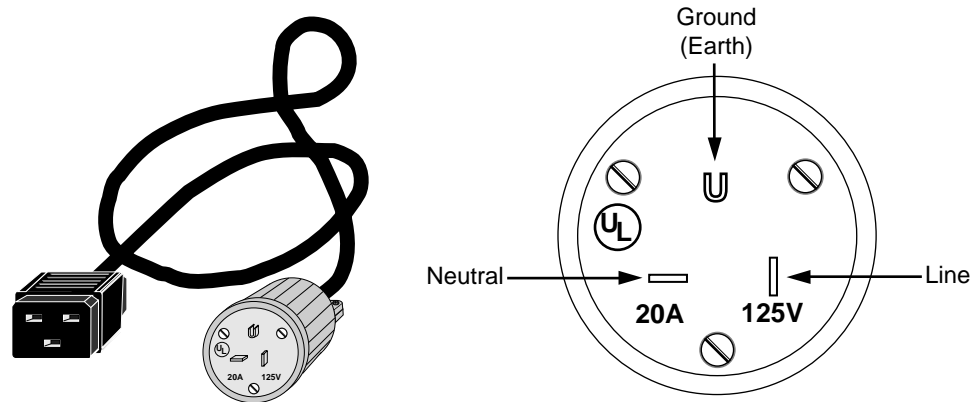


Figure 2-28. Video Processor Frame AC Line Cord and Power Plug

International AC Line Cords

For International customers, the Control Panel and System Controller are each supplied with an 8 foot (2.44 meter) AC cord with a molded connector at one end that connects to the Krystal unit. The cord is rated at 15 amps. The other end of the cord has stripped conductors.

Each Video Processor frame is supplied with an 8 feet (2.44 meter) AC cord with a molded connector at one end that connects to the Video Processor frame. This cord is rated at 20 amps. The other end of the cord has stripped conductors.

These AC cords conform to CEE wiring color code (Figure 2-29). Due to different plug and voltage requirements, AC Power connectors are not supplied. The type of plug required for your application should be wired to comply with the safety regulations of the country in which it is installed.

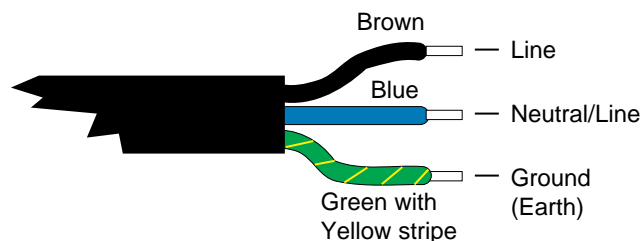


Figure 2-29. International Power Cord Wiring.

Power-Up & Diagnostics

Power Switches

The Krystal Control Panel power switch is located on the back of the panel, on the right hand side from the operator's position (Figure 1-8 on page 1-9).

The Video Processor frame has two power switches. A Main Circuit Breaker/AC Power Switch is located on the back of the frame just above the AC line cord inlet. A DC Power Switch is located on the top front of the frame inside the front access door (Figure 1-9 and Figure 1-10 on page 1-11).

The System Controller frame also has a Main Circuit Breaker/AC Power Switch on the back, and a DC Power Switch inside the front access door (Figure 1-11 and Figure 1-12 on page 1-13).

The AC Power switch routes power to the frame's power supply. The DC Power switch routes power to the processing and I/O modules mounted in the front and back of the frame.

Switches are OFF when the "0" side of the toggle button is depressed, and ON when the "|" side of the toggle button is depressed.

Note When a frame's DC Power switch or a frame's AC power switch is off, you can safely insert and remove modules to and from the front and back slots of the frame.

Power Procedures

CAUTION Power switches (AC or DC) should *not* be toggled rapidly on and off. When cycling power, set the switch to "0", wait 10 seconds, then set the switch to "|".

Initial Frame Power Up

We recommend you initially power up a Video Processor or System Controller frame in the following sequence:

1. Make sure the DC Power Switch is off.
2. Power up the frame with the rear AC Power Switch.
3. Turn on the DC Power Switch.

Single Channel System Power Up

We recommend you power up a single channel system in following sequence:

1. Power up the Video Processor frame. Wait 45 seconds for the Effect Manager and other Video Processor modules to initialize. The Effect Manager should have both its green LEDs lit. If these LEDs are not lit, press the Effect Manager's reset button and wait for the two LEDs to illuminate.
2. Power up the Control Panel.

The Control Panel can be powered up before the Video Processor frame. However, both the Effect Manager and the Video Processor CPU modules must successfully initialize before you acquire the Effect Manager and Channel with the Control Panel to begin system operation. If you acquire the Effect Manager before the Video Processor CPU initializes, unpredictable system behavior may result. (Acquiring Effect Managers and Channels is discussed later in this manual).

Single Channel System Power Down

1. Release the acquired Effect Manager with the Control Panel. This will automatically release the Channel if it has been acquired. (Releasing Effect Managers and Channels is discussed later in this manual).
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 Power Up

We recommend you power up a multi-channel system in the following sequence:

1. Power up all the Video Processor frames.
2. Power up the System Controller. Wait 45 seconds for initialization and channel communications to be established. All the Effect Manager should have both their green LEDs lit. If these LEDs are not lit, press the Effect Manager's reset button and wait for the two LEDs to illuminate.
3. Power up all Control Panels.

The Control Panel can be powered up before the Video Processor and System Controller frames. However, both the Effect Manager and the Video Processor CPU modules must successfully initialize before you use the Control Panel to acquire an Effect Manager and Channel(s) and begin system operation. If you acquire an Effect Manager before all the Video

Processor CPUs initialize, unpredictable system behavior may result. (Acquiring Effect Managers and Channels is discussed later in this manual).

Multi-Channel System Power Down

1. Release every acquired Effect Manager from every Control Panel. This will automatically release any acquired Channels. (Releasing Effect Managers and Channels is discussed later in this manual).
2. Power down the Control Panel.
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.

Multi-Channel System, Individual Channel Power Cycle

1. Release the Channel with the Control Panel if it has been acquired.
2. Cycle power on the Video Processor frame by turning off the DC power switch, waiting 10 seconds, then turning the switch back on.
3. Wait 45 seconds for the Video Processor modules to initialize.

Multi-Channel System, System Controller Power Cycle

1. Release every acquired Effect Manager from every Control Panel. This will automatically release any acquired Channels.
2. Cycle power on the System Controller by turning off the DC power switch, waiting 10 seconds, then turning the switch back on.
3. Wait 45 seconds for initialization and channel communications to be established. All the Effect Manager should have both their green LEDs lit. If these LEDs are not lit, press the Effect Manager's reset button and wait for the two LEDs to illuminate.

Reset Procedures

Control Panel

1. If the Control Panel has acquired an Effect Manager, release the Effect Manager.

2. Reset the Control Panel by turning its power off and back on (the AC switch on the lower rear of the panel), or by opening the top cover (the screws must have been removed) and pressing the reset button located at the front left corner of the lower printed circuit board.

WARNING If you open the Control Panel's top cover, touch only the reset switch. High voltages are present inside the panel.

3. Reacquire the Effect Manger with the Control Panel.

CAUTION If a Control Panel resets while it has acquired an Effect Manager, the Effect Manager will not know that panel has reset. It will retain that panel's suite number setup parameters, and that Effect Manager will not be able to be acquired by any Control Panel with a different suite number. After the Control Panel resets you should be able to re-acquire that Effect Manager, as long as the panel's suite number assignment is the same as before the reset. If Effect Managers remain unavailable after a Control Panel reset, you may need to reset the Effect Managers or Resource Manager.

Video Processor CPU Module Reset

1. Release the Channel with the Control Panel.
2. Press and release the reset button on the Video Processor CPU module.
3. Wait 45 seconds for initialization and channel communications to be established.

Effect Manager Module Reset

1. Release the Effect Manager with the Control Panel.
2. Press and release the reset button on the Effect Manager module.
3. Wait 20 seconds for the Effect Manager to initialize. Both its green LEDs should be lit.

Resource Manager Module Reset

1. Release the Effect Manager with the Control Panel.
2. Press and release the reset button on the Resource Manager module.
3. Wait 45 seconds for System Controller, Channel, and system communications to be established. All the Effect Manager should have both their green LEDs lit. If these LEDs are not lit, press the Effect Manager's reset button and wait for the two LEDs to illuminate.

2 x 2 Combiner Reset

The Resource Manager should also be reset whenever the 2 x 2 Combiner is reset.

1. Release the Effect Manager with the Control Panel.
2. Press and release the reset buttons on the 2 x 2 Combiner Module and the Resource Manager module.
1. Wait 45 seconds for System Controller, Channel, and system communications to be established. All the Effect Manager should have both their green LEDs lit. If these LEDs are not lit, press the Effect Manager's reset button and wait for the two LEDs to illuminate.

Four Channel Combiner

The Four Channel Combiner is automatically reset whenever its Resource Manager is reset. There is no separate reset procedure for these modules.

E-MEM Battery Backup

The Effect Manager has a battery that will fully charge in ten hours, and when fully charged will power the keyframe memory for three days after the power is turned off. If the power is to be off for longer than this, then the effects should be backed up to disk.

To clear the keyframe memory:

1. Turn off the battery switch on each Effect Manager in your system (the switch is located near the Effects Manager reset button).
2. Power off the frame(s) housing the Effect Manager(s) and wait five (5) minutes for the memory to drain.
3. Set the battery switch back on (if desired), and power the frame(s) back up.

Operating the E-MEM battery switch while Krystal is running will cause the Effect Manager Module to reset. If this occurs, the Video Processor must also be reset by pressing its reset button.

Power Protection Circuit

The Video Processor frame Power Protection Board is mounted next to the power supply. This board shuts down the power supply if:

- the system overheats
- the fan housing is removed
- the + 5 Volt fuse on a module opens

The power supply will not be re-energized until the problem is fixed and the DC power switch is turned off and back on again.

The Power Protection Board also has two 6 Amp 250 Volt (F) 3AG Fuses, one for each 12 Volt power supply.

Start-Up Diagnostics

The Krystal Control Panel runs a series of diagnostic tests each time it is turned on. When the panel is turned on or reset, the top two and bottom two LEDs light, then, as each test passes, the LED associated with that test is turned off. After all the tests pass, the panel goes into its normal operating mode. If a test fails, that LED stays on and the diagnostics loops on that test until it passes.

Figure 2-30 shows what test is associated with each LED.

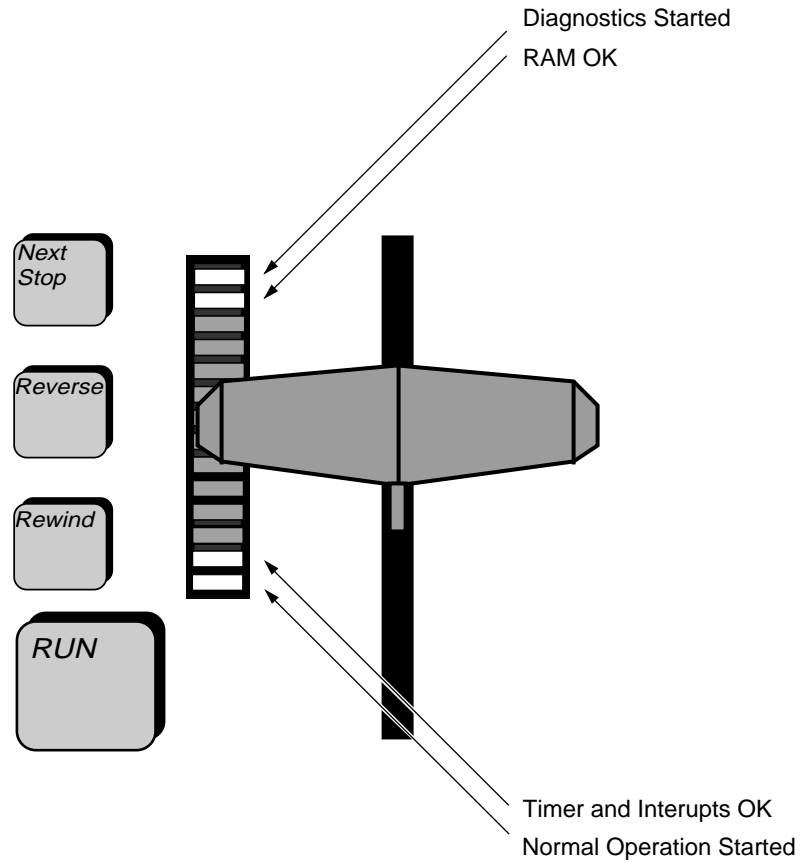


Figure 2-30. Start-Up Diagnostic Indicator LEDs

Additional diagnostics may be run once the panel is operating. See Section 6 – Diagnostics for more information.

Configuration

Introduction

This section describes in general terms how to configure a Krystal DPM system into a facility. This section gives procedures for an initial basic system configuration, and includes additional information for configuring larger Krystal systems. Specific information for configuring Krystal systems with some external devices (switcher, router, and editing systems) are included at the end of this section. Instructions on how to update Krystal system software are also provided.

System Configuration Overview

Configuration sets up the Krystal system to operate in a certain way in a specific environment. A Krystal system itself can contain a variety of hardware components that can be connected in various ways to provide different capabilities. A Krystal system is also able to be connected to a variety of external devices in different ways. This allows the Krystal system to be flexibly integrated into a facility to meet a variety of requirements.

Resource Allocation

On a single channel system, resources are dedicated to a single user. The operator uses the Control Panel to acquire an Effect Manager, which in turn controls the single Krystal Video Processor channel. Though a single channel Krystal system may be equipped with multiple Control Panels (each given a different IP Address), only one panel at a time can be active to control the single Krystal channel.

Multi-channel systems can support pooled resources. In a pooled configuration, each operator uses a separate Control Panel (each with a different IP Address) to acquire a different Effect Manager. Each user then selects different Krystal channels to use with that Effect Manager for that operating session. On a multi-channel Krystal system equipped with the Small

System Controller, from one to four Video Processor channels can be controlled by a single user, and up to two users can be active on the system at the same time, each using separate Effect Managers. On a multi-channel Krystal system equipped with a Large System Controller, up to eight channels are available, four of which can be controlled by a single user, and there can be up to four concurrent users, again each using separate Effect Managers. The Resource Manager in the System Controller frame manages the use of that pool of Krystal system resources.

While the Krystal system can manage its own resources, if you change these resources, you may need to make corresponding changes to video signal routing (video, key, mask). Use of an external video routing system can add flexibility, allowing channels to be allocated as required to different suites. Resource allocation changes also may affect external device control signal routing (for switchers, editors, or routers) as well. For most installations, dedicating each Effects Manager to a particular operating suite and configuring it with dedicated external devices will simplify facility integration.

A single facility may be equipped with multiple Krystal systems, and these systems can run on the same LAN. Krystal resource sharing is only available within the same resource pool. However, each pool will have its own Resource Manager to control the use of that pool's resources. Effect Managers and Krystal channels in one pool cannot be used by a Control Panel in a different pool. In these larger configurations, IP Addresses must be carefully assigned for each pool to avoid conflicts.

External Control

Krystal systems can be configured for control by external devices (switchers, editors, etc.) using GPI contacts, serial control, or the CPL protocol developed by Grass Valley. External devices are connected to an Effect Manager, via the Effect Manager I/O module. These devices are only able to control the Effect Manager they are connected to.

External devices can trigger the running of previously setup effects (GPI and serial control), or with the CPL protocol can run Krystal effects in a coordinated manner. A Grass Valley Switcher using the CPL protocol can “jog” Krystal effects back and forth, move to specific locations within an effect, and recall saved Krystal effects from memory.

Krystal systems can also be configured to control external devices, like switchers and routers, for input source selection. See *External Interfaces* on [page 3-62](#) for specific examples of some of these configurations.

Configuration Data Organization

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 loads its NV RAM into working memory when that device is reset, and this information determines that device's initial behavior for that operating session.

Each Effect Manager loads a copy of the NV RAM data into local working memory, and uses that working copy of the configuration data. The working copy information can be changed independently from the NV RAM. This allows temporary changes to Krystal system behavior for a particular operating session. Resetting the Effect Manager restores the previous NV RAM values. The Effect Manager working copy configuration data can be saved to NV RAM and to floppy disk. Existing Effect Memory NV RAM data can also be loaded into working memory.

The Krystal Control Panel does not have a separate working memory. Any panel configuration changes are applied directly to that panel's NV RAM. Control Panel configuration data can also be saved to floppy disk and can be reloaded from disk.

Factory configuration data (GVG Defaults) also exists which is separate from both of the above sets of NV RAM information. These factory default values can be reloaded to each device if desired.

On single-channel Krystal systems the Effect Memory NV RAM is actually stored in the Video Processor I/O module. Only the working copy exists in the Effect Manager itself. On multi-channel Krystal systems the NV RAM for all the Effect Managers is stored in the Resource Manager. This entire set of NV RAM is loaded into each Effect Manager's working memory. The Effect Manager uses the current suite number to select which portion of this configuration data to use (see below).

Note System Configuration NV RAM should not be confused with E-MEM effect memory, which is a completely separate battery backed up memory for each Effect Manager that is used to store effect data.

Suites

Some of the Krystal configuration data is organized in a special way to permit the sharing of system resources. This portion of the system configuration data is organized into four sets, called suites 1-4. These suites contain identical sets of parameters, which can be set differently for each suite. Each set of suite data usually contains information for a particular

site (editing suite, studio control room, etc.) where a Krystal Control Panel is located. All four sets of suite information reside in the Effect Manager and are identified by their number. When the Effect Manager is reset, all four sets of suite data are loaded into its working memory.

Each Krystal Control Panel has a suite number assigned to it. This is only an identifying number, and does *not* include the actual configuration data for that suite (which is stored in the Effect Manager). When a Krystal Panel acquires an Effect Manager, the Effect Manager recognizes that Control Panel's suite number and uses the set of working memory configuration data corresponding to that suite number for that Krystal operating session. This mechanism allows dynamic control of system configuration data in a pooled environment.

Configuration File Categories

Configuration data is divided into different categories. The names of these categories help identify the parameters they contain:

SYS CFG

- Effect Manager
- Physical Channel
- Source Selector
- Combiner
- Suites 1, 2, 3, and 4
- Network (IP addresses for Effect Managers and System Controllers)

(This data can be saved and reloaded as a group to floppy disk, working memory, or NV RAM, or portions can be individually saved or loaded as required.)

USER PREF

- Run Prefs: Effect Start Field
- Work Buf Prefs: Unity Keyframe parameters values
- External Prefs: Serial Port Enables parameters, GPI Inputs parameters
- Source Memory: 64 Source Memory blocks, Effect Send parameters

(This data is saved and reloaded as a group to and from floppy disk.)

PANEL CFG

- Control Panel IP Address
- Assigned Suite Number
- Lever Arm and Joystick Calibration Data

(This data is saved and reloaded as a group to floppy disk or the Control Panel NV RAM.)

Changing Configuration Data

The Krystal Control Panel is used to change configuration data. To change Effect Manager configuration data, the Krystal Control Panel first acquires the Effect Manager, which recognizes the suite number and activates that set of configuration data in its working memory. The Krystal Panel can then be used change this working copy of the Effect Manager's configuration data. This is accomplished by changing Krystal configuration menu selections, or by loading a previously saved configuration file from floppy disk. To retain these changes, you need to save the configuration data back to the Effect Manager's NV RAM. If the changes are not saved to NV RAM, the earlier configuration settings still residing in NV RAM will be restored when the Effect Manager is reset. See *Save Changes to NV RAM on page 3-31* for more information.

Note When changing Effect Manager configurations via floppy disk, communications with peripheral devices (i.e. switchers, editors, etc.) may be lost. If this occurs, release and reacquire the Effect Manager to restore communications.

You also use the Krystal Control Panel to directly change the NV RAM of that Control Panel. This is how you can change the suite number assigned to that Krystal Control Panel. See *Panel Suite Assignment Changes with an Acquired Effect Manager on page 3-12* for more information. Joystick and Lever Arm data is saved to NV RAM during the calibration process. Other changes are saved to the Panel's NV RAM when you exit that Control Panel menu.

Configuration Procedure Summary

Basic Krystal system configuration involves setting up a single Krystal Control Panel, Effect Manager, and related Video Processor Channels.

The basic configuration steps involved in setting up a newly installed Krystal system include the following steps. (Menus can generally be configured in any order, though parameters set in one menu may interact with other menus.)

1. If necessary, assign a suite number to the Krystal Control Panel.

2. Acquire the Effect Manager and Channel(s) with the Krystal Control Panel.
3. Set parameters in the System Configuration menus:
 - Physical Channel, Effect Manager, and Source Selector Device menus
4. Set Parameters in the Suite Configuration menus:
 - Video Standards, Source Select Configuration, Port Configuration, and System Alignment menus
5. Save Configuration data to Effect Manager NV RAM
6. Set parameters in the System Setup menus:
 - External Control Preferences, Run Preferences, and Panel Configuration menus
7. Set User Tools parameters (optional).
8. Save Configuration data to floppy disk.

After the basic system is configured, you may also need to:

- Setup any external devices you configured the Krystal system to operate with.
- Assign IP addresses to any additional Krystal Control Panels in your system, and configure these panels.
- Repeat the above configuration on any additional Effect Managers and suites in your system.
- Large Krystal systems have additional configuration requirements, which include coordinating IP address assignments.

Reconfiguration

The following items should be considered if you are reconfiguring an existing Krystal system, due to a change in software, hardware, or facility integration.

- Before you change the Krystal system in any way, save the current configuration, effect, and macro files to floppy disk and label them.
- Make sure the correct version of software is installed on all Krystal devices. Follow the installation directions included in the Software Release Notes for that version of software.
- After making your Krystal system changes, reload the files saved above. Most of the configuration data will probably still be valid, so you will only need to change those parameters involved in the system changes that have been made. Then save your new configuration back to the system's NV RAM.
- Save the new Krystal configuration files to floppy disk and label them.

Navigating Through the Configuration Menus

Pressing the EXIT soft button at the lower right side of the Krystal Control Panel display moves you up one menu level. Pressing EXIT repeatedly eventually takes you back to the Status Menu ([Figure 3-1](#)).

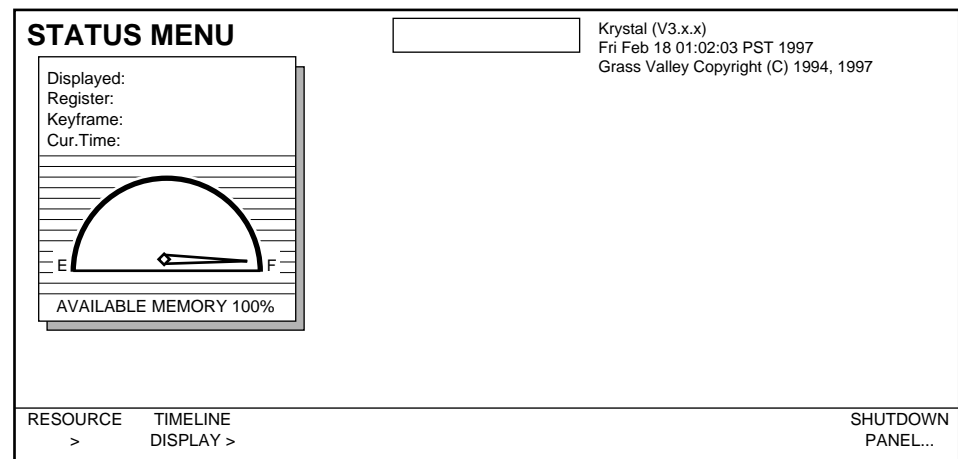


Figure 3-1. Status Menu

Most of the parameters you will set during System Configuration are initially accessed by pressing the System Setup top menu button. This takes you to the System Setup menu (Figure 3-2).

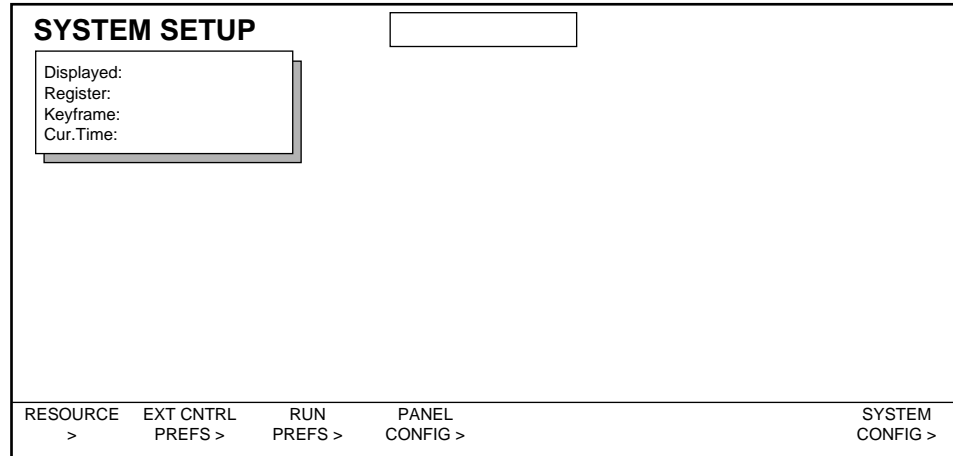


Figure 3-2. System Setup Menu

From the System Setup menu you can reach the other configuration menus. During system configuration you will also use the File Operations and User Tools menus, which are reached by pressing these labeled top menu buttons.

Figure 3-3 gives an overview of the menus you will access during system configuration. Detailed menu trees are also included in the back of this section for reference.

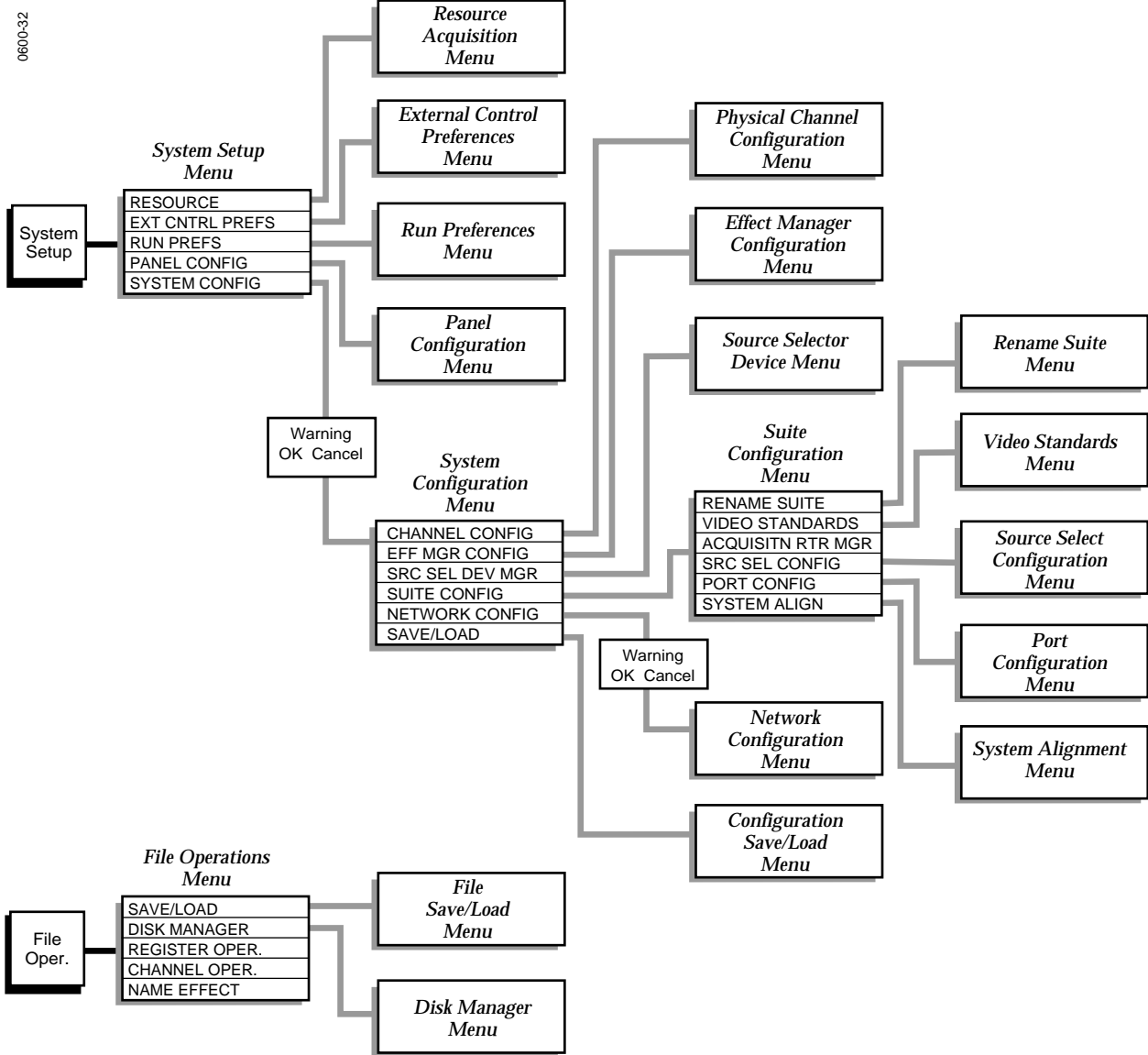


Figure 3-3. Krystal Configuration Menu Tree Summary

Naming Items in Menus

Some of the items in menus can be renamed. To rename an item:

1. Press the RENAME... button to bring up a menu similar to [Figure 3-4](#).

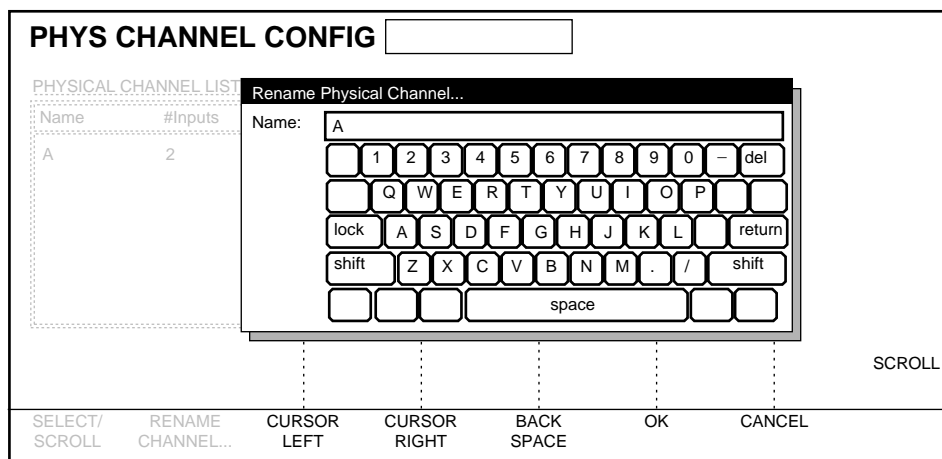


Figure 3-4. Rename Menu Example

If the optional QWERTY keyboard is installed, type the new name. Otherwise, move the cursor to the letter to be changed using the CURSOR LEFT and CURSOR RIGHT soft buttons and scroll through the letters using the Scroll soft knob. Select each letter by moving the cursor off the letter. BACK SPACE deletes letters.

2. Press OK to change the name or CANCEL to keep the old name.

Using Knobs and Keypad During Configuration

Some menus have adjustments at the right edge of the menu. These can be set by turning the closest soft knob, or by pressing the transfer button and entering the data with the Control Panel keypad.

Accessing Scroll Pane Items

You can directly select an item in a scroll pane with the keypad. Make sure no menu or transform function is selected, then type the number preceding the item label on the list and press ENTER. If numbers do not exist the top item is #1.

Reversing Menu Stack 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.

Basic System Configuration

CAUTION System configuration should be done only on the initial setup of the system and when any changes are made in the system. If the configuration is done incorrectly the system can malfunction.

Selecting a Suite to Configure

If you are installing a single user system (one Krystal Control Panel) for the first time, you can use the default suite number (1), and it probably will not need to be changed. In this case you can skip to the next section (*Acquire Effect Manager and Channels* on page 3-12).

If you are configuring a multi-user Krystal system with multiple suites, you can use the default suite for the first suite configuration, but will need to assign the Control Panel to different suites for subsequent suite configurations.

To assign a different suite number to the Krystal Control Panel:

1. Press the System Setup top menu button, then press PANEL CONFIG > to go to the Panel Configuration menu.
2. At the Panel Configuration menu, press SUITE ASSIGN... . A Suite Assignment menu appears (Figure 3-5). Use the SCROLL soft knob to select the suite you wish to assign to the Control Panel, then press OK.

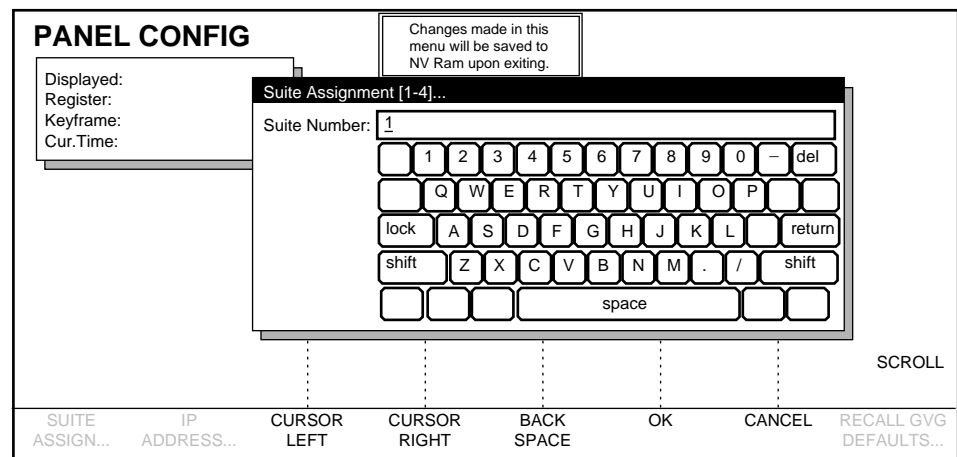


Figure 3-5. Panel Configuration Menu, Suite Assignment

3. Press the EXIT button. The panel will be assigned that suite number when you exit the menu.

Panel Suite Assignment Changes with an Acquired Effect Manager

If an Effect Manager was acquired when you changed the Control Panel's suite number, the Effect Manager will automatically be released and reacquired. This will make the Effect Manager recognize the Control Panel's new suite number and so select that new suite's set of configuration data.

Panel Suite Assignment Changes and Acquired Channels

On a single channel systems without a System Controller, after a Control Panel suite number changes the Video Processor Channel will be reacquired along with the Effect Manager.

On systems with a System Controller, Video Processor Channels will *not* be reacquired along with the Effect Manager after a suite number changes. On these systems you need to reacquire the Channels you will be configuring in the Suite Configuration menus.

Acquire Effect Manager and Channels

Before a Krystal system can be configured the Control Panel must acquire an Effect Manager.

1. Power up the components of the Krystal system you will be configuring, and allow time for them to initialize.

Note Only one Krystal Control Panel, and on multi-channel systems only one System Controller frame, should be active on the network when you begin system configuration. IP Addresses must be changed on any additional Krystal devices before they can be connected to the network. See *Multiple Krystal Systems Configuration* on [page 3-47](#) for more information.

- After a Krystal Control Panel connected to Krystal network initializes, the Resource Acquisition menu will be displayed (Figure 3-6). You use this menu to acquire an Effect Manager and Channel(s). If a different menu has been selected since the Panel initialized, you can reach the Resource Acquisition menu by pressing System Setup \ RESOURCE >.

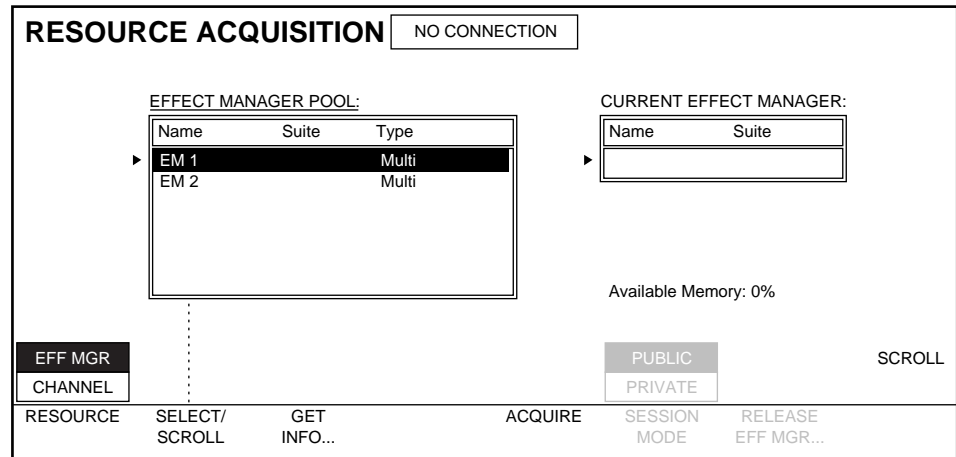


Figure 3-6. Resource Acquisition Menu, Effect Manager Not Acquired

- Press RESOURCE to select EFF MGR. The EFFECT MANAGER POOL box lists all available Effect Managers and the CURRENT EFFECT MANAGER box shows the currently selected Effect Manager. Press SELECT/SCROLL to select the desired Effect Manager and then press ACQUIRE to select that Effect Manager it and place its name in the CURRENT EFFECT MANAGER box (Figure 3-7).

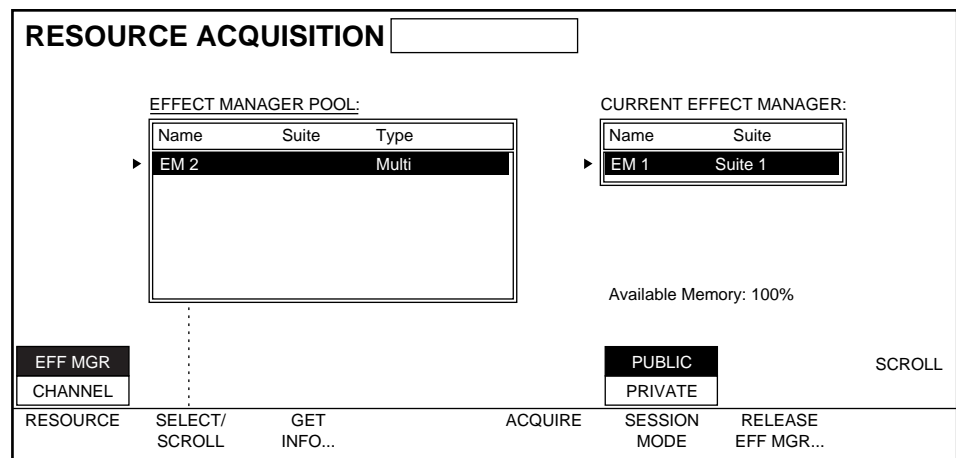


Figure 3-7. Resource Acquisition Menu, Effect Manager Acquired

- The Krystal Control Panel's suite name is also displayed in the CURRENT EFFECT MANAGER box. Make sure this is the suite you wish to configure before proceeding. See [Selecting a Suite to Configure on page 3-11](#) for information about selecting different suites.

5. Acquire Video Processor Channels, if necessary.
 - a. On single channel Krystal systems 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 3-8).

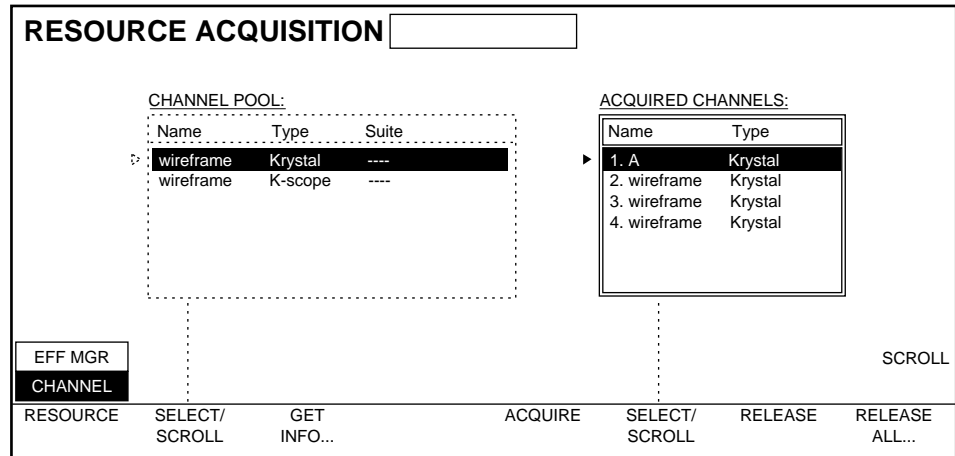


Figure 3-8. Single Channel System, Channel Acquired

- b. On multi-channel systems, Channels must be acquired with the Krystal Control Panel. Press RESOURCE to select CHANNEL, press the left SELECT/SCROLL to highlight the desired channel, and press ACQUIRE. You should acquire all the Video Processor Channels that will be used with that Control Panel (Figure 3-9).

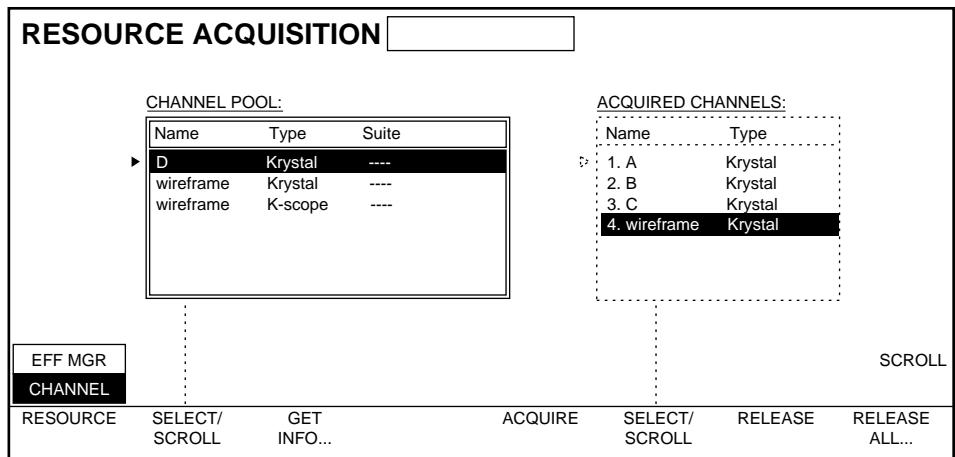


Figure 3-9. Multi Channel System, 3 of 4 Channels Acquired

System Configuration Menus

To reach the System Configuration menu:

1. Press the System Setup top menu button to display the System Setup menu, then press the SYSTEM CONFIG > soft button. A warning appears (Figure 3-10).

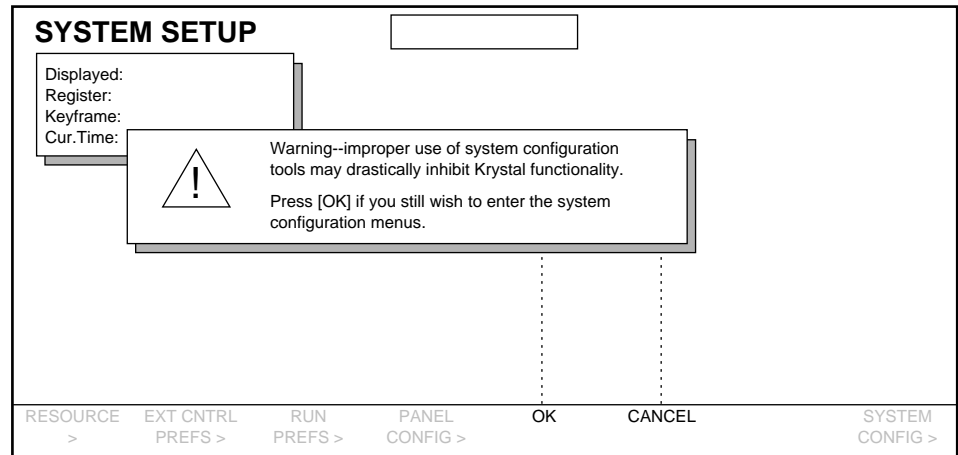


Figure 3-10. System Setup Warning Message

2. Press OK to go to the System Configuration Menu (Figure 3-11). Pressing the CANCEL button returns you to the System Setup menu.

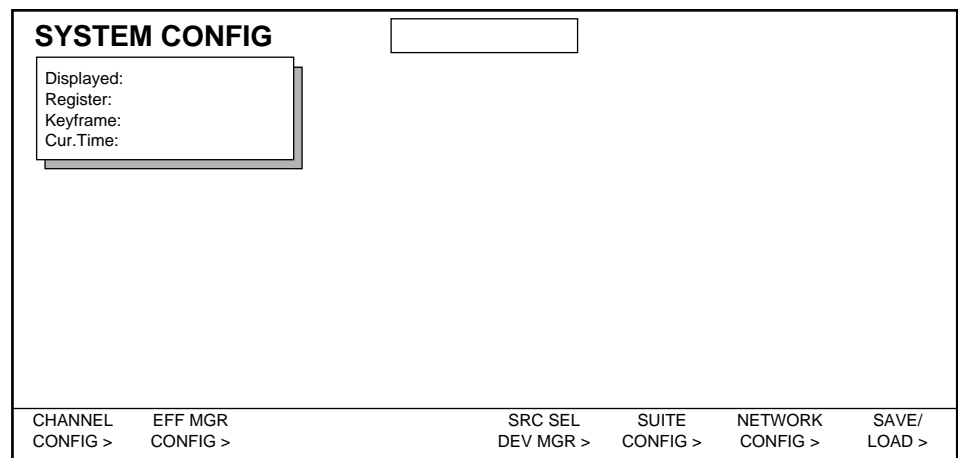


Figure 3-11. System Configuration Menu

Physical Channel Configuration

The Physical Channel Configuration Menu allows you to indicate what channels are installed and rename each channel if desired.

1. From the System Configuration menu, press CHANNEL CONFIG > to go to the Physical Channel Configuration menu. [Figure 3-12](#) shows the display for a single channel acquisition, and [Figure 3-13](#) shows a multi-channel acquisition.

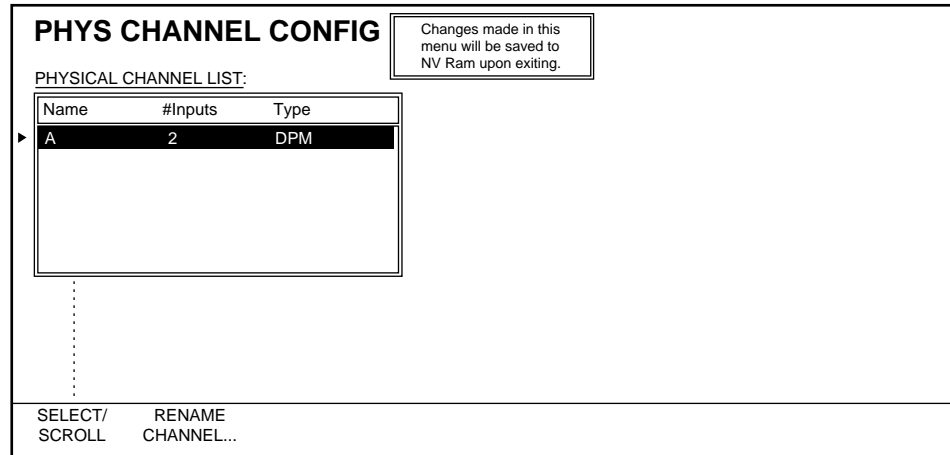


Figure 3-12. Single Channel System

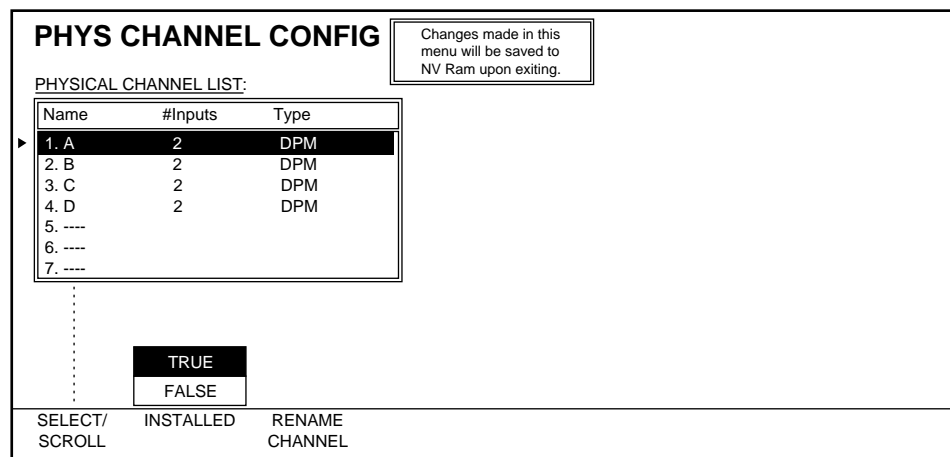


Figure 3-13. Multi-Channel System

2. Press SELECT/SCROLL or use the scroll knob to move through the physical channel list. The INSTALLED button is used to tell the multi-channel system how many channels are connected to the Effect Manager that has been acquired. Press INSTALLED to select TRUE for each installed Channel in your system.

3. Press RENAME CHANNEL... to rename the selected channel, if desired.
Enter the new name as described in *Naming Items in Menus on page 3-10*.
4. On multi-channel Krystal systems, check that each Video Processor CPU Hardware ID corresponds to the channel assignments you have made in the Physical Channel Configuration menu. See *Video Processor CPU Hardware ID on page 2-5* for more information.

Effect Manager Configuration

The Effect Manager Configuration Menu allows you to name the Effect Manager(s) in your Krystal system. This menu also shows the IP Addresses currently assigned to the network devices.

1. From the System Configuration menu, press EFF MGR CONFIG > to go to the Effect Manager Configuration menu. On single channel systems, only one Effect Manager will appear. On multi-channel systems, additional Effect Managers will be listed if present ([Figure 3-14](#)).

| EFFECT MGR CONFIG | | |
|----------------------|----------------------|-------------|
| NETWORK DEVICE LIST: | | |
| Name | IP Address | Subnet Mask |
| 1. EM 1 | 192.65.13.94 | 0 |
| 2. EM 2 | 192.65.13.95 | 0 |
| Internal | 192.65.11.1 | 0 |
| | | SCROLL |
| SELECT/ SCROLL | RENAME EFF MGR... | |

Figure 3-14. Effect Manager Configuration Menu

2. To select and rename an Effect Manager, press SELECT/SCROLL to select the Effect Manager, and then press RENAME EFF MGR... . Enter the new name as described in *Naming Items in Menus on page 3-10*. The INTERNAL device, which shows an internally used IP address, cannot be renamed.

Installing Source Selector Devices

The Source Selector Device menu is used to identify what types of input source selectors are available to the Krystal system. You will install, name, and identify the number of sources for each selector device, and you will also assign an address to any installed router devices.

Up to 16 source selector devices can be installed. These devices include the internal switching built into each Krystal channel, and external devices like Switchers or Routers. A Switcher is connected to the Switcher port on an Effect Manager I/O module, and is only controllable by that Effect Manager. Routers connect to the Router port on each Krystal Channel’s Video Processor I/O module, and so are only controllable by that Channel. More than one router can be used by assigning addresses to the routers connected to the router port.

After the devices are installed, you will define how these devices will be used by each Krystal channel in the separate Source Selector Configuration menu, described later in this section.

1. From the System Configuration menu, press SRC SEL DEV MGR... to go to the Source Selector Device menu. This menu shows a SOURCE SELECTOR DEVICE LIST. Selector devices do not automatically appear in this list (Figure 3-15).

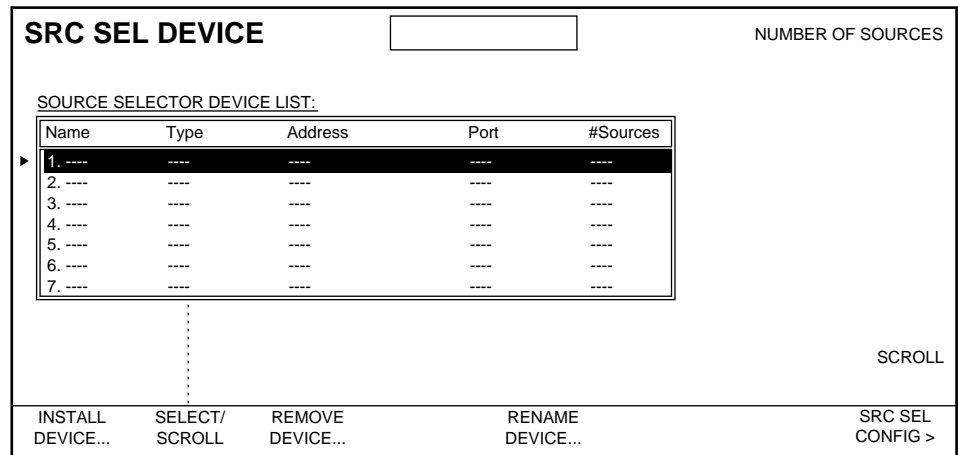


Figure 3-15. Initial Source Selector Device Menu

2. To add a selector device to the SOURCE SELECTOR DEVICE LIST, press INSTALL DEVICE... . You will be asked if the device is Internal or External. If External, you will select whether the device is a Switcher or Router.
3. The NUMBER OF SOURCES knob is used to set the number of sources provided by the selected source selector device. Internal devices default to two sources and this number cannot be changed.
4. Press RENAME DEVICE... to rename the device, if desired. Enter the new name as described in *Naming Items in Menus on page 3-10*.
5. If a router device is selected, the ROUTER ADDRESS... menu button appears. Press this button to enter the hex address that has been set on that router. All routers within the system must have unique addresses.

Note The SELECTOR PORT menu button appears when a router is selected. This should set to CHANNEL and not changed. The Resource Manager router port is inactive.

Figure 3-16 illustrates source selector devices installed for a typical facility.

| SRC SEL DEVICE | | | | | NUMBER OF SOURCES |
|------------------------------|----------|---------|--------|----------|-------------------|
| | | | | | 10 |
| SOURCE SELECTOR DEVICE LIST: | | | | | |
| Name | Type | Address | Port | #Sources | |
| 1. Dev 1 | Internal | ---- | ---- | 2 | |
| 2. Edit A | Switcher | ---- | ---- | 32 | |
| 3. PerformV | Router | 881234h | Router | 10 | |
| 4. PerformK | Router | 881235h | Router | 10 | |
| 5. PerformM | Router | 881236h | Router | 10 | |
| 6. ---- | ---- | ---- | ---- | ---- | |
| 7. ---- | ---- | ---- | ---- | ---- | |

| | | | | | | |
|----------------------|-------------------|---------------------|---------------------|----------------------|---------------------|---------------------|
| INSTALL DEVICE... | SELECT/ SCROLL | REMOVE DEVICE... | RENAME DEVICE... | ROUTER ADDRESS... | RSRC MGR CHANNEL | SCROLL |
| | | | | | SELECTOR PORT | SRC SEL CONFIG > |

Figure 3-16. Typical Source Selector Device Menu

- The REMOVE DEVICE... soft button is used to remove a selector device from the source selector device list.
- The SRC SEL CONFIG > soft button takes you directly to the Source Selector Configuration menu, where you setup the Krystal channels to use the devices you just installed (see *Source Selector Configuration on page 3-21*).

Suite Configuration Menus

The Suite Configuration menus are used to edit a suite configuration. Four different suites are available. For background information see *Suites on page 3-3*.

To go to the top level Suite Configuration menu:

1. From the System Configuration menu, press SUITE CONFIG >. You can also reach to the Suite Configuration menu by pressing System Setup \ SYSTEM CONFIG > \ OK \ SUITE CONFIG > (Figure 3-17)

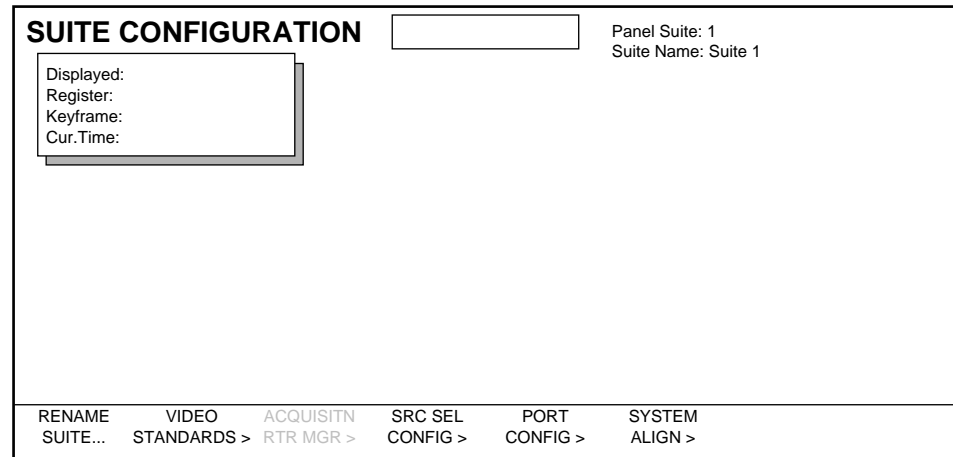


Figure 3-17. Suite Configuration Menu

2. The currently assigned suite number and name appear on the upper right side of the menu. Any changes made to parameters in the Suite Configuration menus are applied to the currently selected suite. Make sure this is the suite you wish to configure before proceeding. See *Selecting a Suite to Configure on page 3-11* for information about changing the current Control Panel suite assignment.

From this higher level Suite Configuration menu you can go to various sub-menus. Some of these menus contain parameters that affect the entire suite (Rename Suite, Video Standards, Port Configuration, and Combiner Output menus). Other menus configure an individual Video Processor Channel that is available for use by that suite (Source Selector Configuration, Channel Input, and Channel Output menus).

Rename Suite

Each suite is given a factory default name. To change the name of the currently selected suite:

1. Press RENAME SUITE... , then enter the new name as described in *Naming Items in Menus on page 3-10*.

Setting the Video Standard for the Suite

Each suite can be configured to operate using different video standards.

1. From the Suite Configuration menu press VIDEO STANDARDS to go to the Video Standards menu.

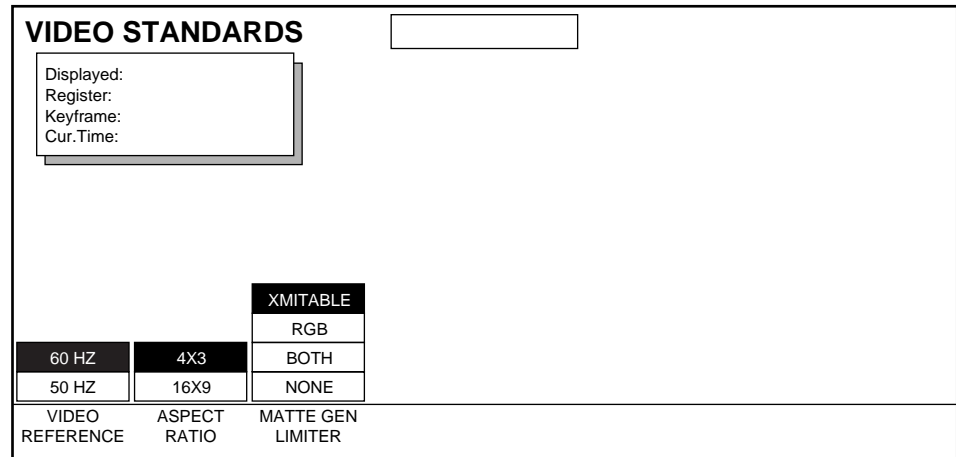


Figure 3-18. Video Standards Menu

2. The VIDEO REFERENCE menu button specifies the vertical sync rate (50 or 60 Hz) that is used when creating and running an effect. When a Video Processor Channel is acquired, its reference input is compared to this value. If a discrepancy is found, a warning notice is displayed.
3. The ASPECT RATIO menu button selects the aspect ratio of the sources feeding an effect. You can specify a 4x3 or 16x9 aspect ratio.
4. The MATTE GEN LIMITER button allows you to select what, if any, limits should be placed on the matte generator.

Source Selector Configuration

The Source Selector Configuration menu is used to associate source selector devices with the inputs (Video, Key, Mask) of each Video Processor Channel. Internal and External Source Selection, and A/B Input Routing

are also configured from this menu. See *Facility Examples on page 1-18* and *Video Inputs on page 2-9* for information about Internal and External source selection.

1. Press SRC SEL CONFIG > from the Suite Configuration menu to go to the Source Selector Configuration menu (Figure 3-19). This menu can also be reached from the Source Selector Device menu by pressing SRC SEL CONFIG > located on that menu.

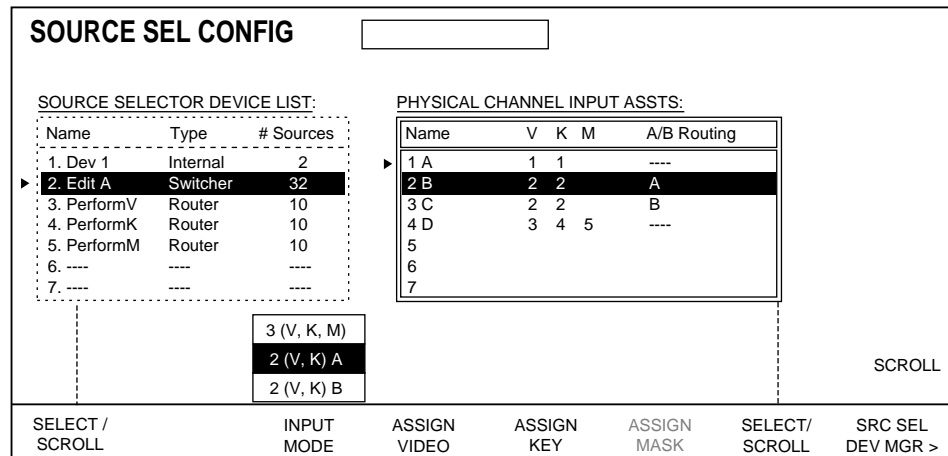


Figure 3-19. Source Selector Configuration Menu, Various Settings Shown

2. If necessary, select a Krystal channel in the right scroll window with the right SELECT/SCROLL button.
3. Press INPUT MODE to select the source selector mode for that channel.
 - 3(V,K,M) – The Video A, Key A, and Mask (Key B) inputs will be used. If Internal source selection is assigned, however (see below), the Video A/Key A input pair is internally switchable with the Video B/Key B input pair with this setting.
 - 2(V,K)A – The Video A and Key A inputs will be used (A/B Input Routing). Also used in conjunction with an Internal device to select Internal front/back source selection.
 - 2(V,K)B – The Video B and Key B inputs will be used (A/B Input routing).
4. Select a source selector device (installed by the Source Selector Device menu) in the left scroll window with the left SELECT/SCROLL button.
5. Assign the selected device to the desired channel input with the ASSIGN VIDEO, ASSIGN KEY, and (if three inputs are selected) ASSIGN MASK buttons.

Note Do not assign an Internal device to a channel set for 3(V,K,M) mode.

- If the selected device is a router, the ROUTER DEST soft knob labels appear. Use these knobs to select the number of the router output connected to the Video, Key, or Mask inputs of the selected channel.

Serial Port Configuration

The Krystal system has several serial ports, which must be configured to the correct protocol and interface to operate properly with the external device connected to that port.

- From the Suite Configuration menu, press the PORT CONFIG button to go to the serial Port Configuration menu. This menu will vary depending on what port and protocol is selected. For each protocol selected, the default settings are the standard settings for that protocol. These settings can be changed if desired. [Figure 3-20](#) gives an example of one of these menu screens.

| SERIAL PORT CONFIG | | | | | | | |
|--------------------|----------|----------------------|--------|---------------------|--------------|--------------|--------------------|
| SERIAL PORT LIST: | | | | | | | |
| Port | | | | | | | |
| Editor | | | | | | | |
| Switcher | | | | | | | |
| Aux | | | | | | | |
| Router Ch A | | | | | | | |
| Router Ch B | | | | | | | |
| | SONY | | EVEN | | | 9600 | |
| | ES BUS | | ODD | 7 BITS | 1 | 19.2 | SCROLL |
| | GVG SEL | | NONE | 8 BITS | 2 | 38.4 | |
| | NONE | | | | | | |
| SELECT/ SCROLL | PROTOCOL | SELECT ADDRESS... | PARITY | CHARACTER LENGTH | STOP BITS | BAUD RATE | POLL ADDRESS... |

Figure 3-20. Serial Port Configuration Menu, Editor Protocol Example

- After a port has been selected a protocol is chosen. Some screening is performed by limiting the types of protocols supported by a particular port. However, the Krystal system cannot determine a mismatch between port protocol and the device connected to the port.
 - An editor or other master device must know Krystal's poll address if ESBUS or GVG Select is chosen. The POLL ADDRESS... button allows this to be selected.
 - When a peripheral protocol is being used, PERIPH ADDRESS... appears. Use this to specify Krystal's peripheral number (0-23).
 - When CPL protocol is chosen, a serial port may use an HDLC (multi-drop) connection. When using an HDLC link, the HDLC ADDRESS... selection allows you to enter Krystal's HDLC address.

See *External Interfaces* on [page 3-62](#) for more information.

System Alignment Menu

1. From the Suite Configuration menu, press SYSTEM ALIGN > to go to the System Alignment menu.

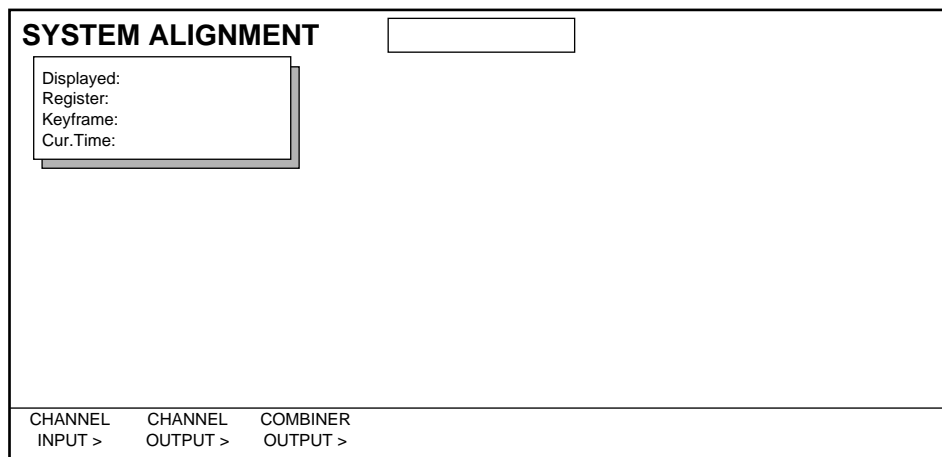


Figure 3-21. System Alignment Menu

From the System Alignment menu you can reach these sub-menus:

CHANNEL INPUT — This menu is used adjust the input timing and preset crop for the selected Video Processor Channel.

CHANNEL OUTPUT — This menu is used to adjust the output timing, resolution, shaping, and to activate depth of the selected Video Processor Channel's output. When Combiner option hardware is present, resolution, shaping, and depth are controlled by the Combiner Output menu.

COMBINER OUTPUT — This menu is used to adjust the timing, resolution, shaping, and depth of the Combiner option output.

Timing Considerations

Each Krystal Video Processing channel and System Controller frame has a reference input. Incoming video must be timed relative to that reference signal for successful system operation. Krystal systems do not need precisely timed inputs, however. Krystal devices incorporate an auto-timing feature, where incoming video that falls within $\pm 18.9 \mu\text{s}$ (± 255 , or 510 clocks) of reference can be used without any timing problems.

Note If the incoming video timing range is outside the 510 clocks window, Krystal may display the video one or more lines early or late.

Each Krystal Channel has internal memory that stores the incoming video for processing. The Krystal channel video output is delayed one frame in actual time. This video is output timed to match the next reference signal

video frame. For this reason, Krystal output video can be advanced as well as delayed in time, relative to that next reference video frame. Each Krystal device supports ± 5 lines of output timing adjustment.

When using a Krystal Combiner, you must make allowances for the video processing delay (512 clocks) of the Combiner itself. You also must take into consideration the delays and timing adjustments of any devices in the video paths to and from the Krystal devices. Figure 3-22 shows a Krystal system setup with delays in both the input and output and will be used to help explain how to set up Krystal system timing. This discussion assumes that all of the equipment uses the same reference video. All timing adjustments are done in clocks.

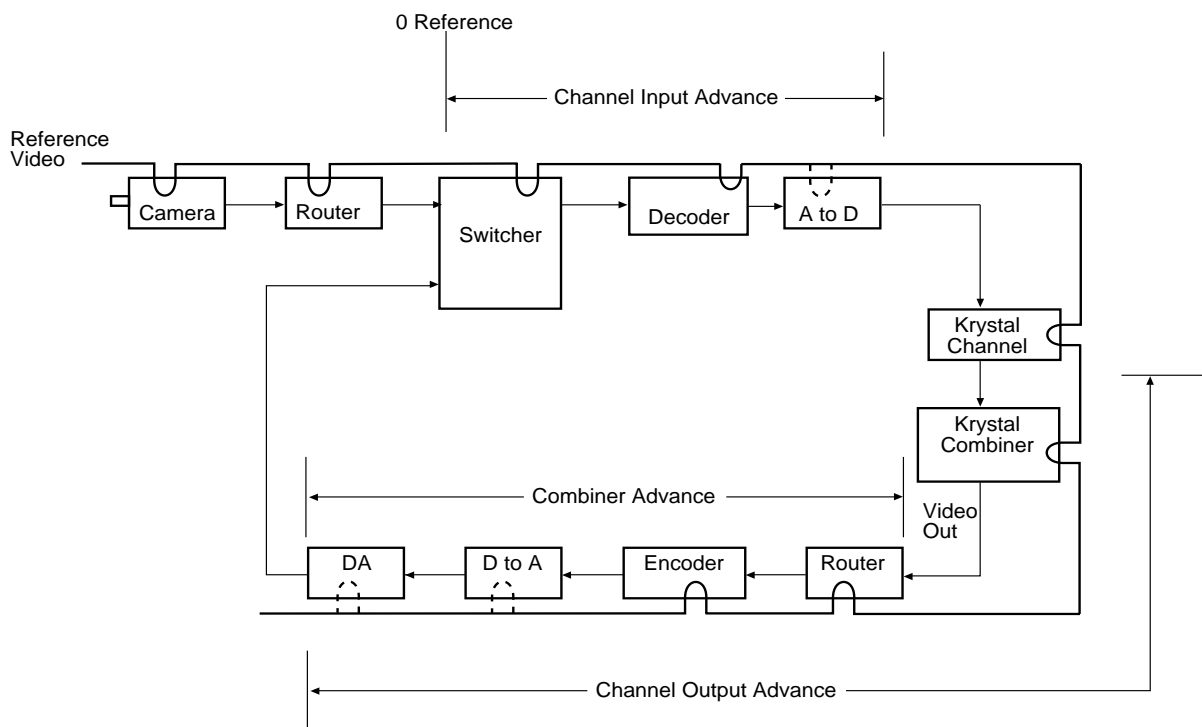


Figure 3-22. Krystal Timing Example

Table 3-1 shows conversions between clocks, μ seconds, and lines

Table 3-1. Clocks Conversion Table

| To Convert From | To Clocks |
|---------------------|------------------|
| From μ Seconds | Multiply by 13.5 |
| From Lines (525 60) | Multiply by 858 |
| From Lines (625 50) | Multiply by 864 |

CALCULATING CHANNEL INPUT TIMING

1. Determine the delay through each piece of equipment that is between the zero time point of the video (switcher input in this example) and the input of the Krystal channel.
2. Convert all of the delays to clocks.
3. Total up the delays of all of the equipment.
4. Make the number negative (-) to advance the autotiming window if there is delay between the zero reference and the input to Krystal. Make the number positive (+) to delay the autotiming window if the video into Krystal is advanced from the zero reference. If the inputs are not timed the same, measure the longest and shortest path and set the timing midway between.

CALCULATING CHANNEL OUTPUT TIMING

1. Determine the delay through each piece of equipment that is between the output of the Krystal channel and the zero time point of the video (switcher input in this example). Include the Krystal Combiner, if installed.
2. Convert all of the delays to clocks.
3. Total up the delays of all of the equipment.
4. Make the number negative (-) to advance the video if there is delay between the output of the Krystal Channel and the zero reference. Make the number positive (+) to delay the video if the Krystal output is delayed from the zero reference.

CALCULATING COMBINER OUTPUT TIMING

1. Subtract 512 clocks from the Channel Output timing calculated above.

Setting Channel Input

- From the System Alignment menu, press CHANNEL INPUT > to go to the Channel Input menu (Figure 3-23).

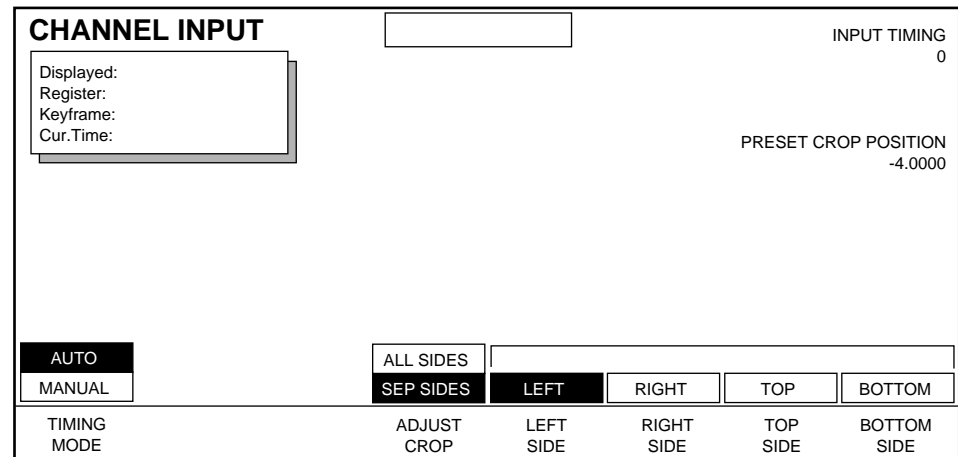


Figure 3-23. Channel Input Alignment Menu

- Delegate the Video Processor Channel(s) you wish to set the input timing on by pressing the DELEG 1, DELEG 2, DELEG 3, and/or DELEG 4 buttons on the lower part of the Krystal Control Panel. These buttons are illuminated when the channel is delegated.
- Press TIMING MODE to select MANUAL. Then set the video timing to the number calculated on [page 3-26](#) with the Input Timing soft knob, or press the Transfer Button and enter the timing on the Control Panel keypad. All video signals must be within the auto timing range. After the timing is set manually, set the timing mode to AUTO to enable the auto capture. The adjustment range is ± 5 lines.

Note It is best to adjust the input timing before adjusting the preset crop. This avoids adjusting preset crop for a timing error.

- Adjust the preset crops, if desired, by pressing ADJUST CROP.
 - When ALL SIDES is selected, you can crop all sides of the current source with the Preset Crop Position knob.
 - When SEP SIDES is selected, you can select individual sides to crop with the Preset Crop Position knob.

Setting Channel Output

1. From the System Alignment menu, press CHANNEL OUTPUT > to go to the Channel Output menu (Figure 3-24).

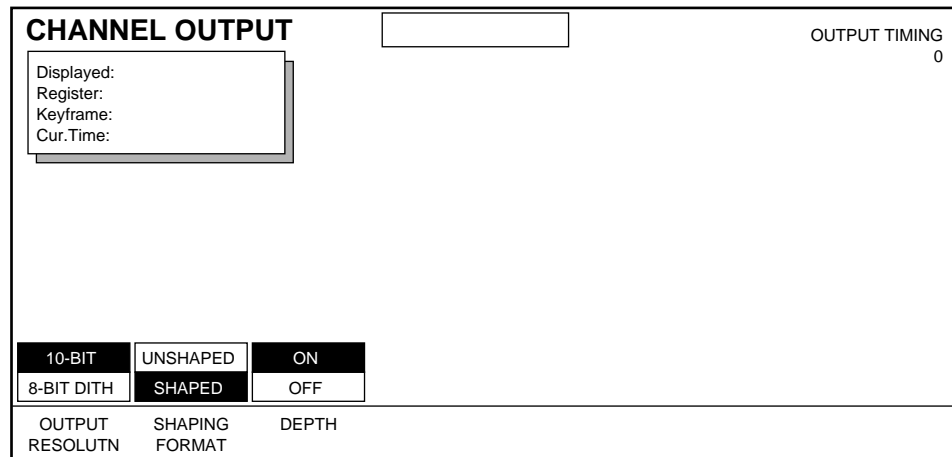


Figure 3-24. Channel Output Alignment Menu

2. Delegate the Video Processor Channel(s) by pressing the (DELEG 1, DELEG 2, DELEG 3, and/or DELEG 4) buttons on the lower part of the Krystal Control Panel. These buttons are illuminated when the channel is delegated.
3. Set the video timing to the number calculated on page 3-26 with the Output Timing soft knob, or press the Transfer Button and enter the timing on the Control Panel keypad.
4. If a Combiner is not installed, use the OUTPUT RESOLUTN, SHAPING FORMAT, and DEPTH buttons to set the output resolution, shaped/unshaped, and turn key depth ON or OFF as desired. When a Combiner is installed, resolution, shaping, and depth are controlled by the Combiner Output menus.

Setting the Combiner Output

1. From the System Alignment menu, press COMBINER OUTPUT > to go to the Combiner Output menu. Different Combiner configuration menus appear, depending on whether Four Channel Combiner or 2 x 2 Combiner hardware is detected by the system.

Four Channel Combiner Output Menu

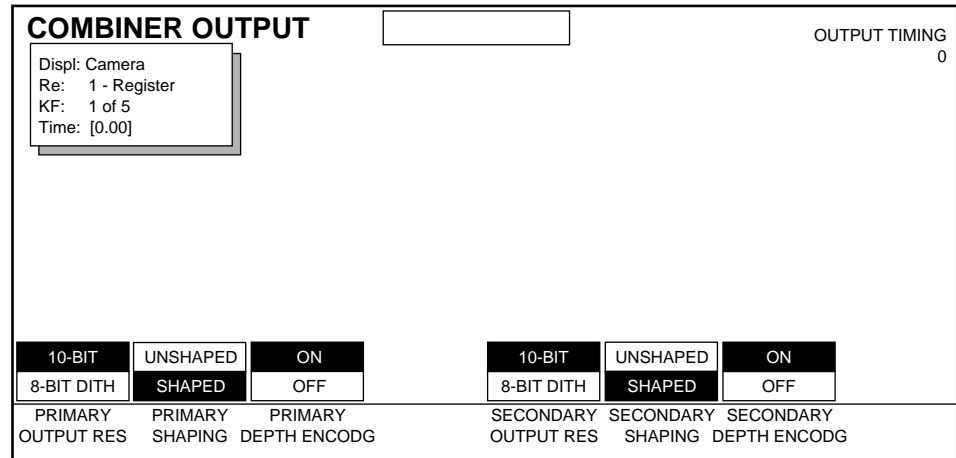


Figure 3-25. Four Channel Combiner Output Alignment Menu

1. Set the Combiner video output timing to the number calculated on [page 3-26](#) with the Output Timing soft knob, or press the Transfer Button and enter the timing on the Control Panel keypad. The timing range is \pm five lines.
2. Use the OUTPUT RES, SHAPING, and DEPTH ENCODG soft buttons to set the desired settings for the primary and secondary Combiner outputs.

2 x 2 Combiner Output Menu

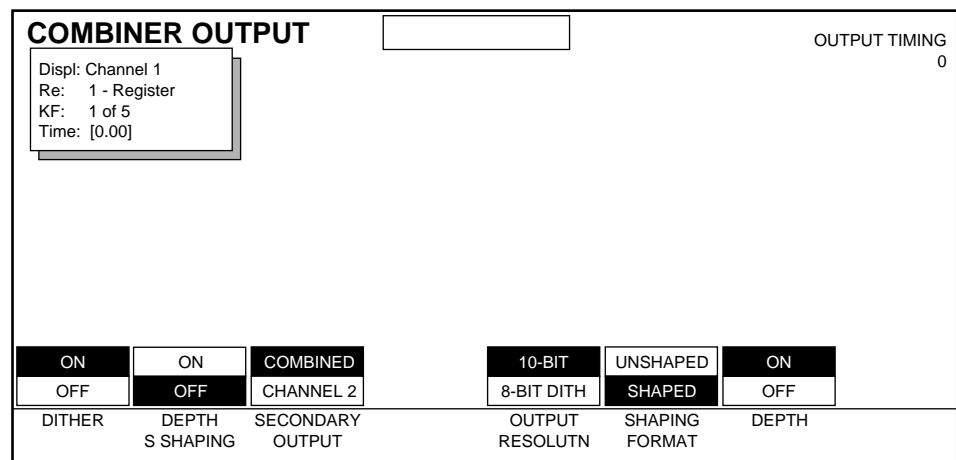


Figure 3-26. 2 x 2 Combiner Output Alignment Menu

1. Set the Combiner video output timing to the number calculated on [page 3-26](#) with the Output Timing soft knob, or press the Transfer Button and enter the timing on the Control Panel keypad. The timing range is \pm five lines.

The remaining controls on the 2 x 2 Combiner Output menu are arranged in two groups. The left group of controls (Dither, Depth S Shaping, Secondary Output) apply to the current suite assigned to the Control Panel.

DITHER — Dithers the least significant video bit to smooth transitions. Only applies when 8-Bit output resolution has been selected.

DEPTH S SHAPING — When ON applies an S-Linear transition to combined picture intersection edges. Only applies when Depth has been selected for combining.

SECONDARY OUTPUT — Controls what is delivered to the Secondary Combiner output.

COMBINED — The secondary combiner output (B) delivers the same video and key output as the primary combiner output (A), provided both combiner input channels are acquired by the same Effect Manager.

CHANNEL 2 — The secondary combiner output (B) delivers the uncombined secondary input (B) video and key signals.

The right group of controls (Output Resolution, Shaping Format, Depth) applies to the primary and secondary combiner outputs individually. The Primary Output is associated with the Krystal Physical Channel 1 (Hardware ID = 0). The secondary output is associated with physical channel 2 (Hardware ID = 1). You need to delegate the physical channel associated with the desired combiner output before making changes to these controls.

2. Delegate physical channel 1 to make changes to the primary combiner output by pressing the appropriate DELEG Control Panel button. You can check which physical channel is currently assigned to which logical channel by going to the Channel Config menu (System Setup \ SYSTEM CONFIG > \ OK \ CHANNEL CONFIG >).
3. Set the OUTPUT RES, SHAPING FORMAT, and DEPTH soft buttons to set the desired settings for the primary Combiner output.
4. Delegate physical channel 2 to make changes to the secondary combiner output by pressing the appropriate DELEG Control Panel button.
5. Set the OUTPUT RES, SHAPING FORMAT, and DEPTH soft buttons to set the desired settings for the secondary Combiner output.

Network Configuration

Each Krystal device on the same network must have a unique IP address. Krystal systems are shipped with default IP addresses that should work on an individual, standard installation. If your system has only one System Controller and only one Krystal Control Panel on the network, the default IP addresses should not need to be changed.

The Network Configuration menu is used to change the IP Address of Effect Managers (see [page 3-45](#)) and internal IP Addresses (see [page 3-47](#)) associated with each Resource Manager.

Save Changes to NV RAM

The changes you have made to the configuration data so far only exist in the Effect Manager's working memory. To retain these changes you must save them to NV RAM. Later you will save this and other configuration data to floppy disk.

You use the System Configuration Save/Load menu to save configuration data to NV RAM, and load NV RAM data into the Effect Manager's working memory.

1. From the System Configuration menu, press SAVE/LOAD to go to the System Configuration Save/Load menu ([Figure 3-27](#)).

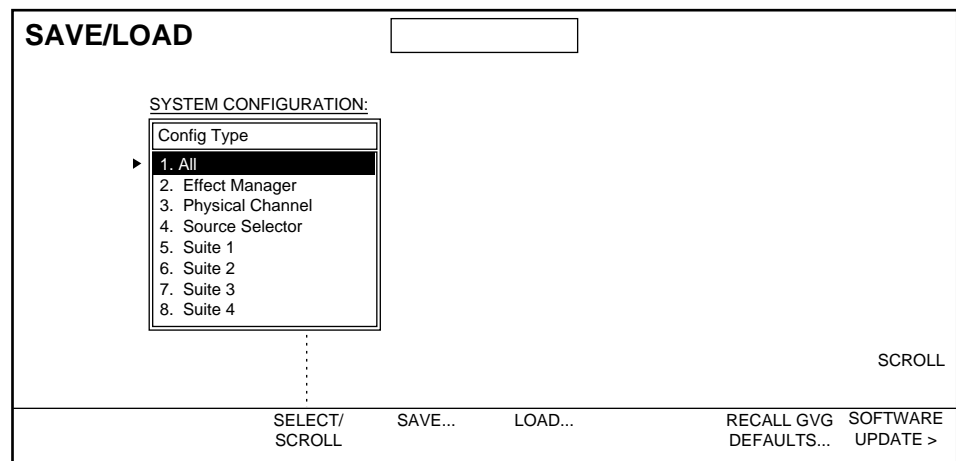


Figure 3-27. System Configuration Save/Load Menu

Note Do not confuse this menu with the separate File Operations Save/Load menu, used to save and load files to and from floppy disk.

2. Select ALL (or any individual configuration data) with the Select/Scroll soft button, then press SAVE.... A warning message appears stating the existing NV RAM will be replaced. Note that selecting ALL also replaces information for the other three suites if any of their configuration data has somehow been changed.
3. Press OK to save the current working configuration data to NV RAM.

To load configuration data from non-volatile RAM to the Effect Memory's working memory, press SELECT/SCROLL to choose the data you want to load and then press LOAD....

Other System Setup Menus

Other menus available from the System Setup menu allow you to set other system configuration parameters. Because you may wish to quickly change these parameters during a Krystal operating session, these menus are located outside the System Configuration menus for easier access.

1. Press the System Setup top menu button to go to the System Setup Menu ([Figure 3-28](#)).

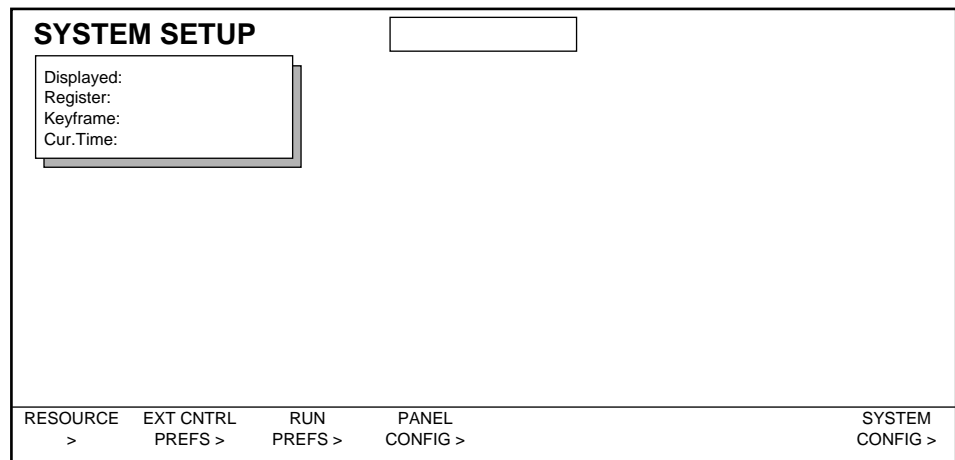


Figure 3-28. System Setup Menu

Resource Menu

Resource menu operation is described under *Acquire Effect Manager and Channels* on page 3-12.

External Control Preferences

The External Control Preferences menu give you ON / OFF control of the Krystal serial ports, and lets you setup the Krystal system’s GPI inputs.

1. From the System Setup menu, press EXT CNTR PREFS > to go to the External Control Preferences menu.
2. Pressing the MODIFY soft button to select PORTS lets you enable or disable each of the serial ports on the Effect Manager I/O Module (Figure 3-29).

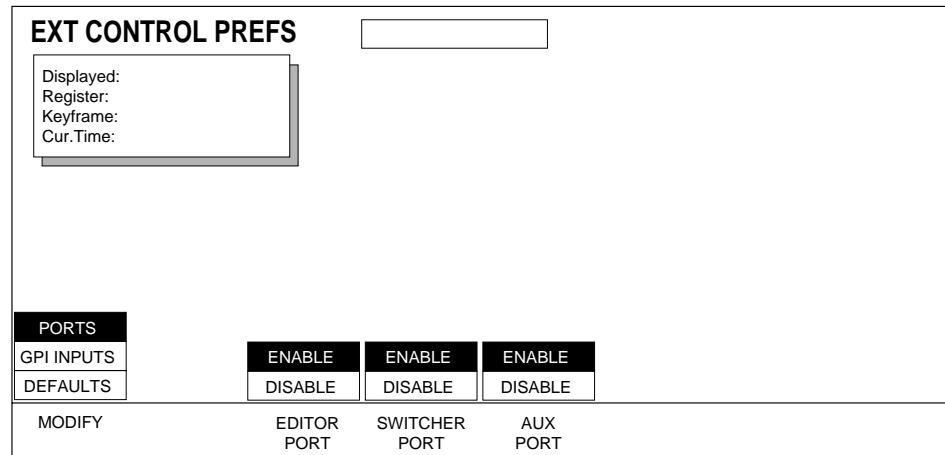


Figure 3-29. External Control Preferences Menu, Ports

3. Pressing the MODIFY soft button to select GPI INPUTS brings up a list of the GPIs and a list of GPI functions (Figure 3-30).

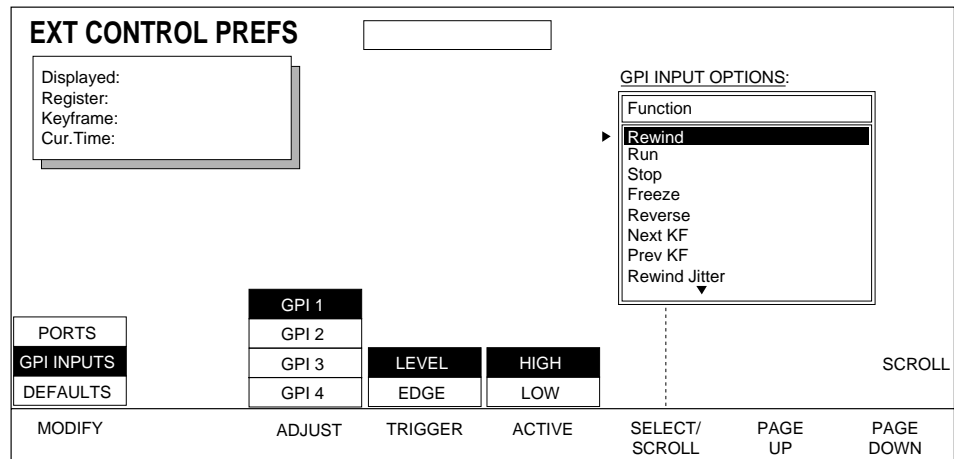


Figure 3-30. External Control Preferences Menu, GPIs

Selecting a GPI and a function causes that function to occur when the selected GPI is activated. Select OFF to disable a GPI.

TRIGGER — Selects level trigger or edge trigger.

ACTIVE — Selects whether the GPI is active when it is high or low.

4. Selecting **DEFAULTS** lets you define or recall External Control Preferences defaults (Figure 3-31).

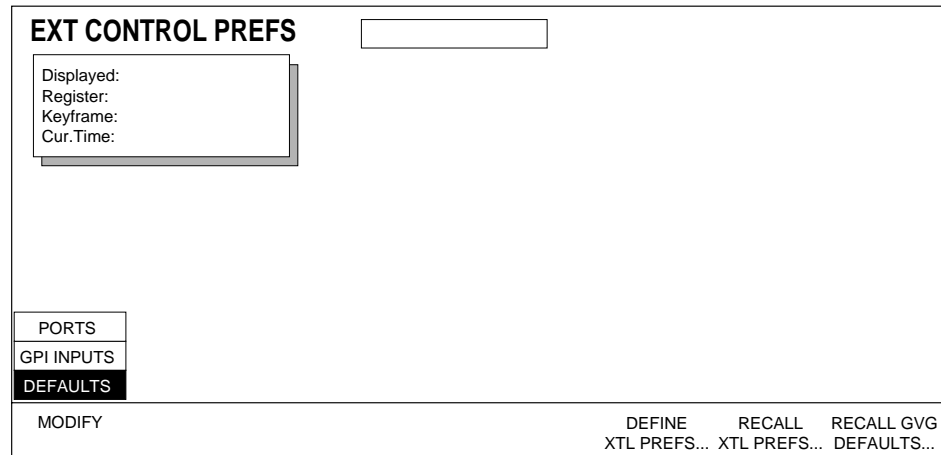


Figure 3-31. External Control Preferences, Defaults

DEFINE XTL PREFS... — Defines the present external control prefs as the user default.

RECALL XTL PREFS... — Recalls last saved user default settings.

RECALL GVG DEFAULTS... — Recalls the GVG default settings.

Run Preferences

The Run Preferences menu gives you control of the starting field of effects when they are run.

1. From the System Setup menu, press RUN Prefs > to go to the Run Preferences menu (Figure 3-32).

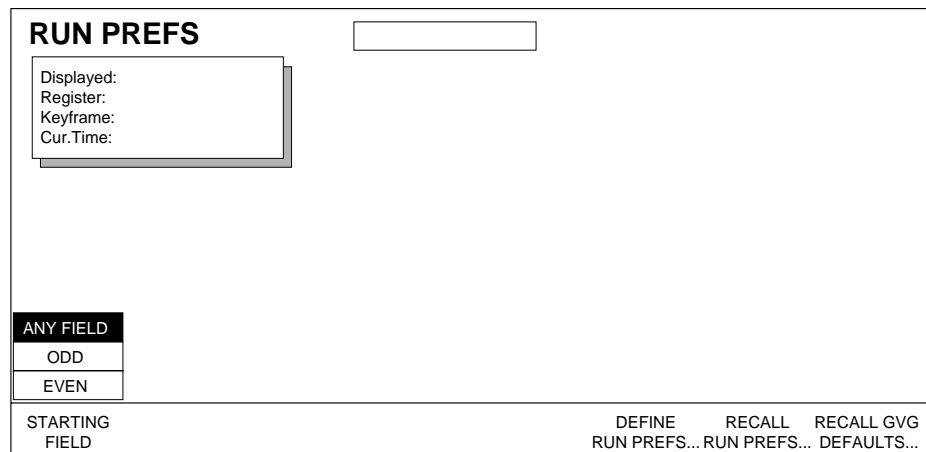


Figure 3-32. Run Preferences Menu

STARTING FIELD — Controls on which field the effect will start. Selecting ODD or EVEN will delay the running of the effect until that field is reached. Selecting ANY FIELD begins the effect on whatever field is present when the effect is run.

DEFINE RUN Prefs... — Defines the present run preferences as the default preferences.

RECALL RUN Prefs... — Recalls the default run preferences.

RECALL GVG DEFAULT... — Recalls the GVG default run preferences

The Run Preferences starting field setting is saved to the Effect Manager's NV RAM. These settings can also be saved to floppy disk (User Prefs).

Panel Configuration

The Panel Configuration menu is used to adjust parameters for that individual Krystal Control Panel. These parameters include calibration settings for the Lever Arm and Joystick. The Krystal Control Panel parameters are automatically saved to NV RAM on the panel when you exit the menu, and are not saved to the Effect Manager.

1. From the System Setup menu press **PANEL CONFIG >** to go to the Panel Configuration menu (Figure 3-33).

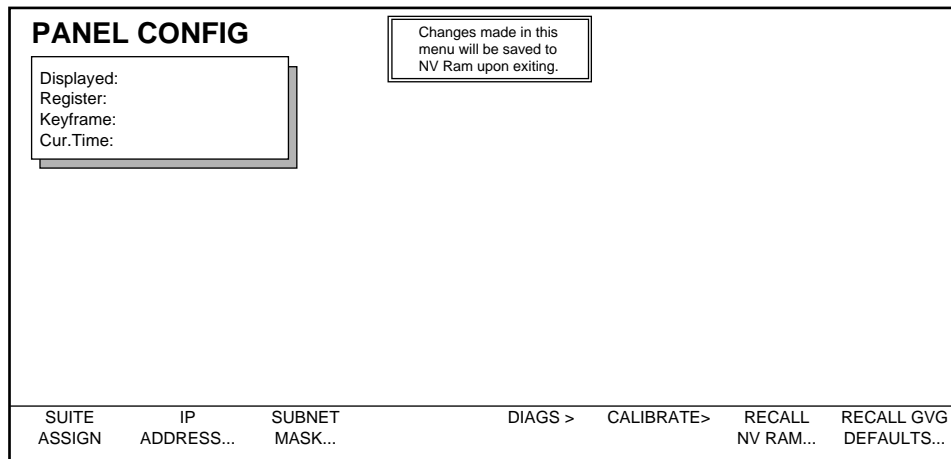


Figure 3-33. Panel Configuration Menu

2. Press **CALIBRATE >** to display a dialog box that allows you to calibrate the Lever Arm and Joystick. Follow the screen directions, moving the Lever Arm and Joystick to various locations, and then save your calibration settings.

SUITE ASSIGN > — Used to assign a different suite number to the Krystal Control Panel, as described in *Selecting a Suite to Configure* on page 3-11. During a basic system configuration the default suite (1) is generally used.

IP ADDRESS > — Used to assign a different IP address to the Krystal Control Panel. During a basic system configuration of the first Control Panel on the network, the default IP Address is generally used. See *Change Control Panel IP Address* on page 3-44 for information about adding additional Control Panels to your Krystal system.

SUBNET MASK... — Used for advanced IP addressing. Generally should not be changed.

DIAGNOSTICS > — See Section 6 – Diagnostics and Fault Isolation for information about Diagnostics Menu operation.

RECALL NV RAM... — Used to recall the last saved Control Panel NV RAM values.

RECALL GVG DEFAULTS... — Used to recall the factory default Control Panel NV RAM values.

User Tools Menus

The User Tools menus are used to set individual operating preferences for the Krystal system. Generally these can be left at their default settings during the initial system configuration. These parameters can be changed as needed by each operator, and can be saved to floppy disk to allow fast reconfiguration as required.

A general description of these menus are included here for convenience. For a more complete description refer to the separate Krystal User and Krystal Reference manuals.

The User Tools menu is reached by pressing the User Tools top menu button (Figure 3-34). Other menus are accessed from this menu.

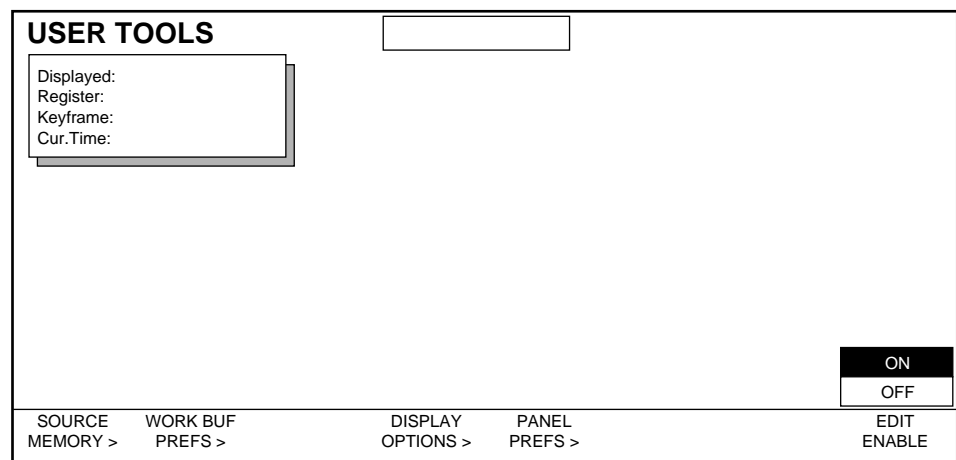


Figure 3-34. User Tools Menu

EDIT ENABLE enables and disables the editing of Krystal effects on that Krystal Control Panel. The Edit Enable setting is not saved, and defaults to ON whenever the Control Panel is reset.

Source Memory Menu

The Source Memory menu is reached by pressing the SOURCE MEMORY > button on the User Tools menu (Figure 3-35).

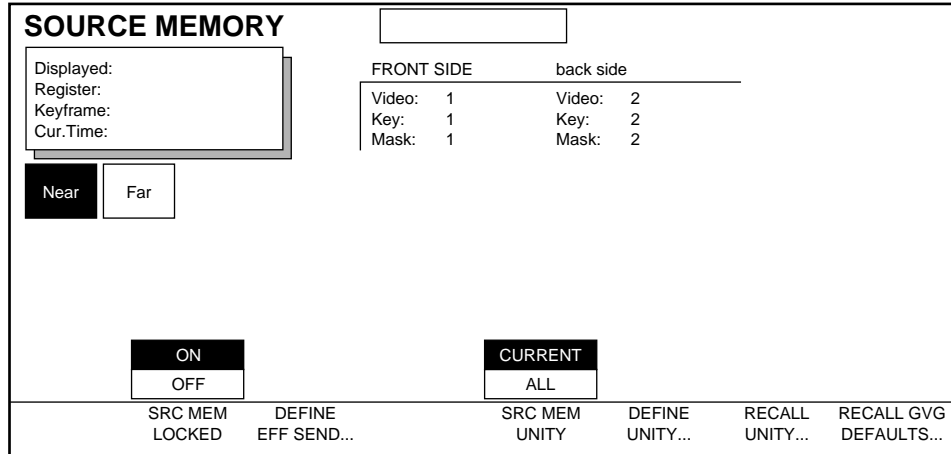


Figure 3-35. Source Memory Menu

The FRONT SIDE and BACK SIDE boxes indicate which of the inputs are currently selected as the front and back video. The Near and Far boxes indicate which side(s) have been delegated for control with the NEAR and FAR Control Panel buttons.

SRC MEM LOCKED — Selecting ON allows the source memory to change as the input sources are changed (this is the normal mode). Selecting OFF disables the automatic source memory selection as the inputs are changed and keeps the same source memory for all inputs.

DEFINE EFF SEND... — When a channel is in the effects send mode, (put there through a switcher’s Aux bus control) source selection to the switcher can be disabled for that channel, and a special “effects send source memory” is activated for that channel.

SRC MEM UNITY— Selects if the CURRENT or ALL 64 source memories are affected by a Define Unity or a Recall Unity command.

DEFINE UNITY... — Sets the user default source memory to be the same as the current source memory work buffer.

RECALL UNITY... — Sets the source memory parameters in the current working buffer to be the same as the user default source memory settings. These parameters were set using the DEFINE UNITY button.

RECALL GVG DEFAULTS... — Sets the source memory parameters in the current working buffer to the GVG default source memory settings. These parameters were set at the factory and are not changeable.

The Source Memory settings are saved to the Effect Manager working memory, not to NV RAM, and will be revert to default values when the Effect Manager is reset. These settings can be saved to floppy disk (User Prefs).

Work Buffer Preferences Menu

The Work Buffer Preferences menu is reached by pressing the WORK BUF PREFS > button on the User Tools menu (Figure 3-36).

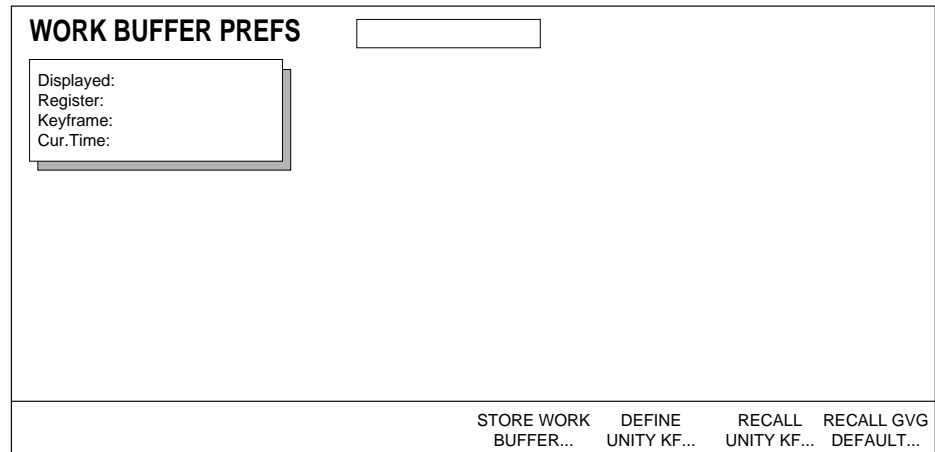


Figure 3-36. Work Buffer Preferences Menu

DEFINE UNITY KF... — Sets the unity keyframe to be the same as the current keyframe settings of the delegated display channel.

Note Unity KF values are applied to all channels, including the Global and Camera Channels. Transform values should be default when the Unity KF is defined, to prevent multiple application of transforms when the Unity KF is invoked.

RECALL UNITY KF... — Sets the current keyframe to be the same as the unity keyframe settings.

GVG DEFAULT... — Sets the keyframe parameters in the current working buffer to the GVG default keyframe settings. These parameters were set at the factory and are not changeable.

The Work Buffer settings are saved to the Effect Manager working memory, not to NV RAM, and will be revert to default values when the Effect Manager is reset. These settings can be saved to floppy disk (User Prefs).

Display Options

The Display Options menu is reached by pressing the DISPLAY OPTIONS > button on the User Tools menu (Figure 3-37).

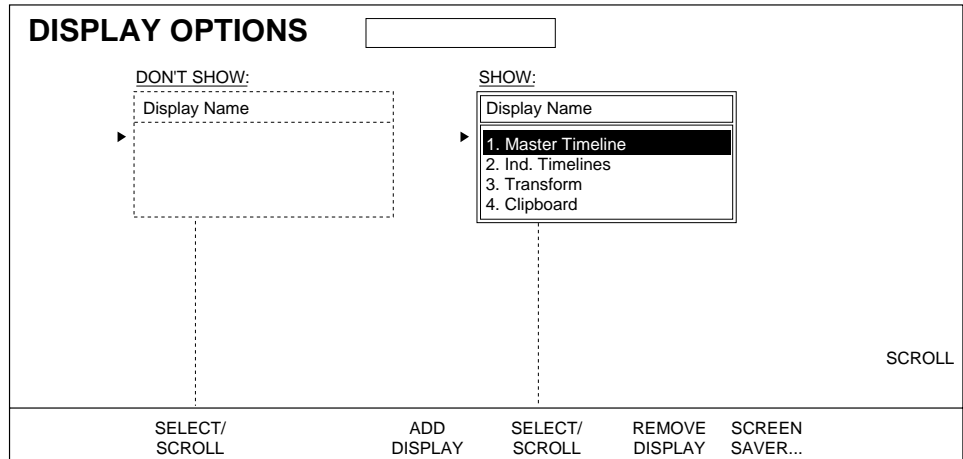


Figure 3-37. Display Options Menu

This menu allows you to set which elements will appear when you cycle through the timeline displays. Items in the SHOW and DON'T SHOW boxes will show or not show on the screen.

To move items between boxes:

1. Press SELECT/SCROLL to select that item and
2. Press ADD DISPLAY or REMOVE DISPLAY to move the item into the SHOW or DON'T SHOW box.

SCREEN SAVER — Activates the Krystal Control Panel screen saver.

The Display Options settings are not saved, and will revert to default values whenever the Control Panel is reset.

Panel Preferences

The Panel Preferences menu is reached by pressing the PANEL PREFS > button on the User Tools menu (Figure 3-38).

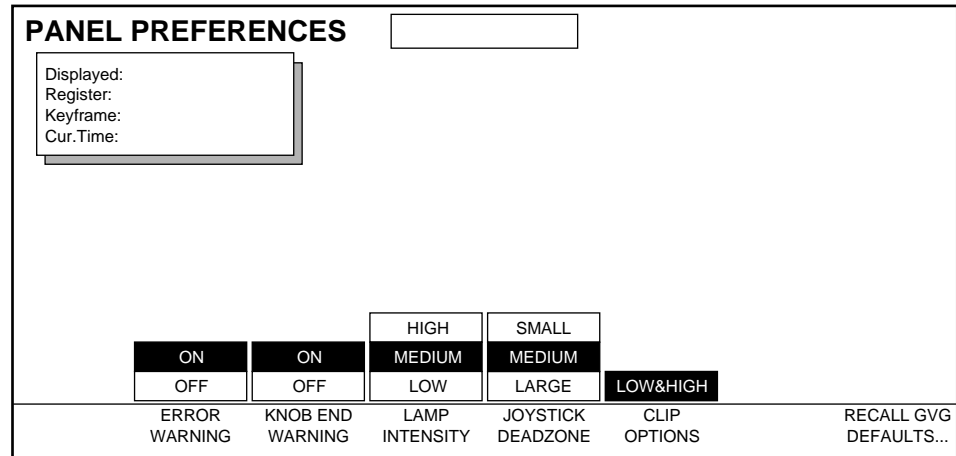


Figure 3-38. Panel Preferences Menu

ERROR WARNING — Turns on or off the warning that an erroneous entry has been made with the keypad. Krystal must be expecting an entry from the keypad for the warning to sound.

KNOB END WARNING — Turns on or off the warning that one of the soft knobs or the joystick has gone to one of its limits. Krystal must be expecting an entry from that knob for the warning to sound.

LAMP INTENSITY — Sets the intensity of the panel lamps.

JOYSTICK DEAD ZONE — This feature is not currently implemented.

RECALL GVG DEFAULTS... — Makes the GVG panel preferences default settings become the active settings. These parameters were set at the factory and are not changeable.

Panel Preferences settings are saved to the Krystal Control Panel's NV RAM, and so are retained when the Control Panel is reset. Also saved to NV RAM are any Krystal DPOP settings. These settings cannot be saved to floppy disk. When the Krystal software is updated, these settings will be lost. After a software update you will need to reset Panel Preferences and DPOP settings.

Saving Basic Configuration to Disk

Note It is recommended that you save all your configuration changes to floppy disk and put this configuration disk in a safe place. This will prevent loss of configuration settings in case of a problem.

Saving your configuration data to floppy disk allows you to make a backup of Krystal's setup before or after you store it to non-volatile RAM, and allows the earlier configuration to be easily restored if necessary.

File Time Stamping

A time/date clock is located in each Control Panel. This clock is only used to time stamp files when they are saved to disk. These clocks are set in the factory (Pacific Time, USA) and are designed to run for 10 years without external power. If you need precise time stamps the Control Panel clocks will need to be set. This is accomplished by connecting an ASCII terminal to the Diagnostics Port on each Control Panel. See Section 5 – Maintenance for specific instructions on setting the Control Panel clock.

Floppy Disk Formatting

It is recommended you format the floppy disks used with the Krystal system with the Krystal Control Panel. The Krystal system is designed to be compatible only with standard formatted 1.44 mB PC disks, but formatting on the panel itself will help ensure data integrity. The Krystal system cannot use 740k disks.

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 copied 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.

Save Files to Disk

1. Acquire an Effect Manager.

2. Insert a formatted 1.44 mB floppy disk into the Krystal Control Panel's disk drive.
3. Press the File Oper. top menu button, then press SAVE/LOAD > to go to the File Operations Save/Load menu (Figure 3-39).

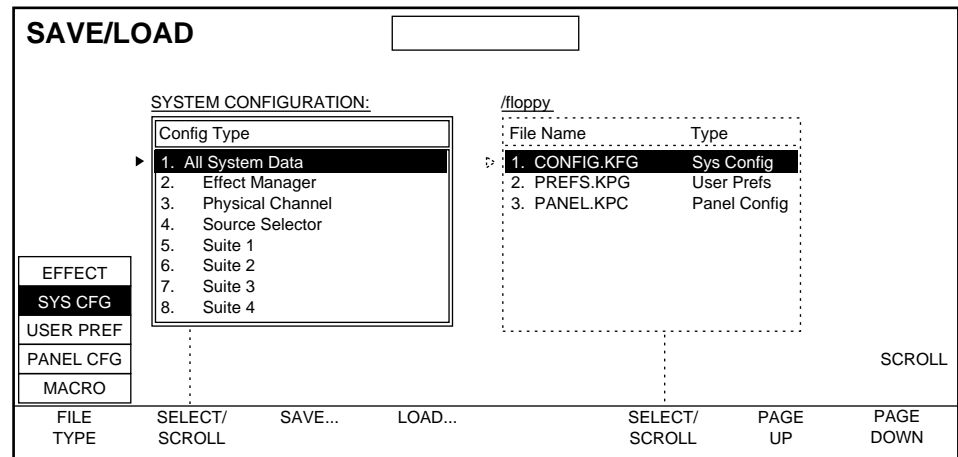


Figure 3-39. File Operations Save/Load Menu

- Note** Do not confuse this menu with the separate System Configuration Save/Load menu, used to save and load configuration data to and from Effect Manager NV RAM.
4. Press the FILE TYPE soft button to select SYS CFG, select ALL SYSTEM DATA with the left SELECT/SCROLL soft button, and then press SAVE... . Press OK at the prompt, rename the file if you wish, then press OK again to save the file to disk. The disk drive light illuminates as the file is being saved. After a couple minutes the light will go out and the name of the saved file will appear on the screen.
 5. If this is an initial system configuration, or you have changed any AP Addresses, you should also save your network configuration to disk. Select NETWORK and press SAVE... . It is recommended this data be saved separately (rather than use the ALL selection at the bottom of the list) because the entire system is rebooted whenever network data is loaded, and loading the wrong network information can cause serious problems.
 6. Repeat the steps above, selecting and saving the USER PREF and PANEL CFG, files onto the same or a separate floppy disk.

7. If Effects and Macros exist, you should also save them to floppy disk. Follow the same general procedure above. Separate sets of Effects reside on each Effect Manager, and separate Macros reside on each Control Panel. If you are configuring a multi-user system you may want to save the Effects for each Effect Manager and the Macros for each Control Panel separately.

Note Because Krystal Effects memory can be large (up to 4 mB), you may need to save your Effects onto separate floppy disks. At capacity, only about 1/3 of Effects memory can be saved to a single floppy disk. To save onto multiple floppy disks, save each Effect to disk individually.

Additional Control Panel Configuration

Change Control Panel IP Address

Each Krystal Control Panel must have a unique IP address. The default IP addresses for Krystal devices are class C. We recommend only class C IP addresses be used and that defaults be used whenever possible.

Because all Control Panels are shipped from the factory with the same default IP address, you will need to change the addresses of any additional Control Panels before they are added to a Krystal network.

To change the Krystal Control Panel IP address:

1. Before powering up the additional Krystal Control Panel, make sure it is not connected to the Krystal network (disconnect the LAN cable).
2. Power up the Control Panel, and then press System Setup \ PANEL CONFIG > to go to the Panel Configuration menu.
3. Press IP ADDRESS and enter the new IP address. It is suggested you increment the default address by one for each additional panel.

Assign a New Suite Number

If the additional Krystal Control Panel is installed at a different location, you will need to assign it a different suite number. See *Selecting a Suite to Configure* on page 3-11 for specific instructions.

Calibrate the New Control Panel

1. Press System Setup \ PANEL CONFIG > \ CALIBRATE to go to the Calibration Menu.
2. Follow the screen directions to calibrate the Lever Arm and Joystick, and then save your calibration settings.

Save the Panel Configuration to Floppy Disk

You should save each Control Panel's configuration file (Panel CGF) to separate disks, label them, and store them in a safe place. See *Saving Basic Configuration to Disk* [on page 3-42](#) for specific instructions.

Additional Effect Manager Configuration

Usually an Effect Manager is added to a Krystal system so multiple operators can use the Krystal system from different locations (suites). Separate sets of configuration data exist for each Krystal suite. When an Effect Manager is added to a system, it must have a unique IP Address, and you will need to configure a new suite for operation with the new Effect Manager, making any changes required to support any devices used by that Effect Manager.

Effect Manager IP Addresses

All Effect Managers in a single Krystal system are shipped from the factory with unique IP Addresses that should not need to be changed. On multi-channel systems these IP Addresses actually reside in the Resource Manager. The default IP addresses for Krystal devices are class C. We recommend only class C IP addresses be used and that defaults be used whenever possible.

You should, however, always make sure all the IP Addresses are unique and change them if necessary before you configure any Krystal system.

Checking Effect Manager IP Addresses

To check your Krystal system's IP addresses:

1. If necessary, connect a Control Panel to the Effect Manager. See *Installing the Control Panel* [on page 2-2](#).
2. Make sure all the Krystal system components are powered up and operational.

3. On the Krystal Control Panel, press the SYSTEM SETUP \ SYSTEM CONFIG \ OK \ SAVE/LOAD \ SOFTWARE UPDATE to display the Software Update menu (Figure 3-40).

| SOFTWARE UPDATE | | | | | | |
|----------------------|------------|-----------|--------------|---------|------------|--------|
| Effects Manager List | | | | | | |
| System ID | Proc Type | Proc Name | IP Address | Op Mode | SW Version | Status |
| System 1 | Effect Mgr | EM 1 | 192.65.13.94 | App | V3.x.x | |
| System 2 | Effect Mgr | EM 2 | 192.65.13.95 | App | V3.x.x | |
| System 2 | Effect Mgr | EM 3 | 192.65.13.96 | App | V3.x.x | |

SCROLL

SELECT/ SCROLL UPDATE... BEGIN UPDATE... SHOW EM's...

Figure 3-40. Software Update Menu

All the IP Addresses displayed should be unique.

Changing Effect Manager IP Address

To change the Effect Manager's IP address:

Note Only one Effect Manager can be connected to the LAN until all of the Effect Managers have different IP addresses.

1. On a Krystal Control Panel connected and running on the network, press System Setup \ SYSTEM CONFIG \ OK \ NETWORK CONFIG \ OK.
2. Select the device whose IP Address you wish to change.
3. Press IP ADDRESS... and enter the new IP address. Subnet Mask is used for advanced IP addressing and generally should not be changed.
4. To save the new IP Address to NV RAM press EXIT to go back to the System Config menu, then press SAVE/LOAD >, select either Effect Manager or All, and then press SAVE... .
5. To get the system to recognize the new IP address, turn the frame power off and then on.

Configure the New Effect Manager

1. Assign a new suite number to the Krystal Control Panel (See *Selecting a Suite to Configure* on page 3-11 for specific instructions).

2. Follow the configuration procedures described previously (Effect Manager Configuration to name the new Effect Manager, and Suite Configuration to set up the new suite's operating environment), configuring any external devices, and then save the configuration data to NV RAM.
3. Save the new system configuration data (including Network data) to a floppy disk, label it, and store it in a safe place.

Multiple Krystal Systems Configuration

Naming Network Devices

The default names assigned to devices may be adequate on smaller systems. However, on larger systems clearly identifying each device can be helpful. When more than one Krystal system is on the same network, use consistent naming conventions for each system to avoid confusion.

System Controller Internal IP Addresses

Complex system integration issues arise when more than one Krystal system is installed on the same network. Besides the need for unique IP Addresses for every Control Panel and Effect Manager on the network, each System Controller also requires a series of unique Internal IP Addresses. Internal IP addresses are only a matter of concern if your network has more than one System Controller.

Internal IP addresses are assigned in groups, to support several different internal devices. When specifying an internal IP address for a multi-channel system 19 consecutive local addresses on the subnetwork are consumed. For example, specifying internal IP address 192.65.11.1 consumes addresses 192.65.11.1 through 192.65.11.19. Notice the second to last number in the IP address is different from the External IP addresses, but is the same for all devices on that internal subnetwork. The internal IP address of a second multi-channel Krystal on the same subnetwork can begin at 192.65.11.20 and will range through 192.65.11.38.

Changing Internal IP Addresses

CAUTION You should have a good understand IP addressing before you make any changes to this critical part of your system.

The procedure for changing an Internal IP address is the same as that used on an Effect Manager:

1. On a Krystal Control panel connected and running on the network, press System Setup \ SYSTEM CONFIG > \ OK \ NETWORK CONFIG >.
2. A warning appears indicating the system will reboot if network addresses are modified. Select OK to go to the Network Configuration menu (Figure 3-41).

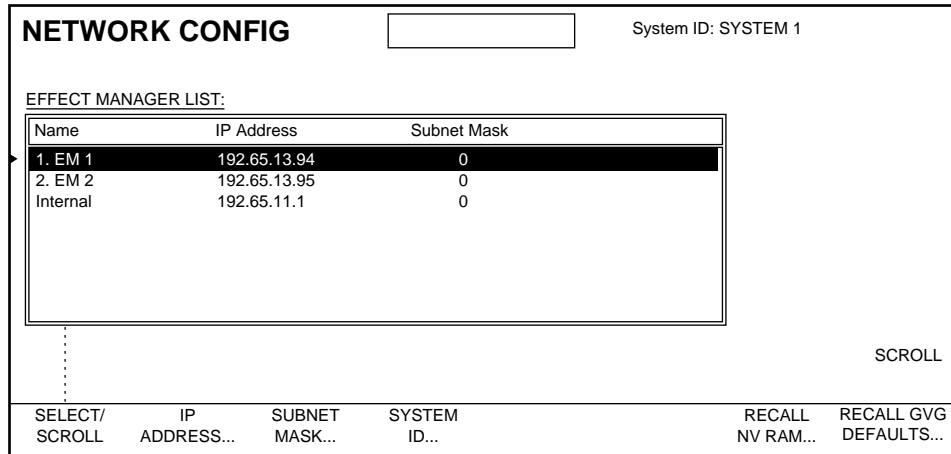


Figure 3-41. Network Configuration Menu

3. Select the Internal device whose IP Addresses you wish to change.
4. Press IP ADDRESS... and enter the new IP address. Subnet Mask is used for advanced IP addressing and generally should not be changed.
5. Pressing SYSTEM ID... allows you to name the System Controller.
6. Upon exiting this menu another dialog box will appear that asks if you want to save the changes NV RAM. Press OK to save the changes, or press CANCEL to leave them unchanged.
7. To get the system to recognize the new IP address, power the Effect Manager off and then on and reset all the Control Panels on the system.

Note When an IP Address has been changed the system will reboot. On a multi-user system this reboot will affect all current Krystal system operations.

Updating Software

A new Krystal system is shipped with software installed. If you experience a problem, you may need to reinstall the software. Also, new Krystal software is periodically released that you can use to update your system. The release notes accompanying the new software includes specific instructions for installing that version of software, and these separately documented procedures should be followed if possible. The following is a general procedure for updating Krystal software, and does not include any release specific information.

Summary

Updating your Krystal software involves the following steps:

- Save Configuration, Effect, and Macro files to disk.
- Update Control Panel software.
- Update remaining Krystal software.
- Clear keyframe memory.
- Reload the Configuration files and save them to NV RAM.
- Power Cycle the Control Panel.
- Reload the Effect files and Macros.
- Calibrate lever arm and joystick.

Note Top menu buttons set to DPOP menus will lose these settings after you update the software. You will need to reset the DPOPs after the new Krystal software is installed.

Save Configuration, Macro, and Effect Files to Disk

You should always save your configuration files to disk before you install any hardware or software. You also must save to disk any Effects or Macros you want to use in the future. System memory is reinitialized when the software is updated, which destroys stored effects.

Note More than one Effect Manager and Control Panel may exist in larger systems. We recommend you save your Krystal System Configuration (All System Data, Network) to floppy disk, save the Effects and User Pref for every Effect Manager, and save the Panel Configuration and Macros for every Control Panel onto separate labeled disks before updating your software.

See *Saving Basic Configuration to Disk* on [page 3-42](#) for the procedure used to save these files to disk.

Update Control Panel Software

1. Optional — connect an ASCII terminal to the J3 Diagnostic port (DB25/DTE) on the Control Panel. Communication settings for the communication port interface is 9.6 KBaud, 8, N, 1.
2. Make sure all Control Panels, Video Processors, and any System Controllers in the system are powered up and operating.
3. Release any currently acquired Effect Manager.
4. Insert the Control Panel Update Floppy, labeled “Krystal Model 4300 Control Panel”, into the Control Panel floppy drive.
5. Power cycle or reset the Control Panel. Resetting the Control Panel is performed by opening the panel cover and pressing the reset button on the left front of the circuit board in the bottom of the panel. The flat panel will go blank and the disk drive access LED will light. The top LED on the LED bar next to the lever arm will light and begin flashing.
6. If a terminal is connected to the panel, it may print out the error message “Floppy Disk Controller: command phase error”. This message may be safely ignored.
7. The panel software update will take 2.5 minutes. As more of the code is loaded into the panel, another one of four LEDs on the light bar will light (two at the top of the bar and two at the bottom of the bar). The blinking LED indicates the software installation process is working properly.
8. If a terminal is connected to the panel, it will list out the hex addresses of the blocks or memory being programmed. The addresses begin with \$80000 and end with an address less than \$280000.
9. When the panel software update is complete, the Control Panel will restart itself and the flat panel will display the Status menu.
10. Remove the floppy disk from the Krystal Control Panel drive.

Update Remaining Krystal Software

1. Bring up the Software Update Menu by pressing the System Setup top menu button, then press **SYSTEM CONFIG \ OK \ SAVE/LOAD \ SOFTWARE UPDATE**. This menu lists all of the Effects Managers on the network. Only Effect Managers that have an Op Mode of “App” or “Boot” can be updated.

| SOFTWARE UPDATE <input type="text"/> | | | | | | |
|--------------------------------------|------------|-----------|--------------|---------|------------|--------|
| Effects Manager List | | | | | | |
| System ID | Proc Type | Proc Name | IP Address | Op Mode | SW Version | Status |
| System 1 | Effect Mgr | EM 1 | 192.65.13.94 | App | V3.x.x | |
| System 2 | Effect Mgr | EM 2 | 192.65.13.95 | App | V3.x.x | |
| System 2 | Effect Mgr | EM 3 | 192.65.13.96 | App | V3.x.x | |

SCROLL

SELECT/SCROLL UPDATE... BEGIN UPDATE... SHOW EM's...

Figure 3-42. Krystal Software Update - Effect Manager List

2. Select the system name with the **SELECT/SCROLL** soft button, press **UPDATE**, then press **OK** at the prompt. This displays a list of all of the Effect Managers, Communications Processors, and Video Processors associated with that system name (Figure 3-43). On a multi-channel system the Resource Manager and Combiner, if present, will also be displayed (Figure 3-44).

| SOFTWARE UPDATE <input type="text"/> | | | | | | |
|--------------------------------------|------------|------------|--------------|---------|------------|--------|
| Processor List--Manual Update | | | | | | |
| System ID | Proc Type | Proc Name | IP Address | Op Mode | SW Version | Status |
| System 1 | Effect Mgr | EM 1 | 192.65.13.94 | App | V3.x.x | |
| | Comm Proc | EM 1 Com 1 | | App | | |
| | Video Proc | Ch A | | App | | |

SCROLL

SELECT/ SCROLL
UPDATE...
BEGIN UPDATE...
SHOW EM's...

Figure 3-43. Typical Krystal Single-Channel Update Screen

| SOFTWARE UPDATE <input type="text"/> | | | | | | |
|--------------------------------------|------------|------------|--------------|---------|------------|--------|
| Processor List--Manual Update | | | | | | |
| System ID | Proc Type | Proc Name | IP Address | Op Mode | SW Version | Status |
| System 2 | Effect Mgr | EM 2 | 192.65.13.95 | App | V3.x.x | |
| | Effect Mgr | EM 3 | 192.65.13.96 | App | V3.x.x | |
| | Comm Proc | EM 1 Com 1 | | App | V3.x.x | |
| | Comm Proc | EM 2 Com 2 | | App | V3.x.x | |
| | Rsrc Mgr | | | App | V3.x.x | |
| | Video Proc | Ch A | | App | V3.x.x | |
| | Video Proc | Ch B | | App | V3.x.x | |
| | Video Proc | Ch C | | App | V3.x.x | |
| | Video Proc | Ch D | | App | V3.x.x | |
| | Combiner | | | App | V3.x.x | |

SCROLL

SELECT/ SCROLL
UPDATE...
BEGIN UPDATE...
SHOW EM's...

Figure 3-44. Typical Krystal Multi-Channel Update Screen

3. Update each item in the list by selecting the item in the order listed below, inserting the appropriate disk for that item, pressing BEGIN UPDATE, and then pressing OK at the prompt. The items should be updated in the following order:
 - a. Combiner (2 x 2 Combiner systems only. Not needed for Large System Controllers with 4 Channel Combiner.)
 - b. Video Processor(s)
 - c. Resource Manager (Multi-channel systems only)
 - d. Effect Manager(s)
 - e. Comm Proc(s)

Note Items should be updated in the order specified. If an incorrect disk is inserted, the system reports "This is not a Software Update Disk. Insert another disk to try again."

As an update progresses, notes appear in the status area for that item giving information on the progress of the update. When finished, the status area reports the updated software version, the device reboots, and then you are prompted the update has completed. Press OK at this prompt.

4. Continue the update until all the items report their new software versions. If for any reason the system cannot update one of the items on the list, a prompt warns you of this. Selecting OK skips that item and continues to the next item in the list. Selecting CANCEL cancels the update. Selecting SHOW EMS returns back to the Effect Managers list.
5. When the update is finished, press the reset button on each of the updated modules in that system.

Note If any installed Proc Type shows "off-line" status, recycle power for the whole system.

6. If you have more than one system on the network to update, repeat the above steps with the remaining systems.

Clear Keyframe Memory

You must clear the keyframe memory on each Effect Manager after updating your software.

1. Release the Effect Manager(s) using the Krystal Control Panel.
2. Power down the frame containing the Effect Manager(s).
3. Turn off the battery switch on each Effect Manager in your system (the switch is located near the Effects Manager reset button).
4. Power off the frame(s) housing the Effect Manager(s) and wait five (5) minutes for the memory to drain.
5. Set the battery switch back on (if desired), and power the frame(s) back up.

Power Cycle the Control Panel

1. Turn off the Control Panel and wait 30 seconds.
2. Turn the Control Panel back on.

Restore Configuration, Macro, and Effect Files

Configuration File Compatibility

If your saved configuration files were created by the currently loaded software version, they should be completely valid. Loading these files restores your system to its earlier configuration. Doing this can save time and help ensure consistent system operation.

If your saved configuration files were created by an earlier software version, the old configuration files can be loaded to restore the earlier configuration. During loading the old configuration files may be converted into a format compatible with the newer software. The resulting configuration file will not contain data for any new software features (default values will be assigned). If any existing features were modified in the newer software, parameters in the old configuration file may be inappropriate for the updated features and may need to be changed. Also, if any changes were made to the system hardware or wiring, configuration parameters may no longer be correct. Always check your configuration parameters after loading any older configuration files.

Older configuration files that have been converted are not backward compatible. Do not attempt to use newer configuration files with older software. For safety, keep separate configuration files on separate labeled floppy disks for your current and previous software versions.

Effect and Macro File Compatibility

If your software version has changed, some older Effects and Macros may need to be edited to work properly with the new software. Refer to the Krystal Release Notes accompanying the software for release specific compatibility information.

File Restore Procedure

1. Acquire an Effect Manager. On multi-suite systems you must be sure the Krystal Control Panel is assigned the correct suite number for your suite and Effect Manager.
2. Insert the appropriate system configuration disk into the Krystal Control Panel floppy disk drive. Press the File Oper. top menu button, and then press SAVE/LOAD.
3. Select SYS CFG with the FILE TYPE soft button, select ALL SYSTEM DATA in the left scroll window and the System Configuration file in the right scroll window with the SELECT/SCROLL soft buttons. Press LOAD, and then press OK at the prompt to load the System Configuration data into the Effect Manager's working memory.

CAUTION Do not load NETWORK or ALL data unless you need to reload your system IP Addresses and are sure you have the correct file for your system. All devices on the system reboot when network data is loaded, and serious operational problems will result if the wrong network data is restored.

4. You must now save the System Configuration data to NV RAM. Press System Setup \ SYSTEM CONFIG \ OK \ SAVE/LOAD, select ALL (or any individual configuration data) with the Select/Scroll soft button, then press SAVE.... A warning message appears stating the existing NV RAM will be replaced. Press OK to save the current working configuration data to NV RAM.
5. Reset the system (on Single Channel systems reset the Effect Manager, on Multi-Channel systems reset the Resource Manager).
6. Return to the Save/Load menu (File Oper. \ SAVE/LOAD >) and restore the User Pref file. Select USER PREF with the FILE TYPE soft button, and select the file name with the SELECT/SCROLL soft button, and then press LOAD. to restore the User Pref information to the Effect Manager.

Note You do not need to restore the Panel Cfg file, and doing so incorrectly could cause problems. The IP Address and assigned Suite Number of the Control Panel when the Panel Cfg file was saved exist in this file. If you restore this file type, be sure to use the correct panel configuration file.

7. If your effects are on a separate disk, you need to insert that floppy disk into the drive, then press EXIT and SAVE/LOAD so the panel can read the directory on the disk. Select EFFECTS with the FILE TYPE soft button, and if the effects were saved as a single file select ALL REGISTERS and select the combined effects file with the SELECT/SCROLL soft buttons. If the effects were saved individually, select each effect in turn. Then press LOAD and press OK at the prompt to restore the effects to the Effect Manager. Remove the floppy disk from the drive.
8. If you have Macros saved to disk, load them back to the Control Panel by selecting MACROS and pressing LOAD and OK.
9. Repeat the Effects and Macros restore steps above (as appropriate) with all the Krystal Effect Managers and Control Panel in your system, being sure to assign the correct suite, acquire the correct Effect Manager, and use the correct floppy disks for each suite.

Calibrate Control Panel

Perform Krystal Control Panel lever arm and joystick calibration whenever a software update has been installed. Failure to do this can result in frequent “limit exceeded” error messages.

1. Press System Setup \ PANEL CONFIG > \ CALIBRATE > to go to the Calibration Menu.

2. Follow the screen directions to calibrate the Lever Arm and Joystick, and then save your calibration settings.

This completes the software update procedure. You can now acquire an Effect Manager and Channel(s) and operate your Krystal system with its new software.

Menu Trees

The figures on the following pages contain menu trees for the Krystal Control Panel screens involved in system configuration.

Some of the parameters in these menus will probably not need to be changed, and can remain at their factory values (GVG Defaults). Which parameters need to be changed will depend on your individual facility requirements.

0600-27

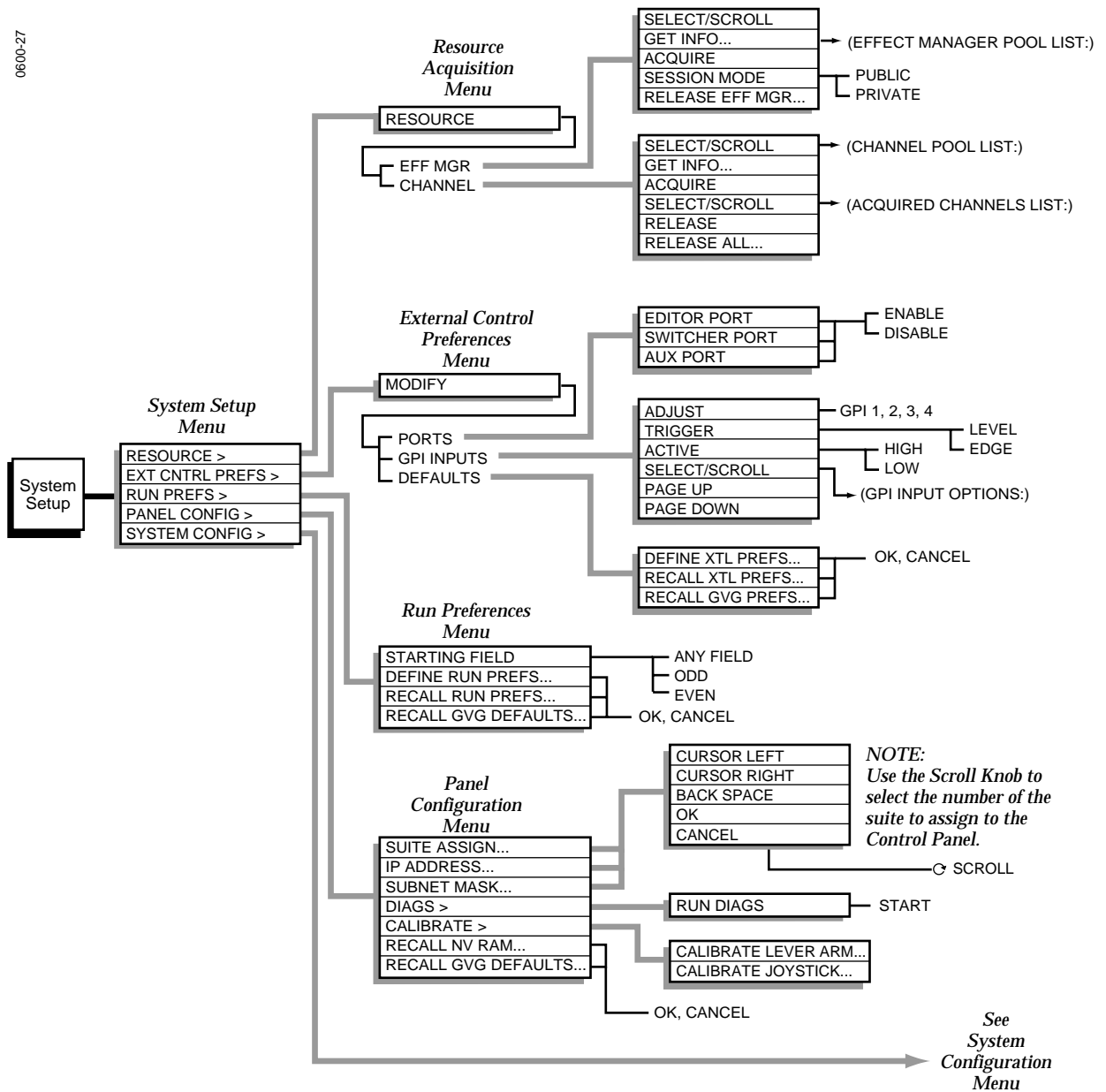


Figure 3-45. System Setup Menu Tree

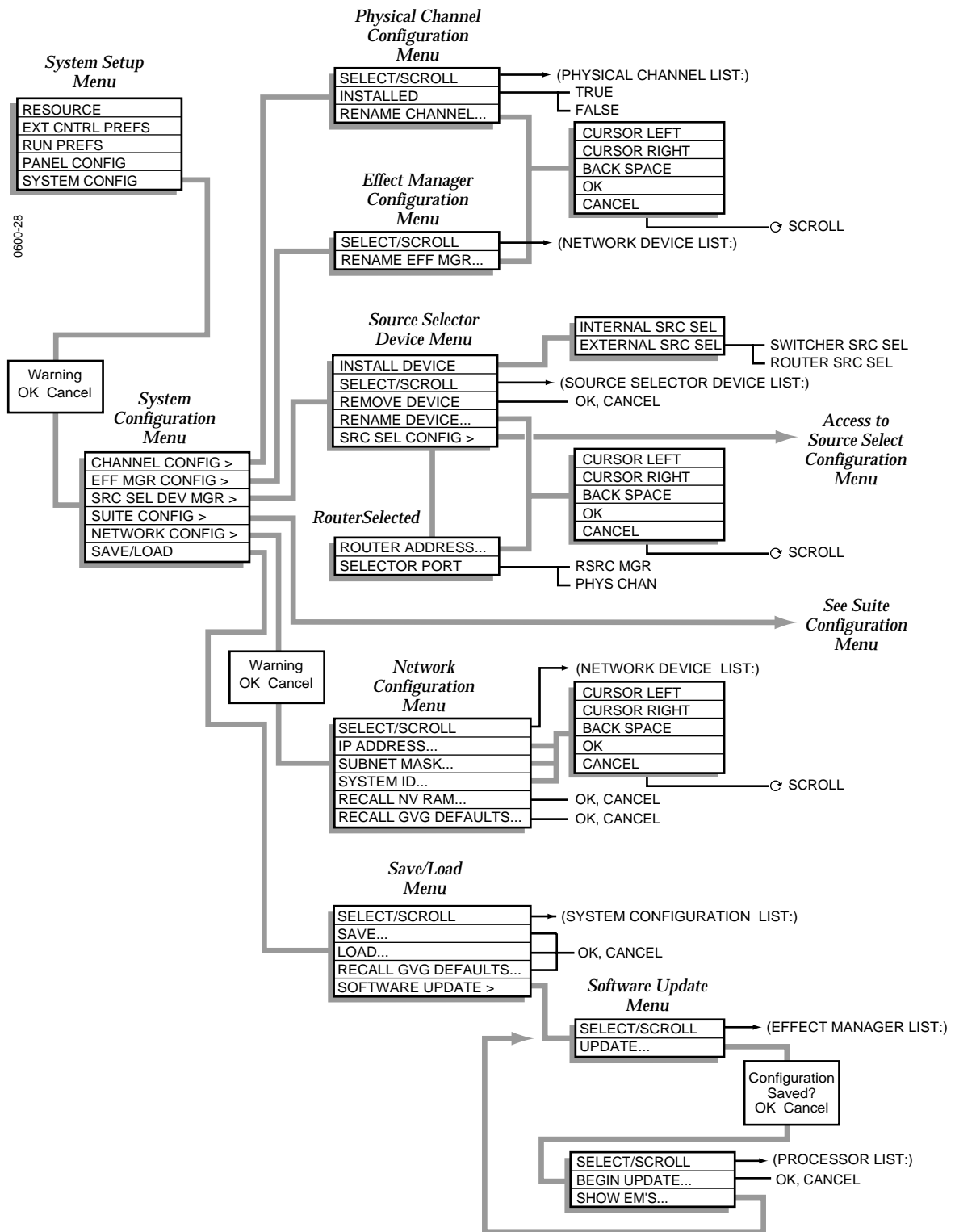


Figure 3-46. System Configuration Menu Tree

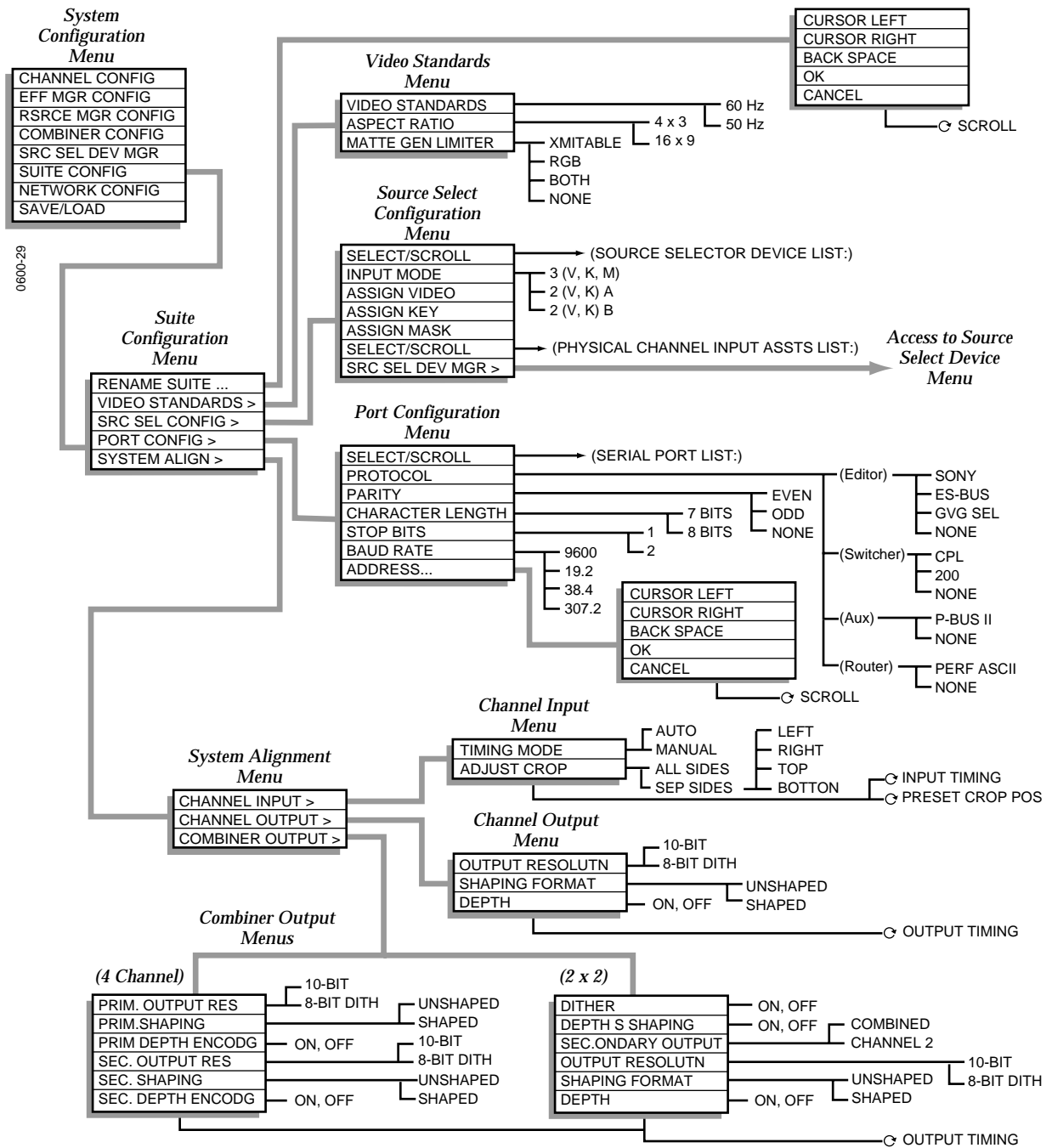


Figure 3-47. Suite Configuration Menu Tree

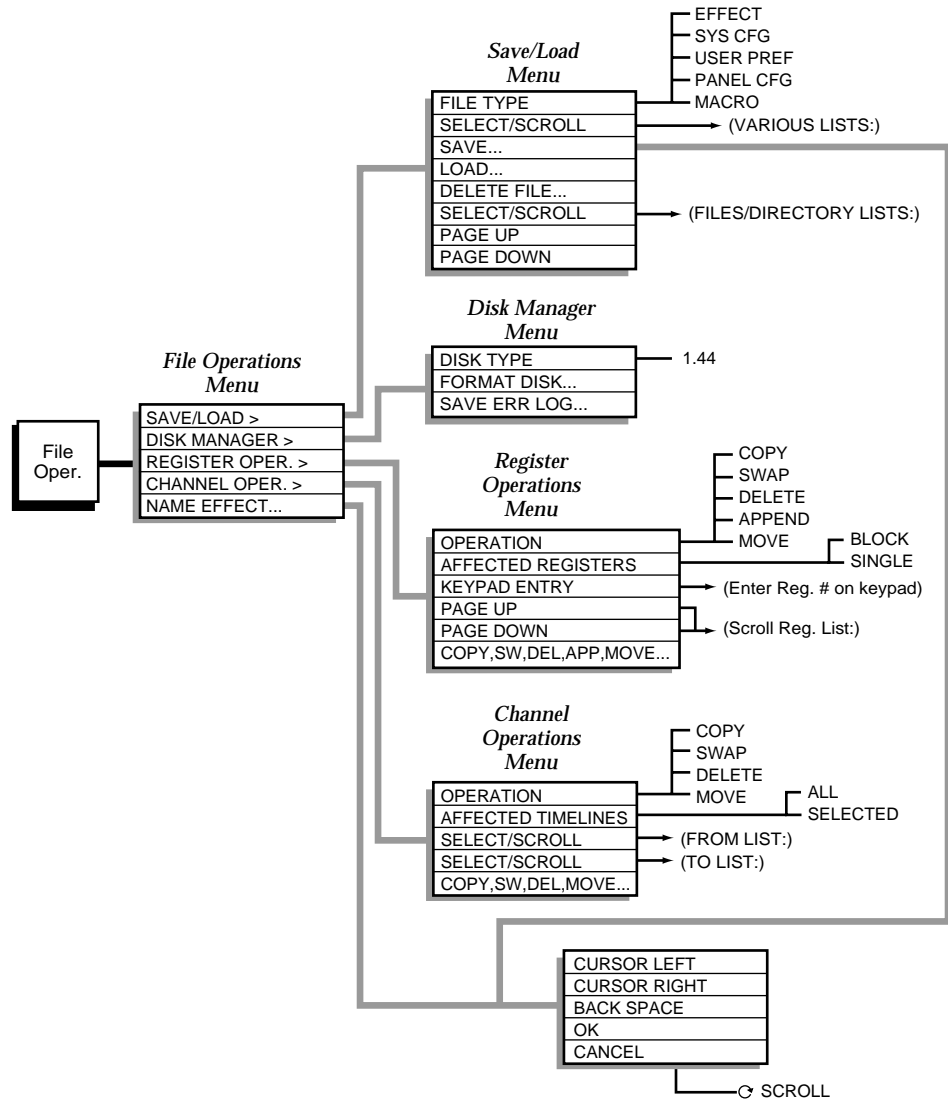


Figure 3-48. File Operations Menu Tree

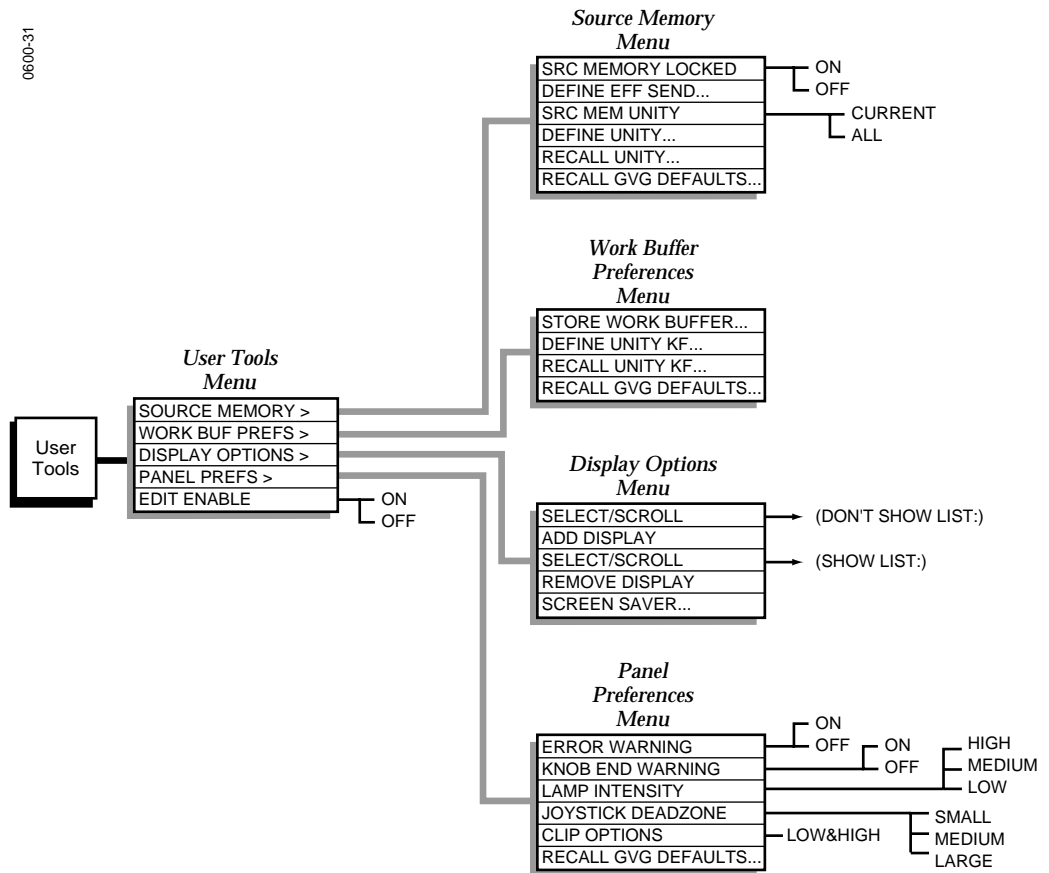


Figure 3-49. User Tools Menu Tree

External Interfaces

Krystal is designed for tight system integration with Grass Valley Production Switchers and Performer Routers. Interfaces with other devices (video editors) are also supported.

Grass Valley Model 4000 Switcher

Refer to the Model 4000 documentation set for more information.

Krystal Interface Functions Supported

- CPL effect run control.
- Krystal input source selection (keyframable).
- Effects Send

Model 4000 Requirements

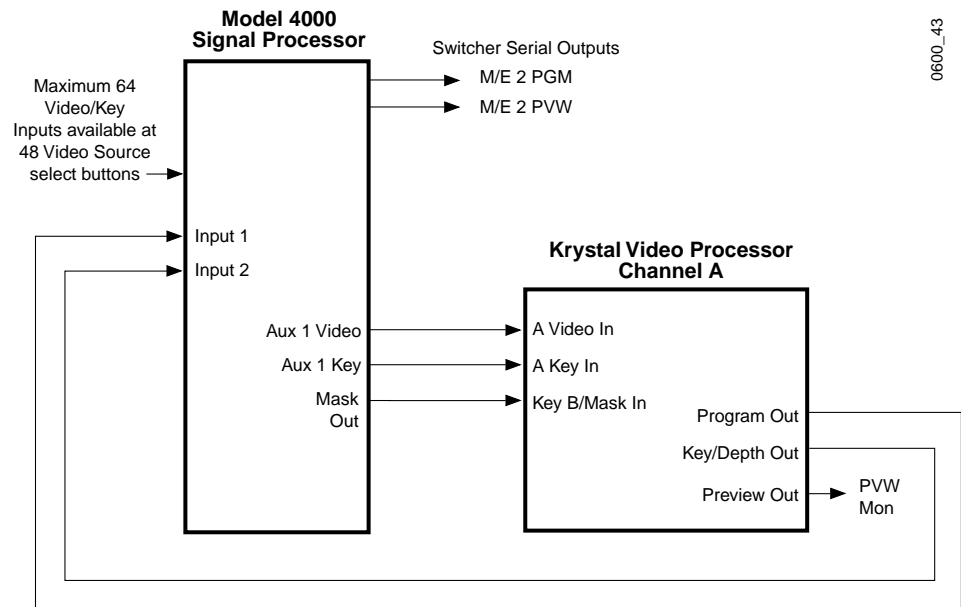
- For CPL run and Krystal source selection, the Model 4000 must have a Serial Communications Mezzanine Board installed on its Expanded Communications Carrier Module.
- For Effects Send, the Model 4000 must have the Effects Send Matrix option.
- Serial digital delay device (if background video is used with Krystal Combiners).

Control Interface Cabling

- An RS422 cable connects the Switcher's Expanded COM module Port A1 (or whatever port assigned) to the Krystal's Effect Manager I/O module Switcher J4 port. On multiple-user systems with multiple Switchers, each Switcher is generally dedicated to a separate Effect Manager. Otherwise, arrangements must be made for signal control routing external to the Krystal and Switcher control systems.

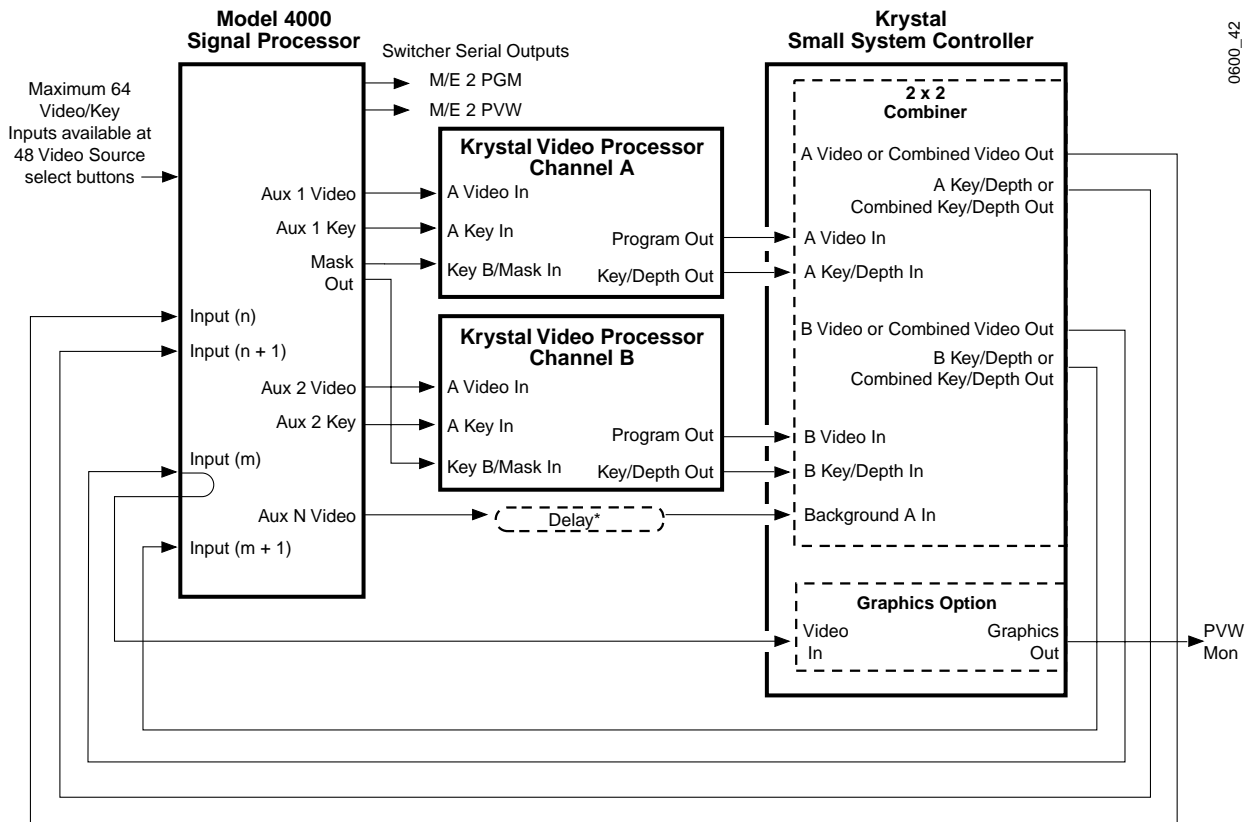
Video Interface Cabling

Video can be routed in a variety of ways, to provide various types of integrated system functionality. Illustrations of some typical video configurations are provided here. These diagrams can be used as a guide to help you design your facility to meet your individual requirements.



0600_43

Figure 3-50. Model 4000 - Krystal Single Channel Video Cabling



0600_42

Figure 3-51. Model 4000 - Krystal 2 x 2 Combiner Video Cabling

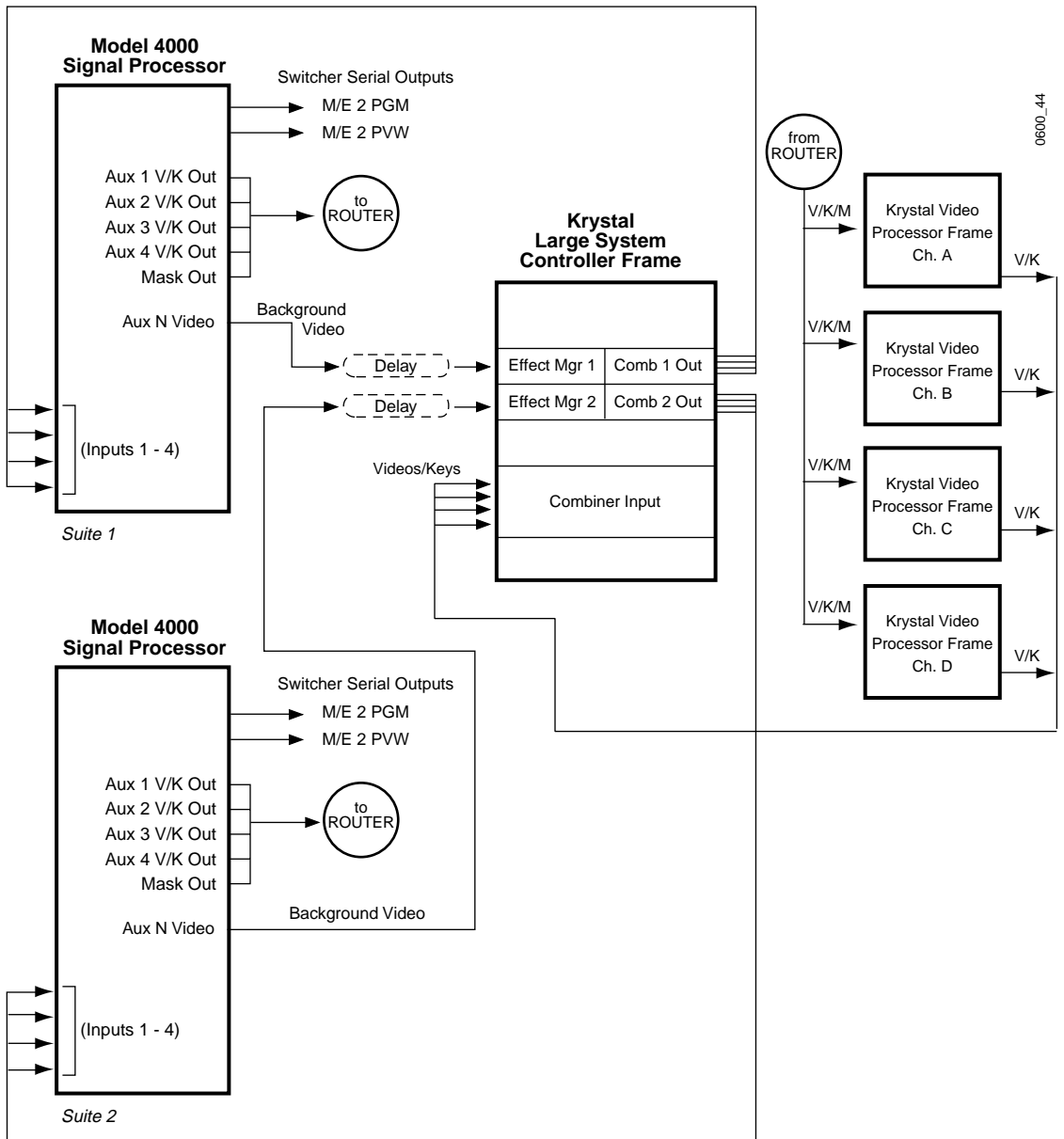


Figure 3-52. Model 4000 - Two User, Four Channel Combiner Video Cabling

Model 4000 Required Settings:

The Model 4000 Inputs, Outputs, and External Interfaces must be properly configured for successful integrated DPM operation. Some of the specific settings involved include:

Table 3-2. Model 4000 Settings

| | |
|---------------|----------|
| DPM Type | Krystal |
| Video Delay | 2 Fields |
| Port Assign | Port A1 |
| Control Delay | 6 Fields |

Other settings must also be set that will be unique for your facility.

Krystal Required Settings:*Table 3-3. Krystal Settings for Model 4000*

| Menu | Setting |
|------------------------|------------------------------------|
| External Control Prefs | Switcher Port: Enable |
| Src Select Device | External Switcher Device Installed |
| Src Select Config | V, K, M inputs assigned |
| Port Config | Switcher CPL protocol |

Other Settings

- Coordinate video shaping on the Switcher, Krystal Channel, and Combiner as required.
- Set timing of channel and combiner inputs and outputs as required.

Grass Valley Model 3000 Switcher

Refer to the Model 3000 documentation set for more information.

The Model 3000 Switcher to Krystal system interface is similar to the Model 4000 described above. The most significant difference is the Model 3000 does not have serial component digital outputs, so signal conversion will be required.

Model 3000 Requirements

- Converters must be inserted in all the video paths between the Model 3000 and Krystal systems.
- To use the Switcher Aux outputs, the Model 3000 must have the optional composite serial digital output modules installed in the aux output slots.
- To use the mask output, a Serial Digital Output Module must be installed in the Model 3000 slot C16 or C17.

Grass Valley Models 2200-2, 2200-2i Switcher

Refer to the Model 2200-2 and 2200-2i documentation sets for more information.

This Grass Valley Switcher line includes the Model 2200-2 and the Model 2200-2i Switchers. The Model 2200-2 can be upgraded to the Model 2200-2i.

MODEL 2200-2— The Model 2200-2 to Krystal interface is similar to the Model 4000 described earlier, with the following differences:

- The 2200-2 must have a Serial Communications Mezzanine Board installed on its Expanded Communications Carrier Module. The Expanded Communications Carrier Module is located in slot C1 in the Model 2200 Signal Processor Frame.

MODEL 2200-2I — The Model 2200-2i supports integrated Krystal operation. This model's interface to the Krystal system is significantly different from the Model 2200-2, and is described in detail below.

Krystal Interface Functions Supported

- CPL effect run control.
- Krystal input source selection (key frameable).
- Effects Send
- Integrated Control Panel Operation (Model 2200-2i only)
- Shared EMEM (Model 2200-2i only)

Model 2200-2i Requirements

- The 2200-2i must have a Serial Communications Mezzanine Board installed on its Expanded Communications Carrier Module.

Control Interface Cabling

- An RS422 cable connects the Switcher's Expanded COM module Port A1 (or whatever port assigned) to the Krystal's Effect Manager I/O module Switcher J4 port.

On the Model 2200-2i, the Switcher Control Panel is used to control the Krystal system. Therefore a control connection must exist between the Switcher Control Panel and the Krystal system.

- An Ethernet 50 ohm coaxial cable, terminated at both ends, connects the J6 ETHERNET port on the Switcher control panel to either:
 - On a single-channel system it connects to the J1 CP COMM port on the Video Processor I/O module in the Krystal Video Processor frame.
 - On a multi-channel system it connects to the J12 CP COMM port on the Resource Manager I/O module in the Krystal System Controller frame.

CAUTION Do not connect any additional control panels (either Model 2200-2i or Krystal DPM) to the Ethernet network without first changing the IP address of the additional panel.

Video Interface Cabling

Video cabling is similar to the Model 4000 cabling described earlier.

Model 2200-2i Required Settings:

When operated in an integrated manner, different configuration settings are required on the Model 2200-2i system.

- DPM Type must be set to INTERNAL (not Krystal) for integrated operation.

Note: The Model 2200-2i may need to be reset before the parameters set above will take effect.

Krystal Settings:

Table 3-4. Krystal Settings for Model 2200-2i

| Menu | Setting |
|------------------------|--|
| External Control Prefs | Switcher Port: Enable |
| Src Select Device | External Switcher Device Installed |
| Src Select Config | V, K, M inputs assigned Number of sources = 2 or 3 (Mask) |
| Port Config | Switcher CPL protocol Mode = HDCL (Address typically 0) |

Grass Valley Model 1200 Switcher

Refer to the Model 1200 documentation set for more information.

Krystal Interface Functions Supported

- Krystal input source selection (keyframable).
- Effects Send

Control Interface Cabling

- An RS422 cable (null modem) connects the Switcher frame's DPM port (J31) to the Krystal's Effect Manager I/O module Switcher J4 port.

Video Interface Cabling

Video can be routed in a variety of ways, to provide various types of integrated system functionality. A typical video configurations is illustrated which you can use as a guide to help you design your facility to meet your individual requirements.

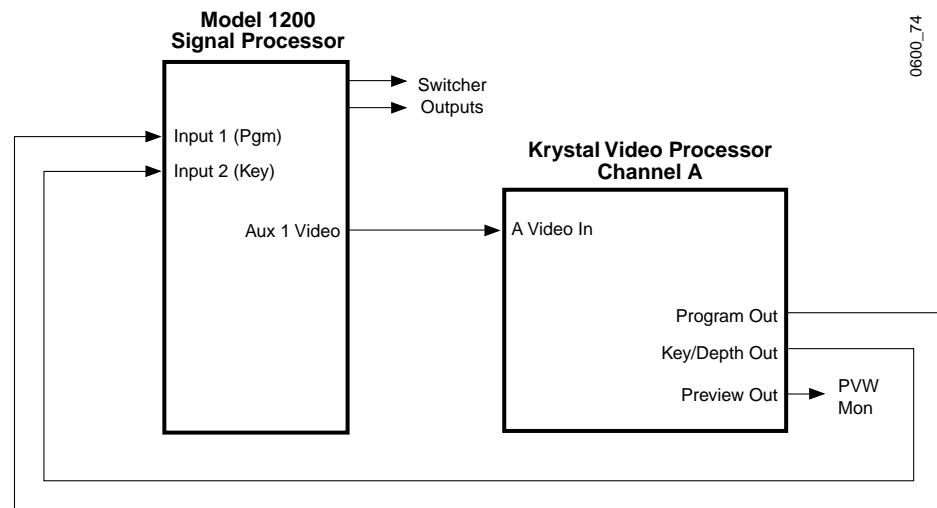


Figure 3-53. Model 1200 - Krystal Single Channel Video Cabling

Important Model 1200 video cabling considerations include:

- On a 1200 system configured with a single Krystal channel, the Krystal system cannot control the 1200 Aux 2 bus for Key selection.
- On a 1200 system configured with a multi-channel Krystal, 1200 Aux bus control maps to physical channels: (Channel 1–Aux 1; Channel 2–Aux 2).

Model 1200 Required Settings:

The Model 1200 must be properly configured for successful integrated DPM operation. Some of the specific settings involved include:

Table 3-5. Model 1200 Settings

| | |
|--------------|---------------------------|
| DPM Button | Enabled |
| Config\Ports | DPM, 30, 38400, 8, ODD, 1 |

Other settings must also be set that will be unique for your facility.

Krystal Required Settings:

Table 3-6. Krystal Settings for Model 4000

| Menu | Setting |
|------------------------|------------------------------------|
| External Control Prefs | Switcher Port: Enable |
| Src Select Device | External Switcher Device Installed |
| Src Select Config | V, K, M inputs assigned |
| Port Config/Switcher | Switcher, 200, ODD, 8, 1, 38.4 |

Other Settings

- Coordinate video shaping on the Switcher, Krystal Channel, and Combiner as required.
- Set timing of channel and combiner inputs and outputs as required.

Grass Valley Performer-SD Router

Refer to the Performer Digital Installation/Operation manual for more information.

Krystal Interface Functions Supported

All Grass Valley Performer-SD compact routers can be controlled by a Krystal Video Processor for acquisition routing. Newer Performer-SD units (U02320 = 151123-04 or later) are frame accurate and so can be used for effect input routing. Some older Performer-SD units may not switch quickly enough to be frame accurate, and so are not recommended for effect input routing. These older units can be upgraded (FM2496).

Performer SD Requirements

- One Performer for each source (video, key, mask) being routed for each Krystal Video Processor. For example, a two channel Krystal system using video, key, and mask inputs will use six Performer routers.
- Performers not at the end in the chain must have their internal terminating resistors removed. The terminating resistor must be present in the last Performer in the chain.
- Daisy chain RS-422 cabling for multiple Performers (see below).

Video Cabling

Connect one of the video outputs of the Performer to the appropriate video input (video, key, mask) on the Krystal Video Processor.

Control Cabling

Connect RS422 cable from Krystal Video Processor I/O module Router port (J3, 9-pin D) to Performer Remote (25-pin D). Daisy chain to the next Performer via the Option port if equipped with the Looping Cable option, or use the Tally Card with a RS422 cable fabricated with a looping mechanism (Figure 3-54).

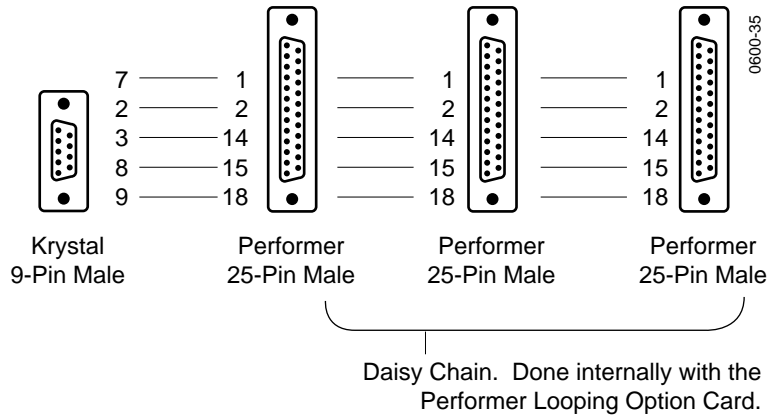


Figure 3-54. Router Cable Pinouts and Daisy Chain

Krystal Configuration

The settings below are for a typical configuration. You may need to modify some of these settings for your individual facility requirements.

Save your changes to Krystal NVRAM when done.

Table 3-7. Krystal Serial Port Config Menu Settings

| | |
|------------------|------------|
| Serial Port List | Router |
| Protocol | Perf ASCII |
| Parity | None |
| Char. Length | 8 |
| Stop Bits | 1 |
| Baud Rate | 38.4 |

Table 3-8. Src Sel Device Menu Settings

| | |
|-------------------|---|
| Device Type | Router (one installed for each routed input) |
| Router Address | Video = 0 Key = 1 Mask = 2 |
| Number of Sources | 10 |

Table 3-9. Src Select Config Menu Settings

| | |
|--------------|----------------|
| Input Mode | 3 (V,K,M) |
| Assign Video | Addr. 0 Device |
| Assign Key | Addr. 1 Device |
| Assign Mask | Addr. 2 Device |

Performer Configuration

All Performer routers should be set as follows, matching the above Krystal Serial Port configuration settings.

Table 3-10. Switch Bank 2 and Bank 3 Settings

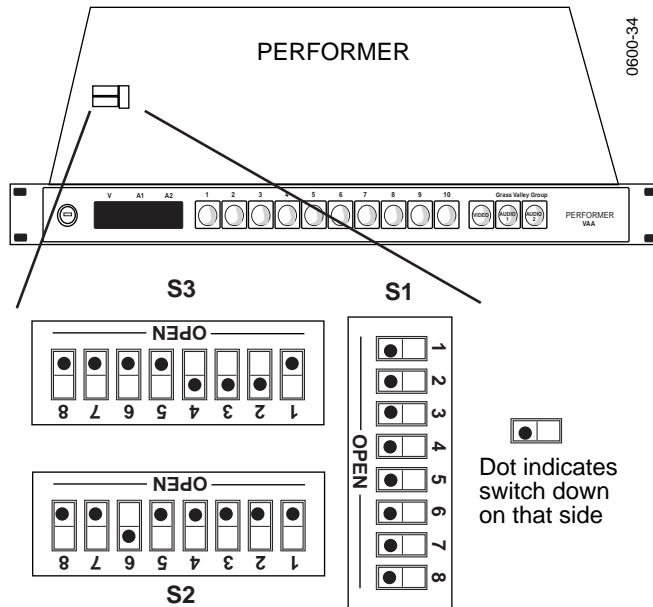
| Position | DIP Bank 2 | DIP Bank 3 |
|----------|------------|------------|
| 1 | Open | Open |
| 2 | Open | Closed |
| 3 | Open | Closed |
| 4 | Open | Closed |
| 5 | Open | Open |
| 6 | Closed | Open |
| 7 | Open | Open |
| 8 | Open | Open |

Bank 1 sets the Router address. Each router requires a different setting to match the address set in the Krystal configuration.

Table 3-11. Switch Bank 1 Settings

| Position | Bank 1 Video (0) | Bank 1 Key (1) | Bank 1 Mask (2) |
|----------|------------------|----------------|-----------------|
| 1 | Open | Open | Open |
| 2 | Open | Open | Open |
| 3 | Open | Open | Open |
| 4 | Open | Open | Open |
| 5 | Open | Open | Open |
| 6 | Open | Open | Open |
| 7 | Open | Open | Closed |
| 8 | Open | Closed | Open |

Figure 3-55 gives an example of Performer DIP settings.



Typical DIP settings for Video, with Address 0

Figure 3-55. Typical Performer-SD DIP Settings

Confirm Performer Settings

After setting the dip switches in a Performer, turn on or recycle its power and observe the initialization messages that appear in the Performer LED's. If set as above, the following messages should appear:

```

reset
ASCII
38.4
Par n8
AddrH xx (Video = 00, Key = 01, Mask = 02)
Slaved
ntsc
SC on
    
```

These settings must match the Krystal Configuration settings for successful operation.

Super Edit Video Editor

Refer to the Super Edit documentation set for more information.

Krystal Interface Functions Supported

The Super Edit can be used to control the Krystal system via serial communications.

Control Interface Cabling

Connect an RS422 cable from the J3 Editor port on the Krystal Video Processor I/O module to any unused Super Edit port.

- On the Super Edit frame: Port 1 through Port 7
- On Super Edit Port Expander: Port 12 through 18

Super Edit Settings

- Install Device
- Assign Port

Krystal Settings

Table 3-12. Krystal Settings for Super Edit

| | |
|-------------|------------|
| Serial Port | Editor |
| Protocol | GVG Select |
| Mode | RS422 |

Functional Description

Introduction

This section contains functional descriptions of Krystal major components. Descriptions are in the following order:

- System Level Description
- Major System Building Blocks
- Modules and Mezzanines

System Level Description

Krystal hardware can be divided into three major functional areas:

- System Control
- Video Processing
- Power Distribution

System Control

The Krystal control system consists of:

- One or More Control Panels
- Video Processor modules
- Effect Manager modules
- Resource Manager

Control Panels

One or more Control Panels may be connected over a Local Area Network (LAN). No other equipment can be connected to the Krystal LAN. Each Control Panel has a unique LAN address, which allows the Krystal's control processing to identify which Control Panel is controlling which system hardware.

Single Channel System Control

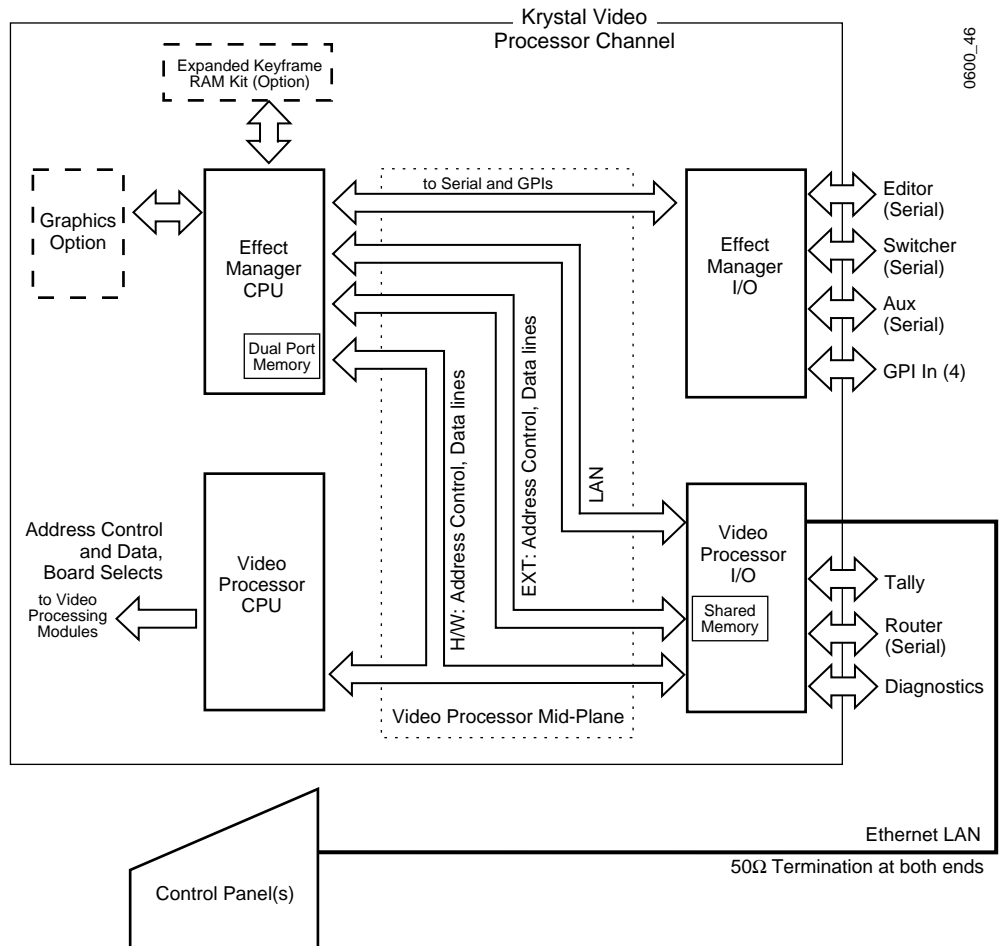


Figure 4-1. Single Channel Control Block Diagram

The Effect Manager CPU module generates hardware control based on Control Panel selections and settings and passes it to the Video Processor CPU module. The Video Processor CPU module uses this data to determine the control parameters that it passes to the video processing modules that actually create an effect.

In a single channel system both the Effect Manager and Video Processor reside in the Video Processor frame (Figure 4-1). Internal system control communications occurs over the midplane in the Video Processor frame, and via an external Ethernet cable connected to the Control Panel.

Multi Channel System Control

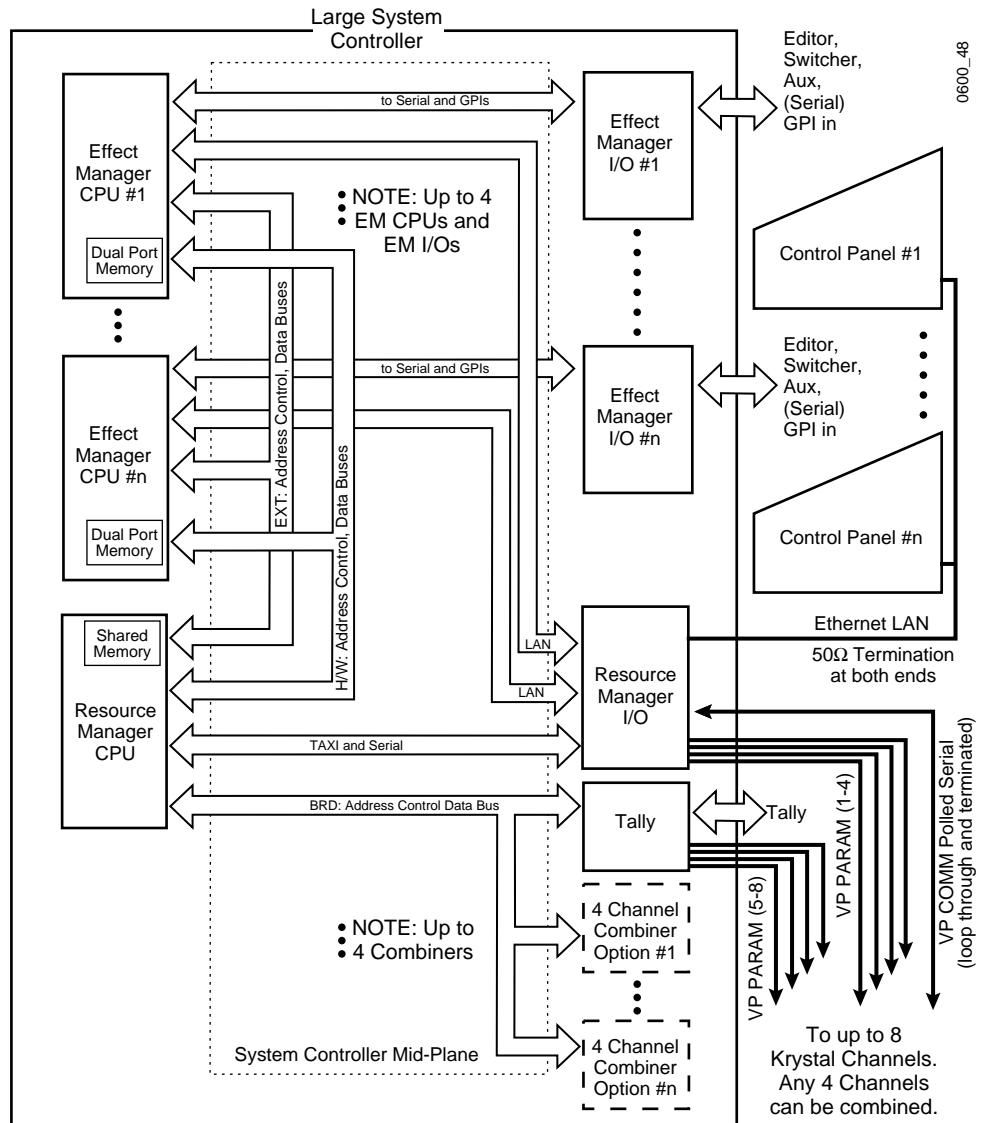


Figure 4-2. Large System Controller Example Control Block Diagram

In multi channel systems the Effect Manager is located in the System Controller frame. Internal system control communications occurs over the midplane in the System Controller frame, over pairs of cables connected to each Video Processor frame, and via an external Ethernet cable connected to the Control Panels. Figure 4-2 shows the communications paths of a Krystal system equipped with a Large System Controller.

Figure 4-3 shows the communications paths of a Krystal system equipped with a Small System Controller.

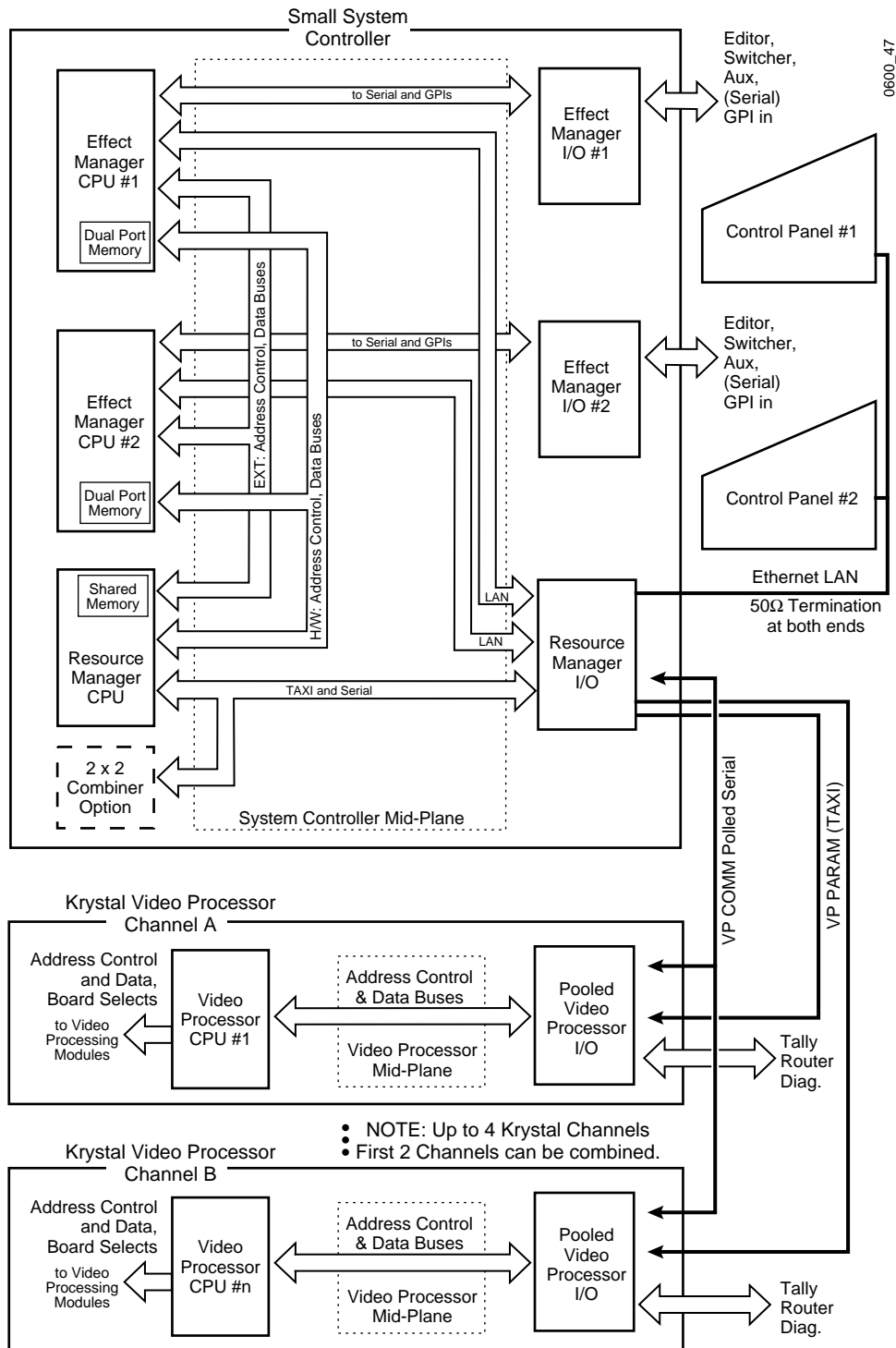


Figure 4-3. Small System Controller Example Control Block Diagram

Video Processing

The Video Processing Frame houses the modules and mezzanines that process the actual video, key, and mask signals to create an effect. [Figure 4-4](#) and [Figure 4-5](#) show the video processing path of a Krystal channel. The functions of each module and mezzanine are summarized here, and described in detail later in this section.

Reference Generator

The Reference Generator module accepts an external video reference (black) signal from the studio. This reference signal must meet the field and line frequency parameters for the PAL or NTSC standards. It is used to generate clock and sync signals which are distributed to modules within the frame.

Serial Input Modules

The Serial Video Input module accepts serial video, key, and mask signals, and converts them to parallel digital form for internal processing.

Source Effects Module

The Source Effects 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.

Input Recursive Module

The Input Recursive module processes incoming video for freeze, mosaic, and motion decay effects that appear within the incoming video raster.

Filter and Filter Control Modules

The Filter module provides anti-aliasing filtering using separable horizontal and vertical filters, a corner-turning memory, and a motion detect function. Motion detection determines whether only the current field or both the current and previous fields should be mapped to the output video by the Interpolator modules. This prevents motion-induced blurring in the output video.

The Filter Control module takes transform data and uses it to create filter module control factors for each pixel, in scan line order.

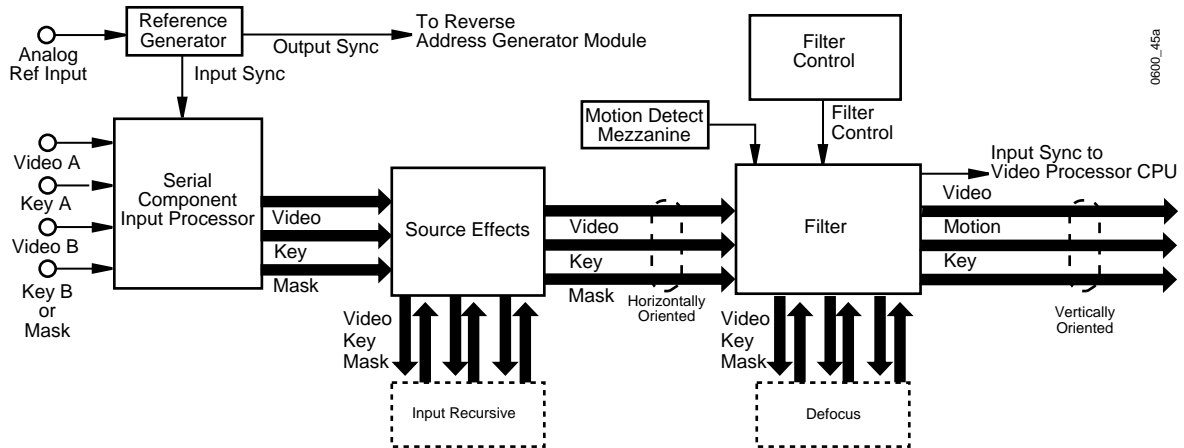


Figure 4-4. Video Processing Function Block Diagram (part 1)

Defocus Module

The Defocus module alters the sharpness of video and key signals, used for defocus and glow effects.

Interpolation and Post Transform Processing

The modules in this section determine the pixel value for each output pixel in the transformed video.

- The Reverse Address Generator (RAG) module uses each pixel's intended location in output space to determine the pixel values to read from input video. These address values are used by the Interpolators and Post Transform module to access the pixel values from input video and perform other processing on them.
- The Kurl (2D Warp) mezzanine, if installed, generates the addresses for non-linear effects including page turns, page rolls, ripples, slits, spheres, rings, position modification, and size modification.

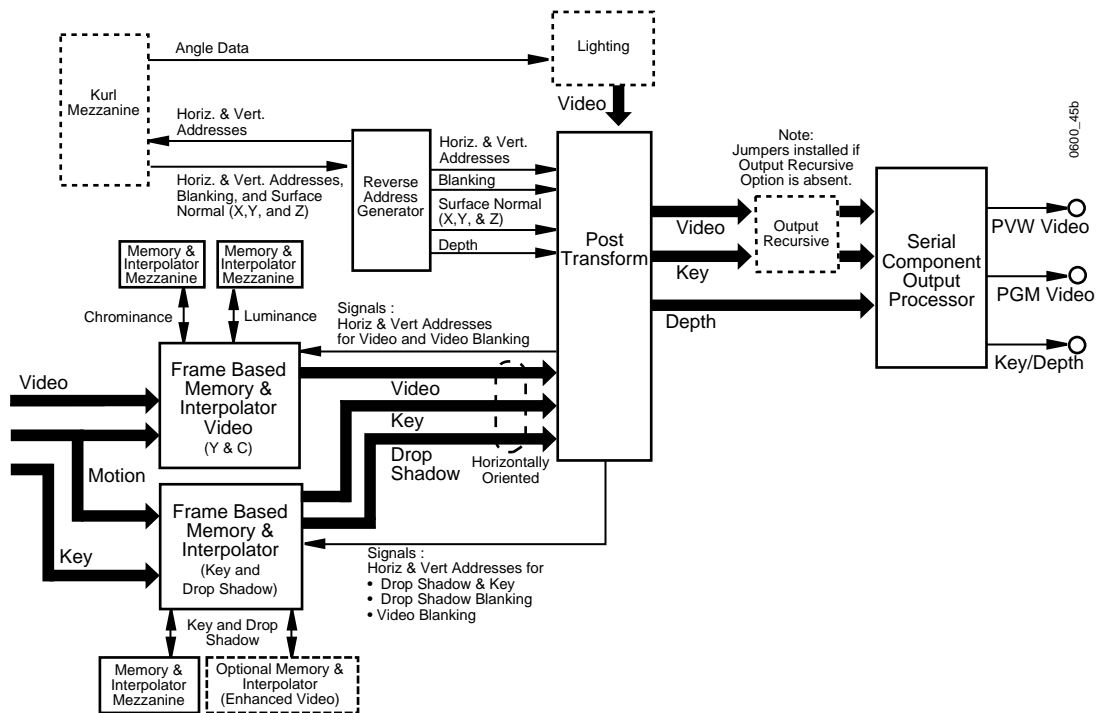


Figure 4-5. Video Processing Function Block Diagram (part 2)

- There are two Interpolator modules. One processes both luminance and chrominance data. The second processes key and drop shadow data. The Interpolators use the addresses generated by the Reverse Address Generator (RAG) module to retrieve pixel information from memory and generate the output video. As a result of the effects applied to the input signal, the pixel location on the output may not have a direct correspondence to a single pixel on the input. When this situation exists, the Interpolator modules use a bi-cubic pixel averaging technique to determine the proper output values.
- The Post Transform module takes the addresses generated by the RAG module and uses them to locate the key hole and generate drop shadow offset values. This module also generates perspective dims, perspective fades, and drop shadows.

Lighting

The Light Source module takes the depth signal and the surface normal signal from the Reverse Address Generator and the current transform from the Video Processor module and creates two keys for generating lights and shadows. All outputs go to the light mixers on the Post Transform module.

Output Recursive

The Output Recursive module processes output (post transform) video for freeze, motion decay, montage, and trail effects that can appear outside and inside the raster of the incoming video.

Serial Outputs

This module accepts video, key, and depth information in internal parallel format and outputs component serial digital video program, preview, depth, and key signals to BNC type connectors on the rear of the Video Processor Frame.

Four Channel Combiner

The Large System Controller frame supports four channel combining. The combining hardware consists of an input and output module.

The Four Channel Combiner Input module receives up to four video and four key/depth serial digital inputs. Up to two Four Channel Combiner Input modules can be installed to support up to eight Krystal channels. The input signals are deserialized and autotimed, and then routed over the midplane to each Four Channel Combiner Output module.

Every Four Channel Combiner Output module is dedicated (in ascending order) to an Effect Manager in that Large System Controller frame. The Four Channel Combiner Output module has a mezzanine which does the actual signal combining. This mezzanine has mixing and keying circuitry to combine the inputs and one background video only input in a variety of ways. The combined signals are serialized and scrambled and routed to the output BNC connectors. Two separate video and key output pairs can be generated, which through software control can each consist of various combinations and layering of the inputs. The primary video output is also routed a separate preview BNC.

2 x 2 Combiner

Krystal channel outputs can be combined in various ways using hardware located in the System Controller frame. The Small System Controller frame supports two channel combining.

The 2 x 2 Combiner Inputs module has inputs for two videos, two keys, and a background (the B background input is inactive). Each inputs deserializes and descrambles the serial video, then sends parallel data to the 2 x 2 Combiner module through the midplane.

The 2 x 2 Combiner CPU module has mixing and keying circuitry to combine two foreground video and key and one background video only input in a variety of ways. Combined or uncombined signals are sent to the Combiner Outputs module through the midplane.

The 2 x 2 Combiner Outputs module receives video and key signals from the Combiner module, serializes and scrambles the signals, and then routes it to two video and two key output BNC connectors.

Power Distribution

The Krystal Control Panel, Video Processor frame, and System Controller frame each have their own, independent power supplies and power distribution nets.

WARNING Do not attempt to repair any Krystal power supply. If the power supply malfunctions, contact Tektronix/Grass Valley Products for replacement instructions.

Control Panel Power Distribution

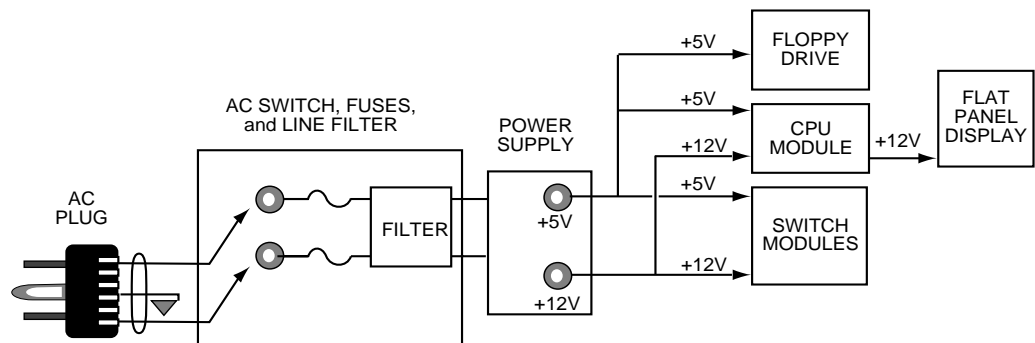


Figure 4-6. Control Panel Power Distribution

The Control Panel power supply, assembly PE1264, is housed inside a partial enclosure mounted at the back of the Control Panel tray. The power supply generates +5 and +12 volts which are used on the Control Panel circuit boards. The +5 volts is used by the logic circuits and the +12 is used by the LEDs and the flat panel display.

Video Processor Frame Power Distribution

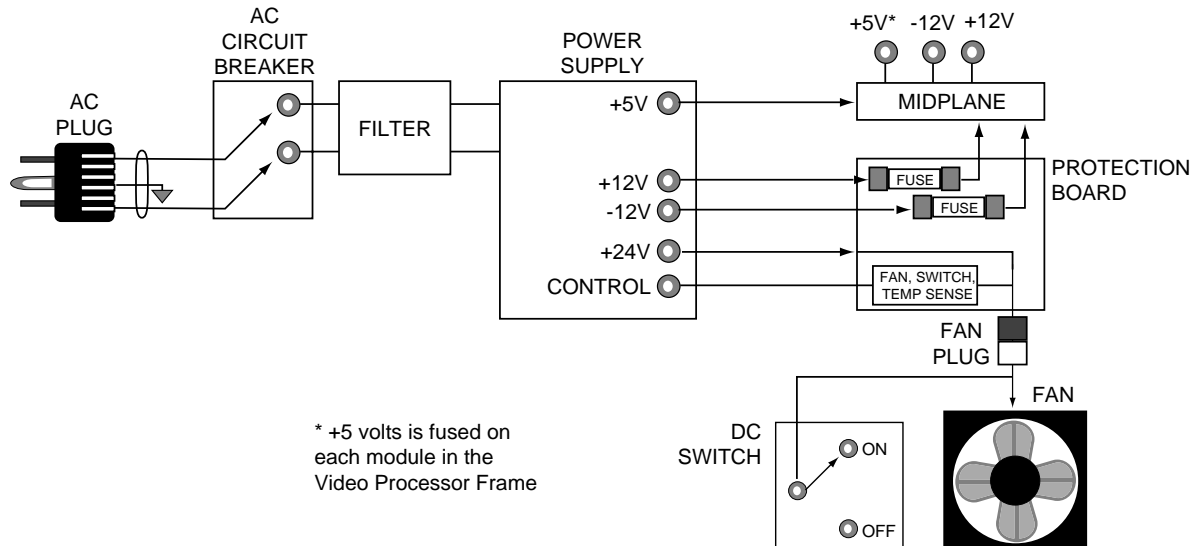


Figure 4-7. Video Processor Frame Power Distribution

The Video Processor frame power supply is located behind a hinged door at the top rear of the Video Processor frame. The Power Protection Board is located next to the power supply. The filter following the circuit breaker prevents noise from being passed back into the AC supply lines.

The Video Processor frame power supply provides four DC voltages:

- +5V power for logic circuitry is distributed through the Video Processor Frame midplane board. +5V power is fused on each module.
- +12V and -12V for video circuitry is distributed through a Protection Board, then through the frame midplane board. $\pm 12V$ power lines are both fused on the Protection Board.
- +24V is distributed through the Protection Board to the frame cooling fan. It is not fused.

The Power Protection Board shuts off the power supply if the DC power switch is turned off, if the frame overheats, if the fan housing is removed, or if a +5 Volt fuse blows on any module.

Large System Controller Frame Power Distribution

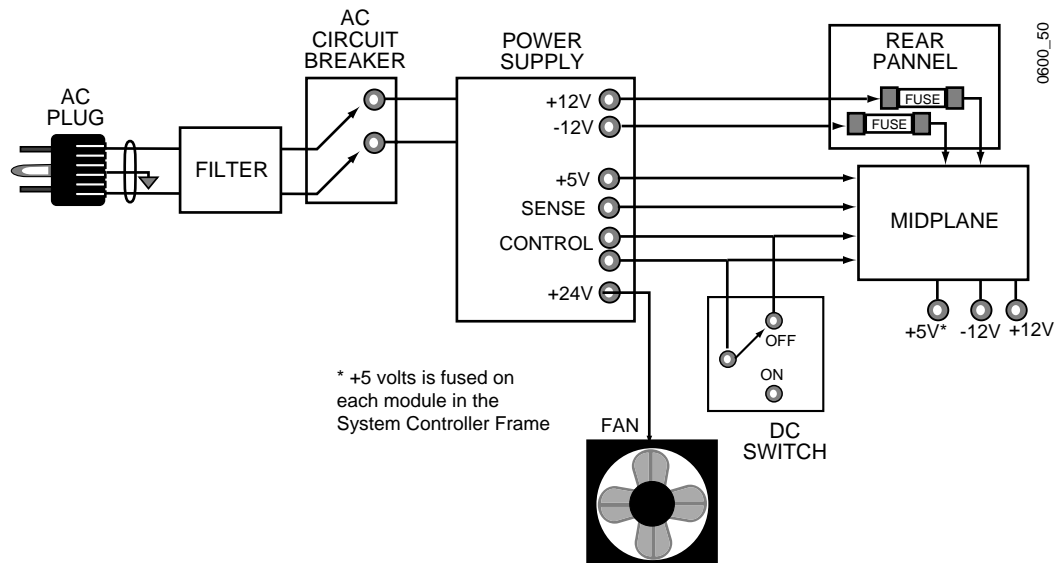


Figure 4-8. Large System Controller Frame Power Distribution

The Large System Controller power supply is located behind a hinged door on the left side of the rear of the frame. The AC first goes through a line filter to prevent noise from being passed back into the AC supply lines.

The power supply provides four DC voltages:

- +5V for logic circuitry is distributed through the Small System Controller frame midplane board. +5V power is fused on each module.
- +12V and -12V for video circuitry is distributed through the frame midplane board. $\pm 12V$ power lines are both fused on the rear panel.
- +24V is distributed to the frame cooling fan. It is not fused.

The power supply has control inputs which shuts off the power supply if the DC power switch is turned off, if the frame overheats, if the fan housing is removed, or if a +5 Volt fuse blows on any module.

CAUTION The over temperature sensor is located on the mother board and the over temperature circuitry is located on the Resource Manager module. If the Resource Manager is not plugged in, the System Controller will not shut down for an over temperature condition.

Small System Controller Frame Power Distribution

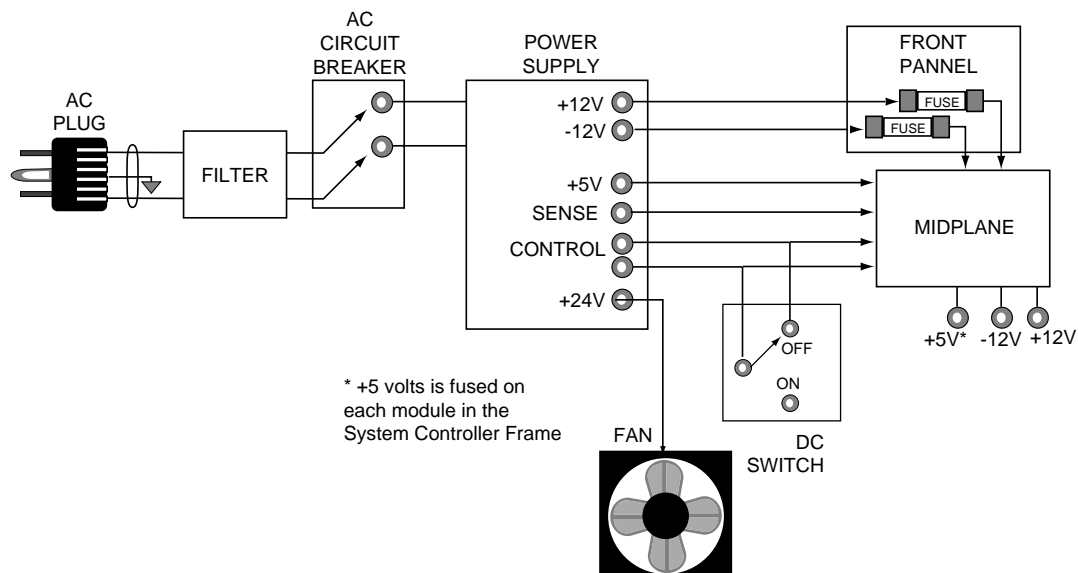


Figure 4-9. Small System Controller Frame Power Distribution

The Small System Controller power supply is located on the left side behind the panel inside the frame's front door. The AC first goes through a line filter to prevent noise from being passed back into the AC supply lines.

The power supply provides four DC voltages:

- +5V for logic circuitry is distributed through the Small System Controller frame midplane board. +5V power is fused on each module.
- +12V and -12V for video circuitry is distributed through the frame midplane board. $\pm 12V$ power lines are both fused on the front panel.
- +24V is distributed to the frame cooling fan. It is not fused.

The power supply has control inputs which shuts off the power supply if the DC power switch is turned off, if the frame overheats, or if a +5 Volt fuse blows on any module.

CAUTION The over temperature sensor is located on the mother board and the over temperature circuitry is located on the Resource Manager module. If the Resource Manager is not plugged in, the System Controller will not shut down for an over temperature condition.

Functional Descriptions of Krystal Modules

This section contains functional descriptions of Krystal circuit modules and power supplies. Modules are described in the following order:

- Control Panel modules
- Video Processor frame front and rear modules by slot number
- Small System Controller frame front and rear modules by slot number
- Large System Controller frame front and rear modules by slot number

Frame modules are hardware-keyed so that they may be plugged into only the correct physical slot. In addition, each module has a software ID. The module ID allows system software to identify which hardware options are present so that appropriate software functions may be enabled or disabled.

Control Panel Modules

The Control Panel contains the following:

- Control Panel CPU Board
- Lower Switch Board
- Upper Switch Board
- Low Profile Switch Board
- Flat Panel Display
- Floppy Drive
- Control Panel Power Supply

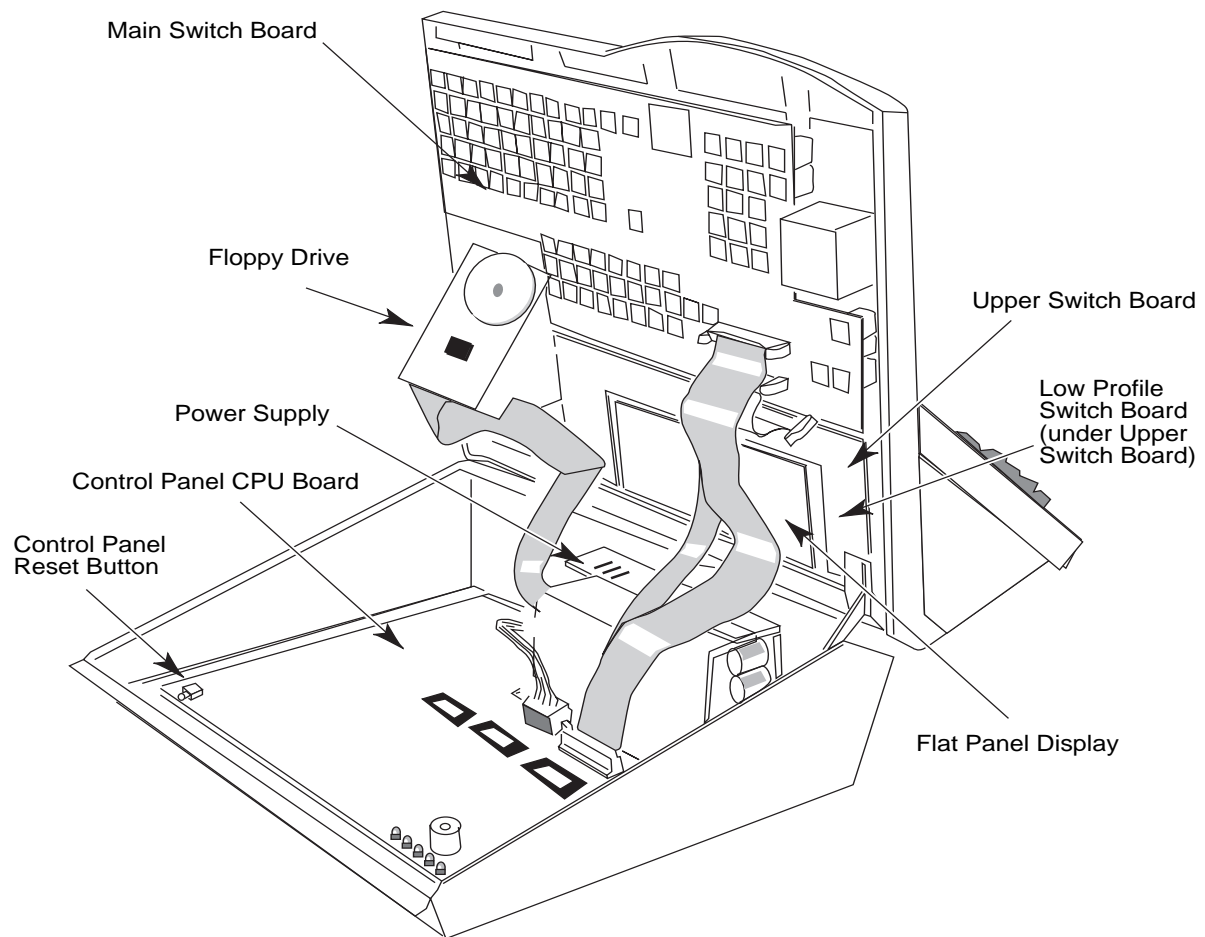


Figure 4-10. Control Panel Circuit Module Locations

WARNING Disconnect AC power before opening the Control Panel. The Control Panel should not be opened except by qualified Service Personnel. If AC power is not disconnected, potentially lethal shock hazards exist from AC power connectors and power supply components.

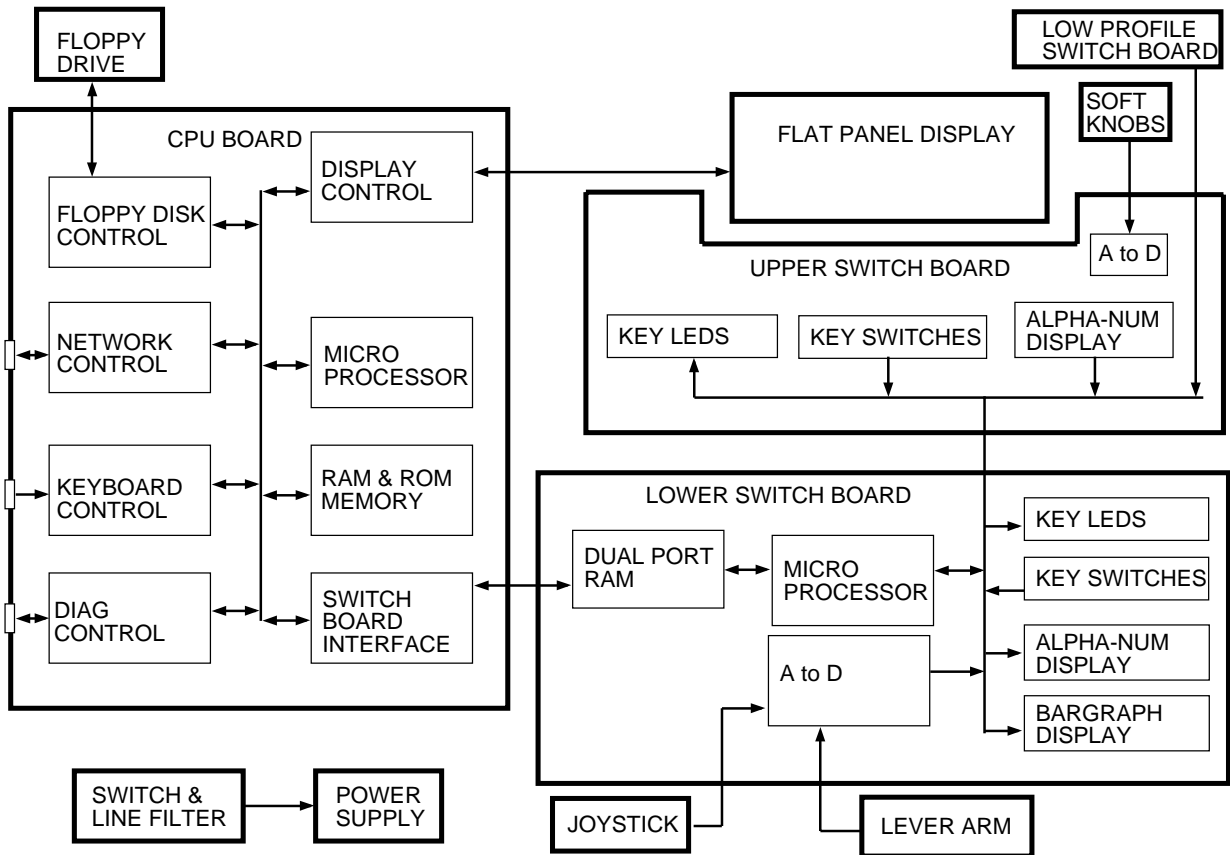


Figure 4-11. Krystal Control Panel Block Diagram

Control Panel CPU Board

The Control Panel CPU Board, assembly 066200, is mounted on stand-offs in the bottom of the Control Panel tray. Board functions include

- Switch Board Communication
- Keyboard Control
- Display Control
- Disk Drive Control
- LAN Communications
- Diagnostics

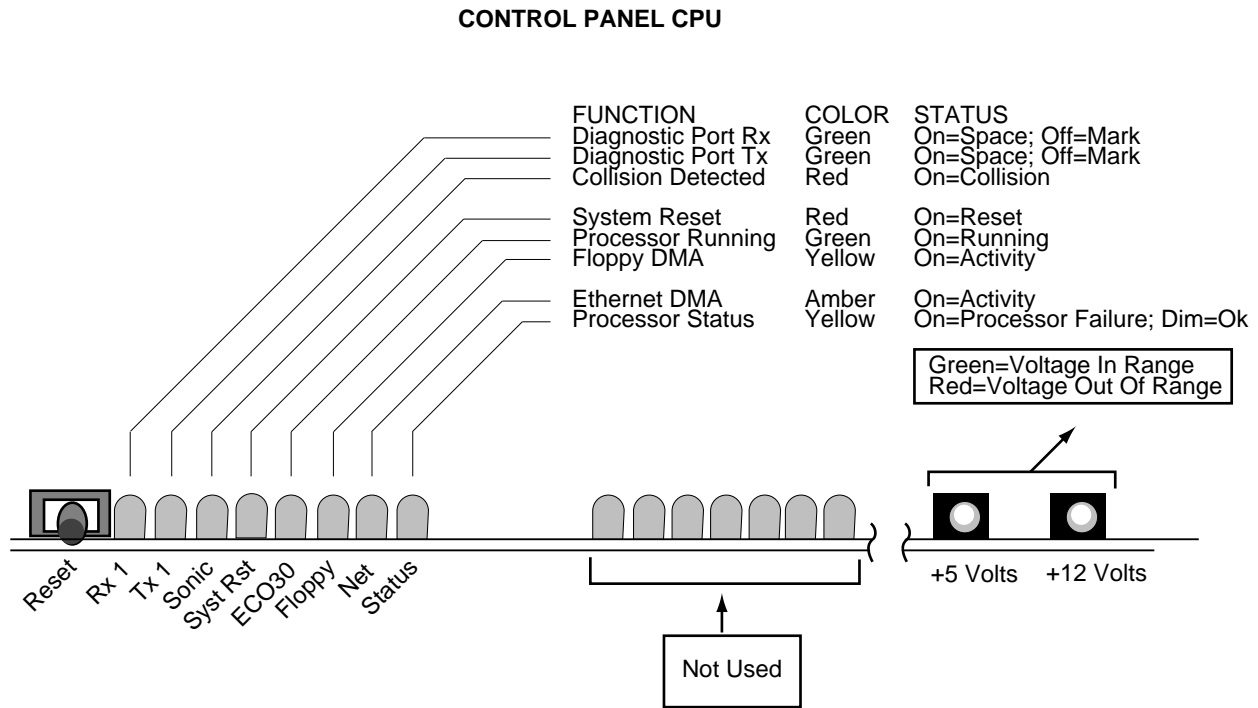


Figure 4-12. Control Panel CPU LEDs

Upper Switch Board

The Upper Switch Board, assembly 066203, is mounted on stand-offs in the upper section of the Control Panel lid. This board has switches, knobs and an interface to the Low Profile Switch board.

Low Profile Switch Board

The Low Profile Switch Board, assembly 066202 is mounted on the Upper Switch Board and contains the four buttons located to the right of the Flat Panel Display.

Main Switch Board

The Main Switch Board, assembly 066201, is mounted on stand-offs in the lower section of the Control Panel lid. The board communicates directly with the Control Panel CPU Board and acts as a communications link between the CPU Board and the rest of the boards in the Control Panel. The

Main Switch Board reads and digitizes the position of the joystick and the lever arm. This board has switches, bar-graph display, and the alpha-numeric display mounted on it. Functions include

- Switch Polling
- LED Brightness Control
- A to D Conversion
- Alpha-Numeric Display Control
- Bar-graph Display Control
- Time/Date Clock (used for time stamping files saved to disk)

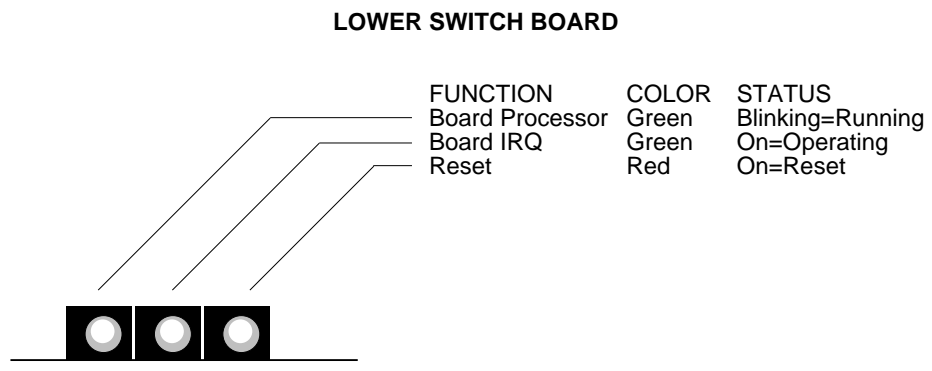


Figure 4-13. Lower Switch Board LEDs

Flat Panel Display

The Flat Panel Display, assembly EA2302, is mounted on stand-offs in the upper section of the Control Panel lid and is surrounded on three sides by the Upper Switch Board. The Flat Panel Display is operated by the Control Panel CPU Board. The power for this board goes through the control cable.

Floppy Drive

The Floppy Drive, assembly EA2415, is mounted on the Control Panel lid. The Floppy Drive uses 3.5" 1.44 MB floppy disks which are formatted to the MS DOS high density standard.

Video Processor Frame Modules

Frame modules are hardware-keyed so that they may be plugged only into the correct physical slot. In addition, each module has a software ID. This ID allows system software to identify which hardware options are present so that appropriate software functions may be enabled or disabled. The Video Processor Frame may contain the following modules ([Figure 4-14](#) and [Figure 4-15](#)):

Section 4 — Functional Description

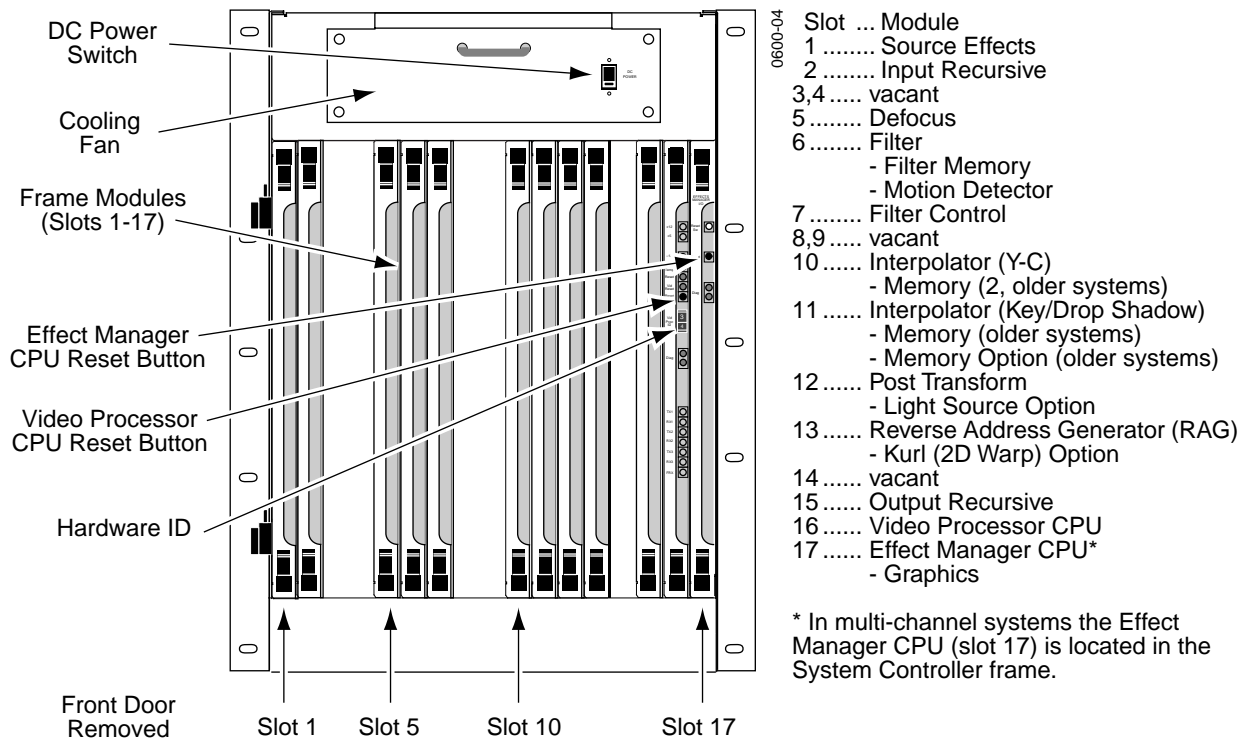


Figure 4-14. Video Processor Frame, Front View

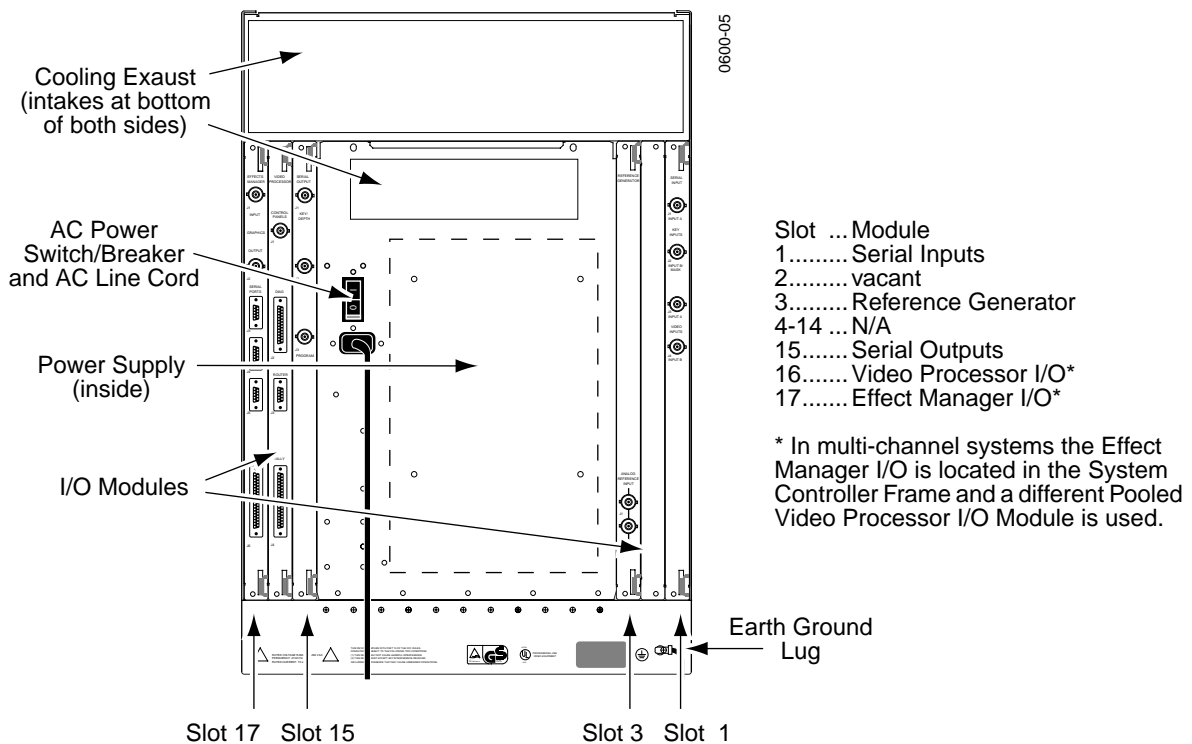


Figure 4-15. Video Processor Frame, Rear View

Slot 1: Source Effects Module (066221)

The Source Effects module processes key, mask, and border mixing information.

Test points and Indicators

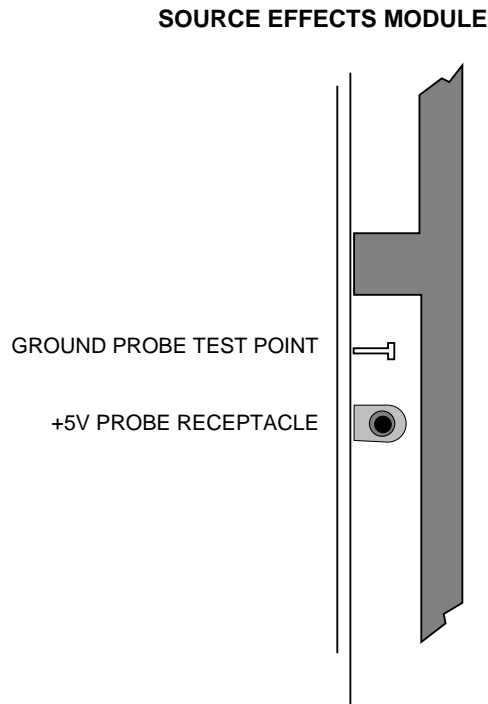


Figure 4-16. Source Effects Module Test Points and Indicators

Major Functions

The Source Effects module is located in the Video Processor signal path immediately following the Serial Inputs module.

Inputs to the module include luminance, chroma, key, mask, and sync. A diagnostic pattern generator may substitute a pseudo-random number pattern at the module input for diagnostic testing.

Section 4 — Functional Description

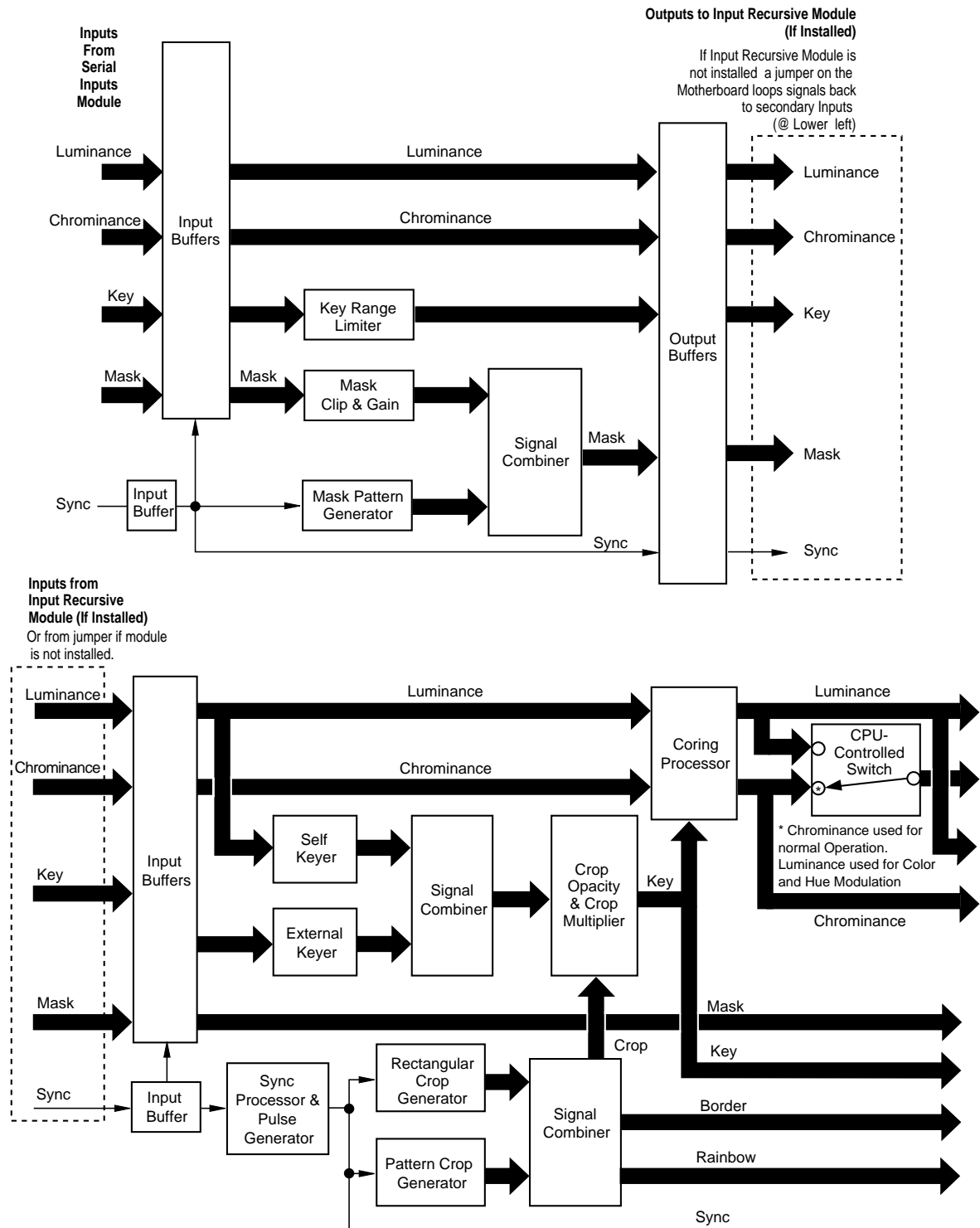


Figure 4-17. Source Effects Module Block Diagram, part 1

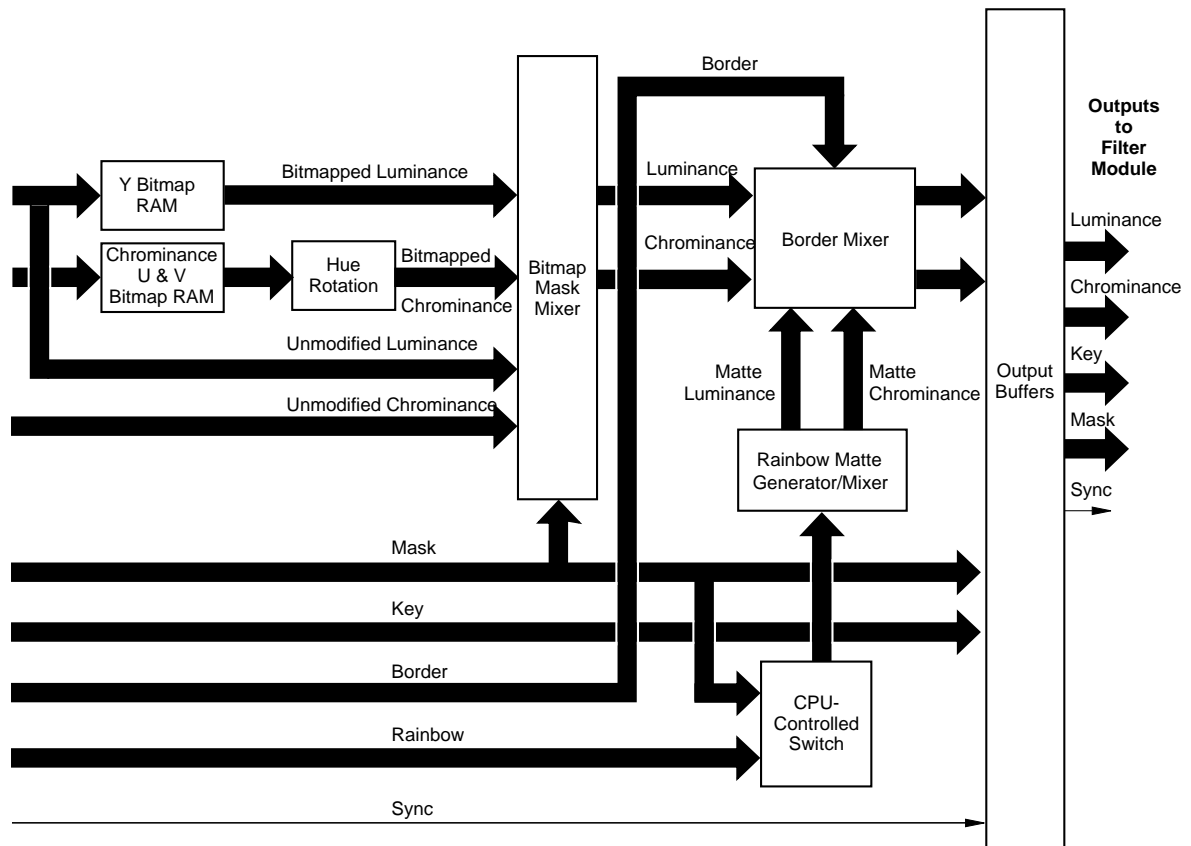


Figure 4-18. Source Effects Module Block Diagram, part 2

The Source Effects module provides a number of functions.

Mask Processor and Pattern Generator – Mask processing is performed at the input of the Source Effects module. The user may take an External Mask signal and apply clip and gain to it if desired. A pattern from an internal pattern generator may also be applied. These may be applied individually or in combination. Either of these, as well as any combination, may be inverted. The opacity of the mask is adjustable. The final mask signal is placed on the Mask Bus which is used by the Source Effects module.

Key Processing – The Source Effects module has separate keys for Self and External Key signals, and allows the user to select either key or to combine them by positive or negative NAM or multiplication. Clip and gain may be set on each. Each key, as well as the combination, may be inverted. The final key is multiplied by a variable opacity crop. The crop generator also generates the pattern used for picture borders to be added to the video. Processed key is used by the coring circuit and is also routed off the module.

Crop Generator – The crop generator consists of a rectangular crop generator and a pattern generator. The rectangular crop generator provides a rectangular crop pattern parallel to the raster edges, with independently adjustable position and softness on each edge. It also generates a picture border mix signal and a wash border mix signal which are independently adjustable in position and softness on each edge. The pattern generator, identical in functionality to the Mask pattern generator, provides more complex patterns with control over position and softness, but not individual controls for each edge of a pattern. The two generators may be used independently or in combination. The border mix signal also provides control over picture border opacity.

Coring – Luminance and chroma from the Input Recursive Memory buffers are routed to the coring circuit which allows the user to set a threshold below which video will be forced to black. This is primarily useful in minimizing the visibility of noise, especially when several layers are added. Coring may be applied across the entire picture, or it may be applied only in areas where the key signal is low, indicating that there is no video content of interest. The output of the coring circuit is routed to the bitmap.

Video Bitmap – The bitmap consists of three look-up tables in RAM: one for luminance and one for each of the two chroma components. Input video drives the address inputs to the RAM, and output video is read from the RAM data outputs. The RAM is dual-port; the second port is used by the module microprocessor to write the desired input-to-output transfer function. The various bitmap effects — Posterization, Solarization, Color Modulation, Hue Modulation, and Reverse Video — are accomplished by the RAM function which describes what video input value will read out what video output value. When Color Modulation or Hue Modulation is selected, the input to the chroma bitmap is switched from chroma to lumi-

nance and the original chroma is discarded. Luminance output from the bitmap is routed to the bitmap mask mixer while chroma output first goes through hue rotation.

Hue Rotation – Chroma from the bitmap enters a hue rotation circuit which allows the hue to be varied over a zero to 360 degree range. After this processing, it is routed to the bitmap mask mixer.

Mask Mixer and Color Mix – The luminance and chroma modified by the Bitmap/Hue Rotate circuits are input to a mixer where they are combined with their unmodified counterparts under control of the mask bus signal. This allows a mask to define an area of the raster where an effect is to appear and outside of which the video is unmodified. A simple dissolve mix between modified and unmodified video may also be done in this mixer.

Color Mix is a color correction technique accomplished by mixing a small amount of matte with video. Where bitmap is not to be used, Color Mix is performed in the mask mixer. The matte is substituted for the bitmap input to the mixer, and the mix from the unmodified video to bitmap becomes a mix between unmodified video and matte. This may be a fixed mix, or it may be masked by using mask opacity to set the mix ratio. If the mix is fixed, separate degrees of luminance and chroma mix may be set.

Border and Wash Border Mixer – The luminance and chroma from the Bitmap/Hue Rotate mask mixer are next input to another mixer where border matte is mixed with video under control of the border signal from the crop generator. The second input to the border mixer is the matte signal, which is supplied by yet another mixer. This is the wash mixer which mixes between two mattes under control of either the wash signal from the crop generator or the mask bus signal. Thus, a border may be placed around a picture and that border may consist of one matte, or, using the crop generator wash signal, it may be divided into two mattes following the same outline with a variable softness and position transition between them. If the mask bus controls the wash signal, then the division between two mattes is based on the mask signal, be it an internal pattern, an external signal, or a combination of both.

Output Buffers – The luminance and chroma from the border mixer, the processed key and mask, and regenerated sync are all routed to output buffers from which they are sent off the module. Part of this buffer circuit is used in diagnostic testing.

Module Control – The Source Effects module is controlled via a system microprocessor interface circuit which sends data to various ICs on the module, configuring them to perform the desired functions. It also communicates with an on-board microprocessor which in turn configures other functions, including bitmap RAM, rectangular crops, and hue rotation.

Slot 2: Input Recursive Module (066212)

The Input Recursive module provides the circuitry to create the mosaic effect and the recursive mode effects such as freeze and motion decay on the input video.

Test Points and Indicators

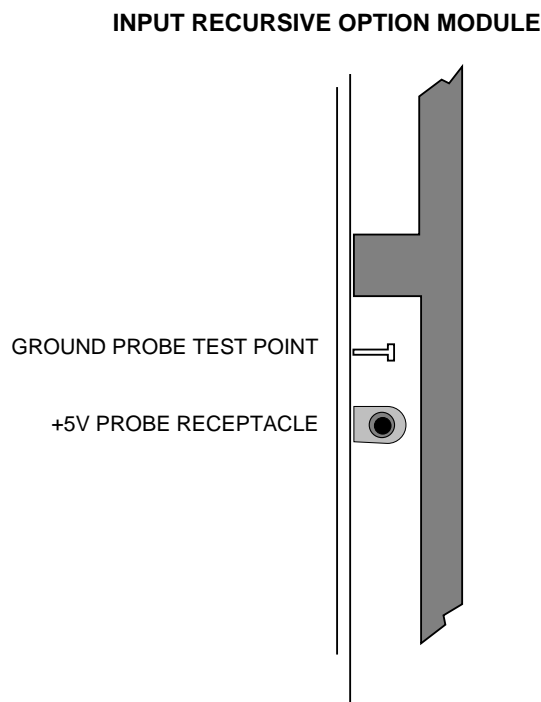


Figure 4-19. Input Recursive Module Test Points and Indicators

Major Functions

The major functions of the module include the following:

- Input freeze
- Motion decay
- Mosaic

As shown in the block diagram in [Figure 4-20](#), the basic generation of the input freeze and motion decay functions involves a recursive loop which is accomplished by mixing the current video/key with the recursive frame delayed video in the output memory combiner circuitry. The data paths for luma, chroma and key are almost identical and what is done to one path can also be done to all three.

The output combiners pass the mixed data to the mask combiner which then passes the data through the mosaic circuitry and onto the motherboard.

The memory combiners pass the noise reduced data to the low pass filter circuitry. Then the data is delayed and read out one frame later from the recursive memory creating a recursive loop.

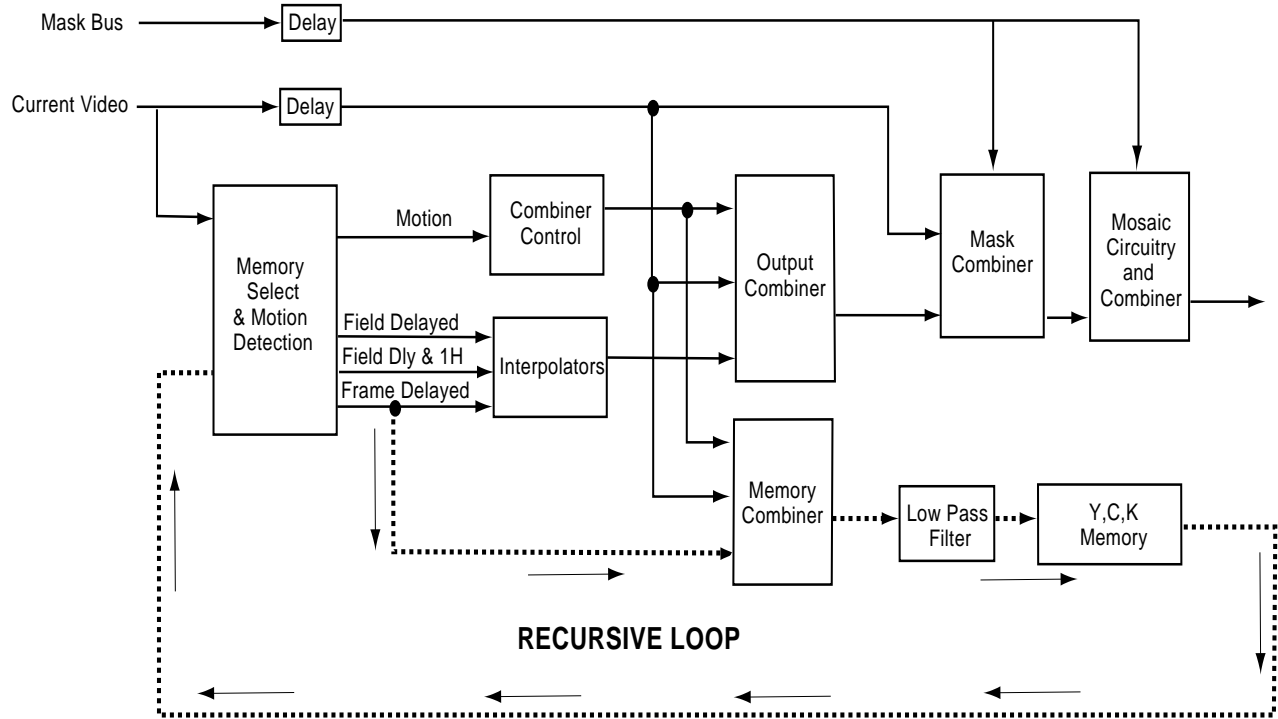


Figure 4-20. Input Recursive Module Simplified Block Diagram

Slot 5: Defocus Module (066216)

The Defocus module provides large scale Horizontal and Vertical Filtering of the Luminance, Chrominance, and Key channel in support of Glow and Defocus effects. Many of the circuit blocks indicated for horizontal and vertical processing function identically and so are described only once below.

Defocus and Glow effects are actually produced with both the Defocus and Filter modules working in conjunction with one another. The defocus module filters the signals while the filter module contains the signal processing/combining hardware that blend the normal and defocused video streams and glow matte signals.

Test Points and Indicators

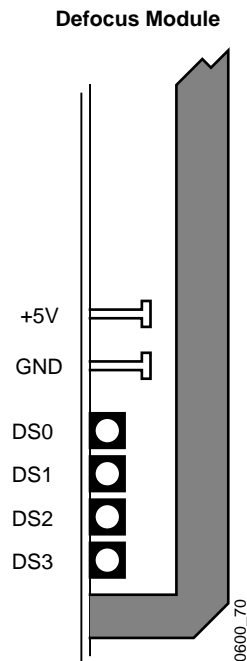


Figure 4-21. Defocus Test Points and Indicators

The standard +5V and GND test points are present on the module edge. In addition four green LEDs (labeled DS0, DS1, DS2, DS3) are driven from the local DSP processor. In the course of normal processing the top LED is sequentially lit and extinguished rapidly so it appears constantly lit (although a slight flicker may be noticed). The state of on and off LED lamps does not indicate any particular error or halt code, and the off LEDs do not indicate a local problem with the DSP processor.

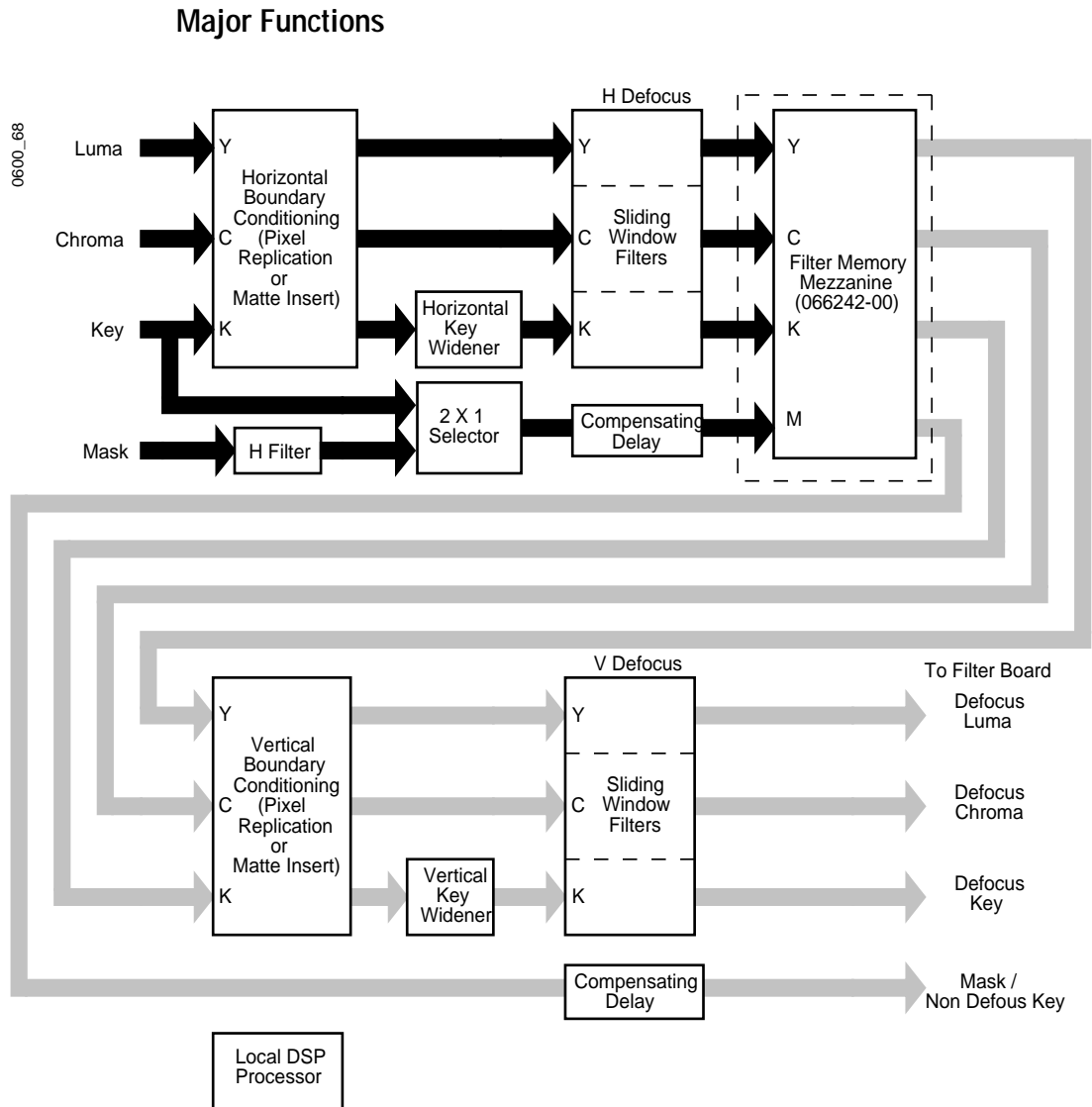


Figure 4-22. Defocus Module Block Diagram

The defocus filter board receives four signals: Luminance, Chrominance, Key, and Mask. The Y, C, and K channels are boundary conditioned. The key passes through offset/widener blocks. Y, C, and K channels are ‘defocused’ with rectangular impulse response FIR (rolling average) filters. Full defocus is achieved with separable horizontal and vertical filters block on the processed channels. A Filter Memory mezzanine (066242-00) is installed on the Defocus module to “corner turn” the channel data for the vertical processing paths. A local DSP controls the operation of the module.

Boundary Conditioning – The raster image has finite extent. Filtering operations occurring near the boundary must be handled in a special manner. Filters gather a group of pixels and blend them in order to produce an output pixel. As the filters operate near the boundary their kernels span into the blanking boundary beyond the raster edges. Data does not exist

that can be used to feed the taps that extend past the boundary so a substitution method is used. The boundary conditioning circuits provide the substituted pixels. There are two alternates: pixel replication or matte injection. Replication takes a defined pixel along the current scan line or column and duplicates it. Matte injection simply substitutes a flat matte value for all pixels outside the raster boundaries.

Filter Memory – The filter memory is a mezzanine used on both the Defocus and Filter modules. Its function is to resequence the image from scan lines to scan columns. This ordering of the data determines the orientation of the filtering.

Key Offset / Widener – These blocks function to widen or shrink the extent of the key signal in support of the key glow effects. A characteristic of the rectangular impulse response filters is that they create linear ramps in response to step functions. The ramps extend symmetrically on either side of the step, and have a value of 50% at the corresponding step edge position. To extend the range of the linear ramp output from the filter the key is widened by an amount coordinated with the filter width.

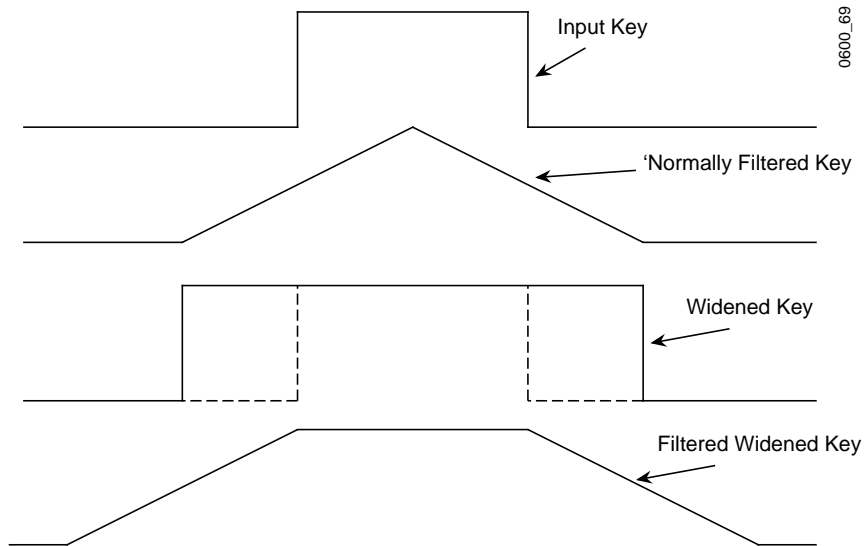


Figure 4-23. Defocus Key Offset and Widener

The filtered, widened key signal creates controls the insert mix of the glow matte signal. By extending the range of the matte signal the glow extension over the image is increased.

Sliding Window Filters – Defocus of the three data channels is accomplished by a set of six sliding window filters; two for each channel. Two dimensional filtering is realized by sequential filtering in each (H and V) dimension. Sliding Window Filters are compact implementations of a rectangular,

or box window FIR filters. The N tap box filter simply returns the average of N samples covered by its kernel. The value 'N' is adjustable through user parameters.

The filtering blocks shown here also includes interpolation and compensating delay functions. The delay of the filters depends on the width, N, of the filters. Compensating delays cascade onto the filter outputs and are adjusted so the signal delay through the filter block remains constant with varying values of N. Interpolation is used to create a half pixel shift when even values of N are programmed.

Mask H Filter – This is a horizontal anti-aliasing filter for the Mask bus. It is identical to the horizontal anti-aliasing filter on the filter board key channel and is bandwidth controlled by FCF values from the filter control board.

Mask Bus 2 X 1 Selector – This circuit simply switches the board mask or key inputs signals onto the internal mask bus. Some of the Glow and Defocus effects require both a defocused and original key signal to construct them. When this is the case the Mask input is ignored and the input key is shunted around onto the mask bus to be passed on to the filter board for further processing/combining.

Mask Bus Compensation Delay Blocks – Because the mask bus does not experience the same processing delays that occur on the other channels (due to the sliding window filters, etc.). These blocks add time delay to the mask bus data to match the processing latency of the other buses so that all four signals undergo the same time delay passing through the board.

Local DSP Processor – The local DSP processor converts higher order system parameters to elemental registers values and loads the hardware devices.

Slot 6: Filter Module (066215)

The Filter module provides anti-aliasing filtering, corner-turning memory, and motion detect functions. This module also operates with the Defocus Module to produce Defocus and Glow effects.

Test points and Indicators

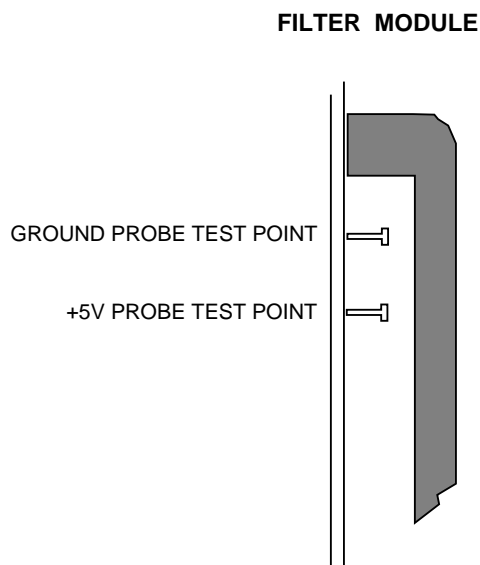


Figure 4-24. Filter Module Test Points and Indicators

Major Functions

The Filter module provides anti-aliasing filtering using separable horizontal and vertical filters, a corner-turning memory, and a motion detect function. Motion detection determines whether only the current field or both the current and previous fields should be used by the Interpolator modules. This prevents blurring in the output video caused by motion.

Emboss – The Filter module receives luminance, chroma, key, and mask signals from the Source Effects module. They first enter the Emboss function where a software switch controls whether the key or mask is used to do emboss functions. Emboss produces a highlight on one edge of a key and a shadow on the other, to create a three dimensional texturing effect where the keyed image appears to stand up over the background. A software switch also controls whether the Embossed key is passed to the output.

Horizontal Filtering – The horizontal filtering section receives the output of the Emboss process and performs anti-alias filtering. This section of the module can also apply horizontal key blur functions. The output of the Horizontal filter is passed to the Filter memory and, if installed, the Defocus module.

Filter Memory – The filter memory section of the module performs horizontal to vertical scan conversion (corner turning). Data is read in horizontally (in rows) and out vertically (in columns).

Note Because the output signals of this section are corner turned they are not readable through normal methods (with an oscilloscope).

Video Mixer and Key Processor – This section receives vertically oriented luminance, chrominance, and key signals from the filter memory section. If the Defocus module is installed, this section also receives defocused, vertically oriented luminance, chrominance, and key signals from that module. A software-controlled mixer equipped with a matte generator determines how the defocused, regular video, matte, and key signals are mixed.

Vertical Filtering – The vertical filtering section receives the vertically oriented output of the video mixer and key processor. This section can apply a vertical blur function to the key.

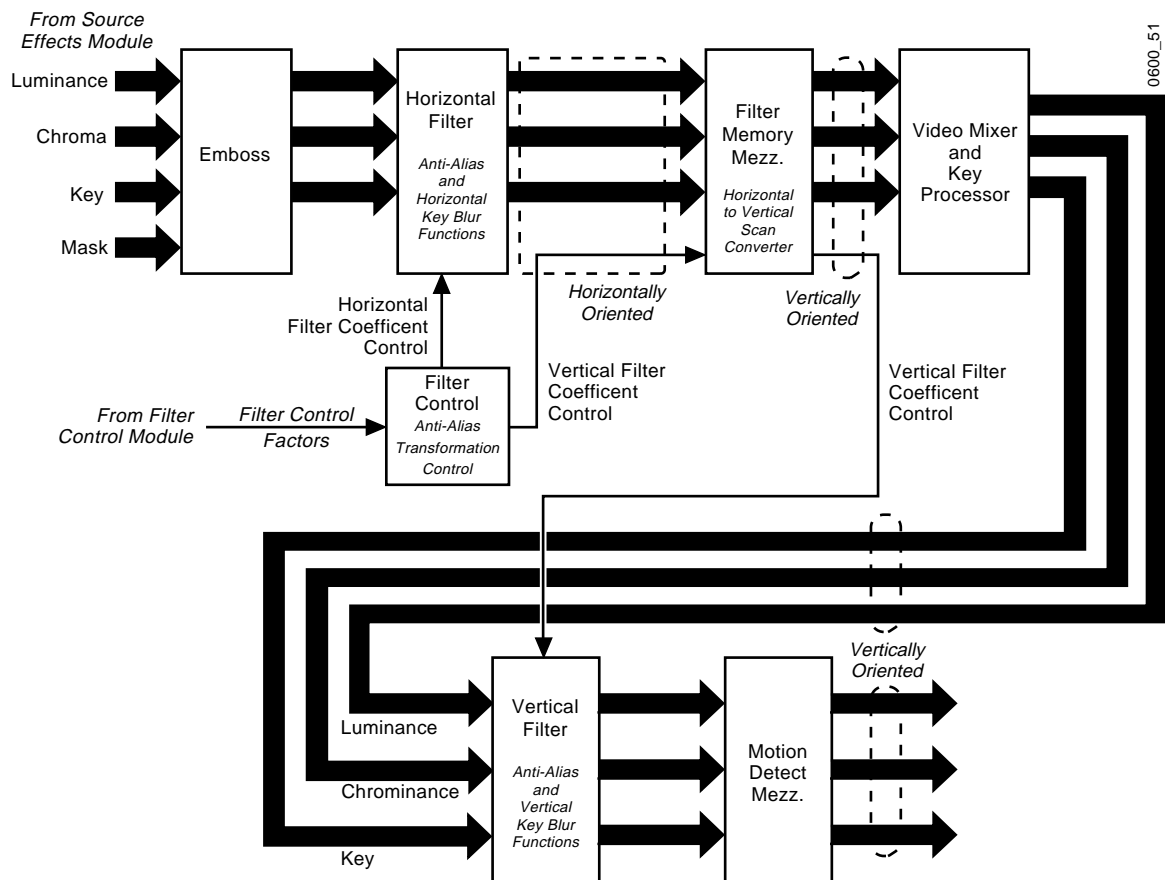


Figure 4-25. Filter Module Block Diagram

Motion Detect Mezzanine (066243)

The motion detect function compares successive fields of video data and determines whether only the current field or both the current and previous fields should be used by the Interpolator modules. This prevents motion induced blurring in the output video.

Filter Memory Mezzanine (066242)

The Filter Memory mezzanine has memory for two fields and some associated registers and control circuitry. This mezzanine takes in a field horizontally (line by line) and then outputs that field vertically (first byte of each line then the second byte of each line). This vertically oriented data is then sent back to the Filter module.

Slot 7: Filter Control Module (066217)

The Filter Control module processes transform information to create filter control factors.

Test points and Indicators

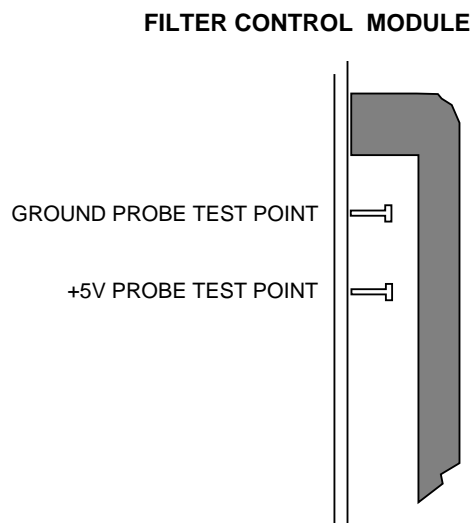


Figure 4-26. Filter Control Module Test Points and Indicators

Major Functions

The Filter Control module takes transform information and uses it to set up hardware that creates filter control factors. These are passed, in real time, to the anti-aliasing filter module for each pixel in the input video in scan line order. This module generates filter control factors for planar (not Kurl) effects. This transform information is downloaded from the video processor. Sync signals are also input, which control the timing of the module output.

The outputs are filter control signals that control the amount of horizontal and vertical filtering for full bandwidth components (luminance/key) and half bandwidth components (chrominance).

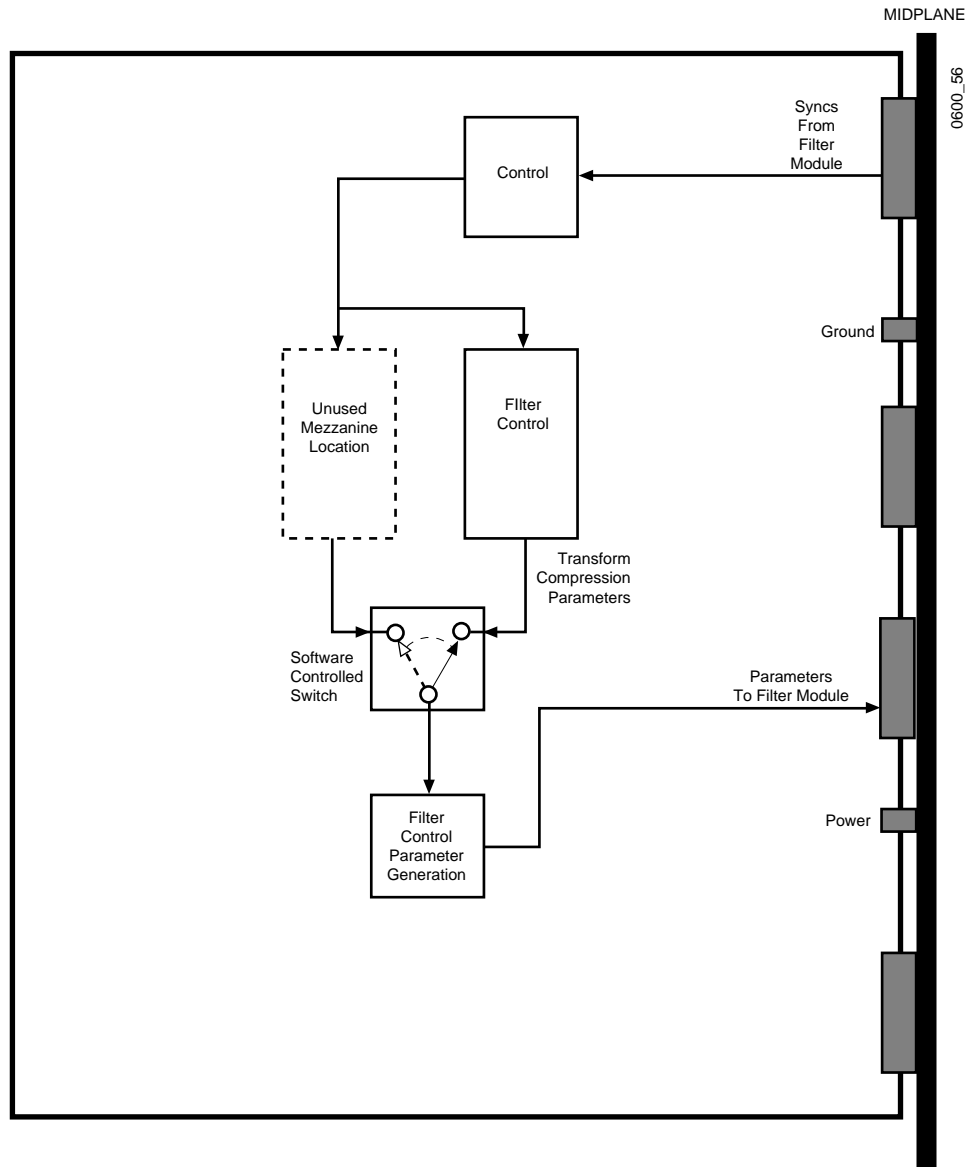


Figure 4-27. Filter Control Module Block Diagram

Slots 10, 11: Interpolator Modules (066250, 066213, 066261)

The Krystal system uses two memory interpolator modules. They work together to determine color and intensity of the processed video, and the offset of drop shadow effects applied to key video. The Y/C Interpolator module handles interpolation functions for luminance and chrominance signals. The K/DS Interpolator module handles interpolation functions for the key and drop shadow signals.

Types of Interpolator Module Hardware

Newer Krystal systems use two of the same type of interpolator module (066250, called the Y/C K/DS Interpolator) in each of the two slots #10 and #11. When the Video Processor resets or power cycles, it interrogates the modules to determine their type (new or old) and if new modules are detected sets each to its correct operating mode. The module in slot #10 is set to perform Y/C (Luminance/Chrominance) processing, and so can be considered the Y/C Interpolator. The module in slot #11 is set to perform Drop Shadow processing, and so can be considered the K/DS Interpolator. The Y/C K/DS Interpolator hardware has memory built into the main board, and so has no mezzanines and always produces full bandwidth drop shadow. The part number of this module includes an extension (eg. 066250-50) that indicates the module has a programmed FPGA.

Note The newer Y/C K/DS Interpolator modules work with v3.1.0 and later software only.

Older Krystal systems use two different types of Interpolators module hardware in the two slots #10 and #11. Each must be in the correct slot for proper operation. The Y/C Interpolator (066213) goes into slot #10, and the Drop Shadow Interpolator (066261) goes into slot #11. If the Enhanced Video option is installed, the K/DS module will have a second memory mezzanine installed.

The new and old interpolator modules can be combined in the same frame (provided v3.1.0 or later software is being used).

Test points and Indicators

The newer Y/C K/DS Interpolator module (066250) does not have test points on its rear facing edge. Test points on the board itself are identified by silk screen labeling.

The older Interpolator modules (066213, 066261) have the test points shown in [Figure 4-28](#).

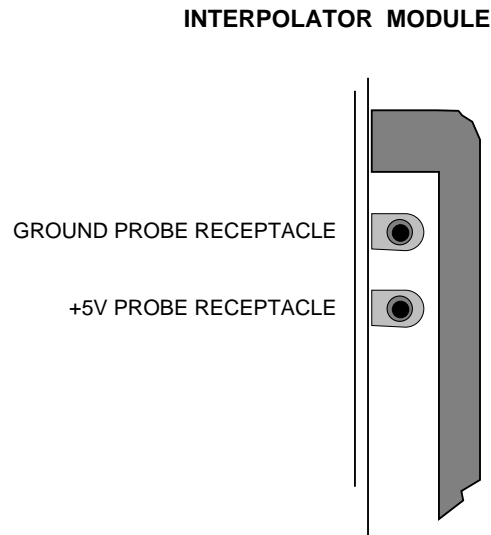


Figure 4-28. Old Interpolator Module(s) Test Points and Indicators (066213, 066261)

New Y/C K/DS Interpolator Module Description

The Interpolator boards receive vertically oriented Luma, Chroma, and Key data from the Filter board. This data is stored in the on-board SRAM memory. After the Luma, Chroma and Key have been stored in memory, they can be pulled out in any order according to the transformation addresses. The transformation addresses for Luma, Chroma, and Key come from the RAG board, through the Post Transform board. The transformation addresses for Drop Shadow are derived on the Post Transform board. When a transformation address is received, the interpolator pulls out of memory the 16 pixels (4 x 4) surrounding that address. These 16 pixels are interpolated down to 1 output pixel. All 4 Interpolator outputs (Luma, Chroma, Key, Drop Shadow) are sent to the Post Transform board. Note that the Drop-shadow is derived from the Key input using the Drop-shadow transformation addresses.

Older Interpolator Module Description

Both Interpolator modules receive vertically-oriented video data from the Filter module and store it in memory. Three fields of video data are stored in memory at any one time and they are continually updated.

On the Y/C Interpolator, the luminance data is stored in the memory on one mezzanine and the chrominance data is stored on the other. On the K/DS Interpolator the Key data is stored on a single mezzanine. If the Enhanced Image Fidelity option is installed key data is also stored on an additional mezzanine.

After data has been stored in memory, it can be pulled out in any order according to the transformation addresses from the RAG module. The transformation addresses for Drop Shadow are derived on the Post Transform module and sent to the Drop Shadow Interpolator. When an address is received, the interpolator pulls the 16 pixels (4 x 4) surrounding that address out of memory.

The 16 pixels are used to interpolate one output pixel. The pixel data outputs from both Interpolators are passed to the Post Transform module.

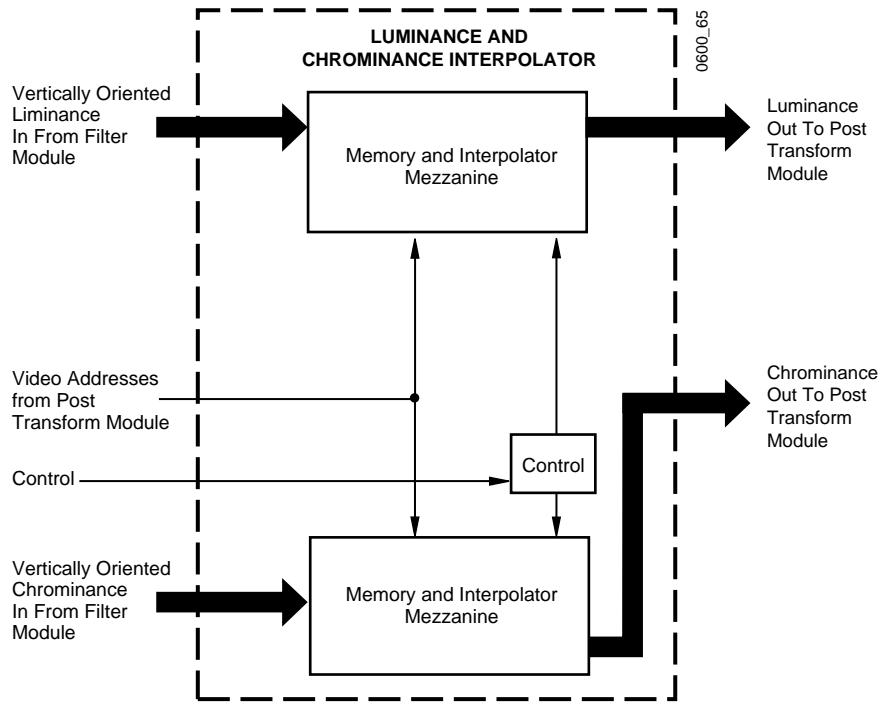


Figure 4-29. Y-C Interpolator Module Block Diagram

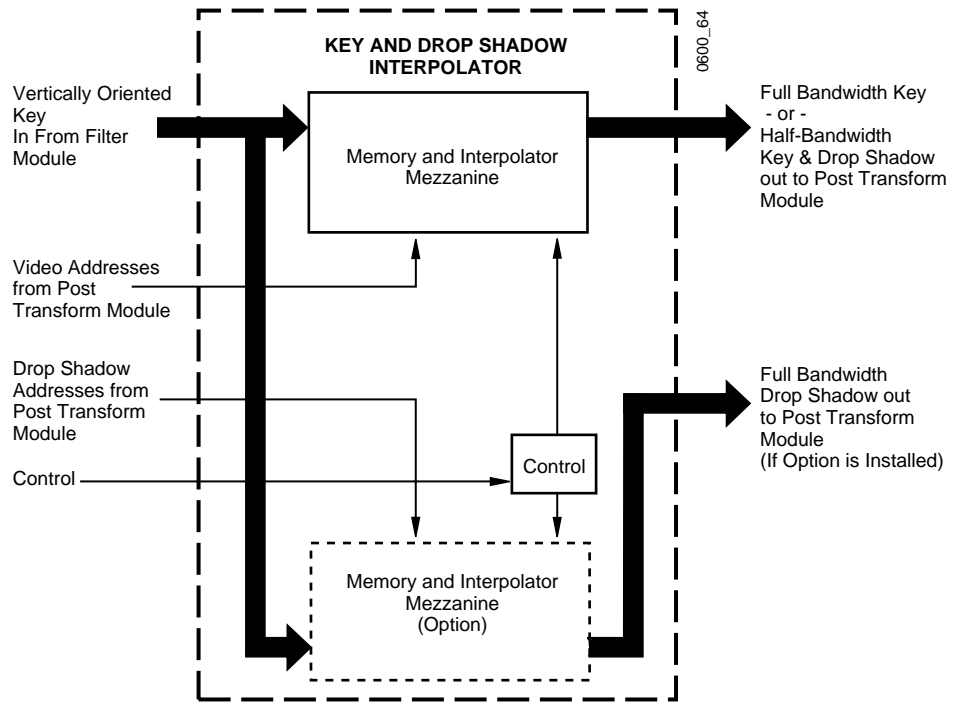


Figure 4-30. K/DS Interpolator Module Block Diagram

Interpolator Memory Mezzanine (066235)

Older Interpolator modules use memory mezzanines.

The Y-C Interpolator has two mezzanines which have video data storage memory and interpolators. One mezzanine handles luminance data the other handles chrominance data.

The K/DS Interpolator has one mezzanine (standard) which handles both key and drop shadow data. This mezzanine can output full bandwidth key data alone or half bandwidth key and drop shadow at the same time. A second memory and interpolator mezzanine can be added which expands the capabilities of the K/DS Interpolator to allow it to handle full bandwidth key and drop shadow simultaneously.

Slot 12: Post Transform Module (066222)

The Post Transform module locates and cuts a hole in Program video for Key video and drop shadow insertion. Light Source mezzanines may also be mounted on the Post Transform module, allowing two variable light sources to be virtually located anywhere in 3D space. The module also performs perspective enhance functions.

Test points and Indicators

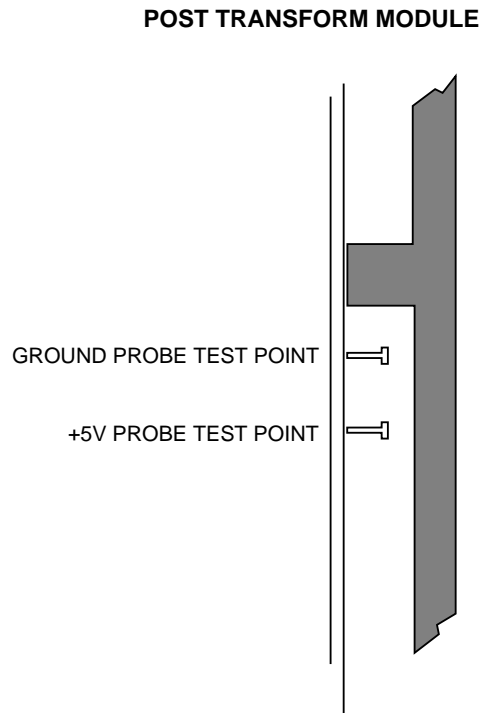


Figure 4-31. Post Transform Module Test Points and Indicators

Major Functions

The Post Transform module receives two types of inputs.

- Video addresses from the Reverse Address Generator (RAG) module
- Video, key, drop shadow and depth information from the Interpolator modules

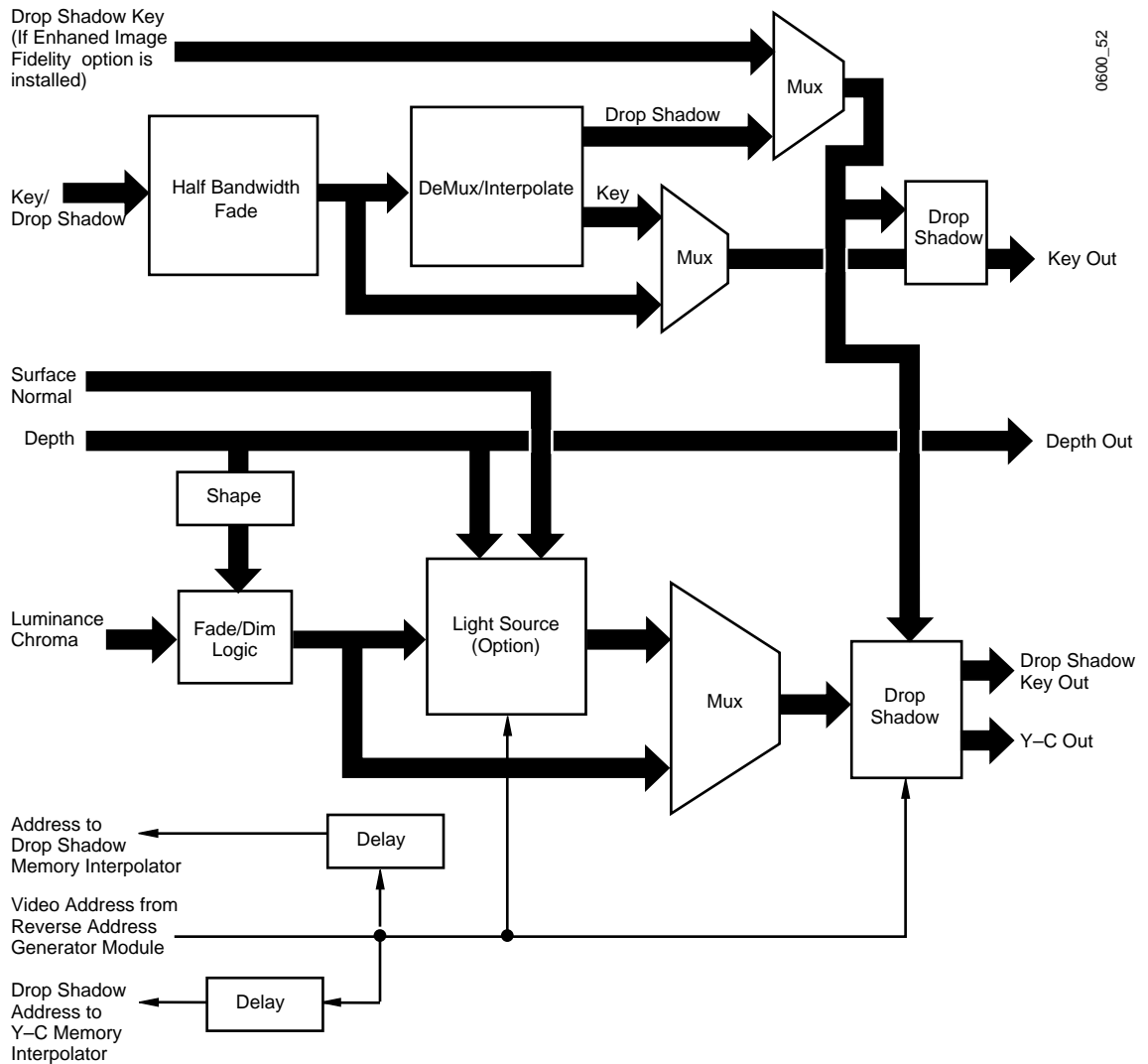


Figure 4-32. Post Transform Module Block Diagram

The RAG generated addresses are delay compensated and passed to the Interpolator modules. The video addresses are also modified to indicate the location and size of a Drop Shadow. These addresses are passed to the Key/Drop Shadow Interpolator module.

The Post Transform module generates a blanking signal that is used on the Y-C Interpolator module to shape the video before outputting it to the Post Transform module. The blanking signal that is generated is also used on the Key/Drop Shadow Interpolator module to shape the Key/Drop Shadow data before outputting it to the Post Transform module.

The Key channel is used to shape the video before it is passed onto the output module.

Perspective Fade and Dim – Key, luminance, and chrominance can be faded independently based on the pixel depth values received from the Reverse Address Generator (RAG) module.

Perspective fades or dims of the video are applied before the video is mixed with Drop Shadow. The Depth signals coming from the RAG module are used to perspective fade/dim the video. Farther parts of transformed objects are faded or dimmed to a matte color. The Key input is faded to black, while the video is faded to a matte.

Drop Shadow – Half Bandwidth Drop Shadow is a standard feature of the Krystal system. Full Bandwidth Drop Shadow is an option.

If the Enhanced Image Fidelity option is installed, and the Key/Drop Shadow mode is selected, the Drop Shadow data is mixed with the video. If standard Key/Drop Shadow mode is selected, the missing data values are interpolated and then the Drop Shadow data is mixed with the video.

Light Source – The Post Transform module contains two on-board mixers for adding and mixing light sources with video. The Post Transform module has provisions for the installation of the Light Source mezzanine

Light Sources Mezzanine (066236)

The Light Source mezzanine takes the depth signal and the surface normal signal from the Reverse Address Generator and the current transform from the Video Processor module and creates two keys that show where the lights will be. There are two modes. In one mode, the keys set up the intensity of the highlights, and in the other mode, one key sets up the highlights, while the other key sets up a black mix for shadows. All outputs go to the light mixers on the Post Transform module.

Slot 13: Reverse Address Generator (RAG) Module (066220)

The Reverse Address Generator module determines the address of each pixel in the output video.

Test points and Indicators

REVERSE ADDRESS GENERATOR MODULE

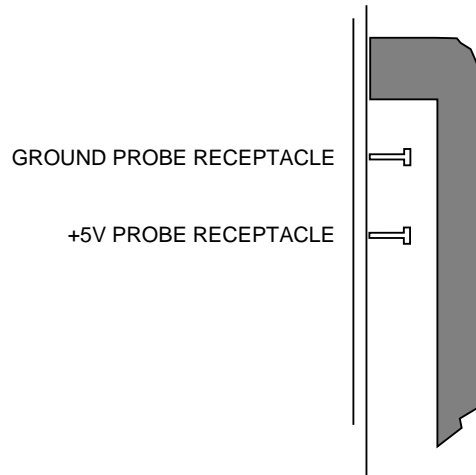


Figure 4-33. Reverse Address Generator Module Test Points and Indicators

Major Functions

The Reverse Address Generator (RAG) module ([Figure 4-43](#)) generates video addresses used by other modules.

Based on parameters determined by user selections and the effect being run, this module maps which source pixel value will be placed in each output pixel position. It calculates one pixel source address for each output pixel address.

The addresses generated may not be pixel locations. The generated addresses are used by the Interpolator modules (see following paragraphs) to mathematically derive what pixel value to be put into the output video pixel location based on surrounding pixel values.

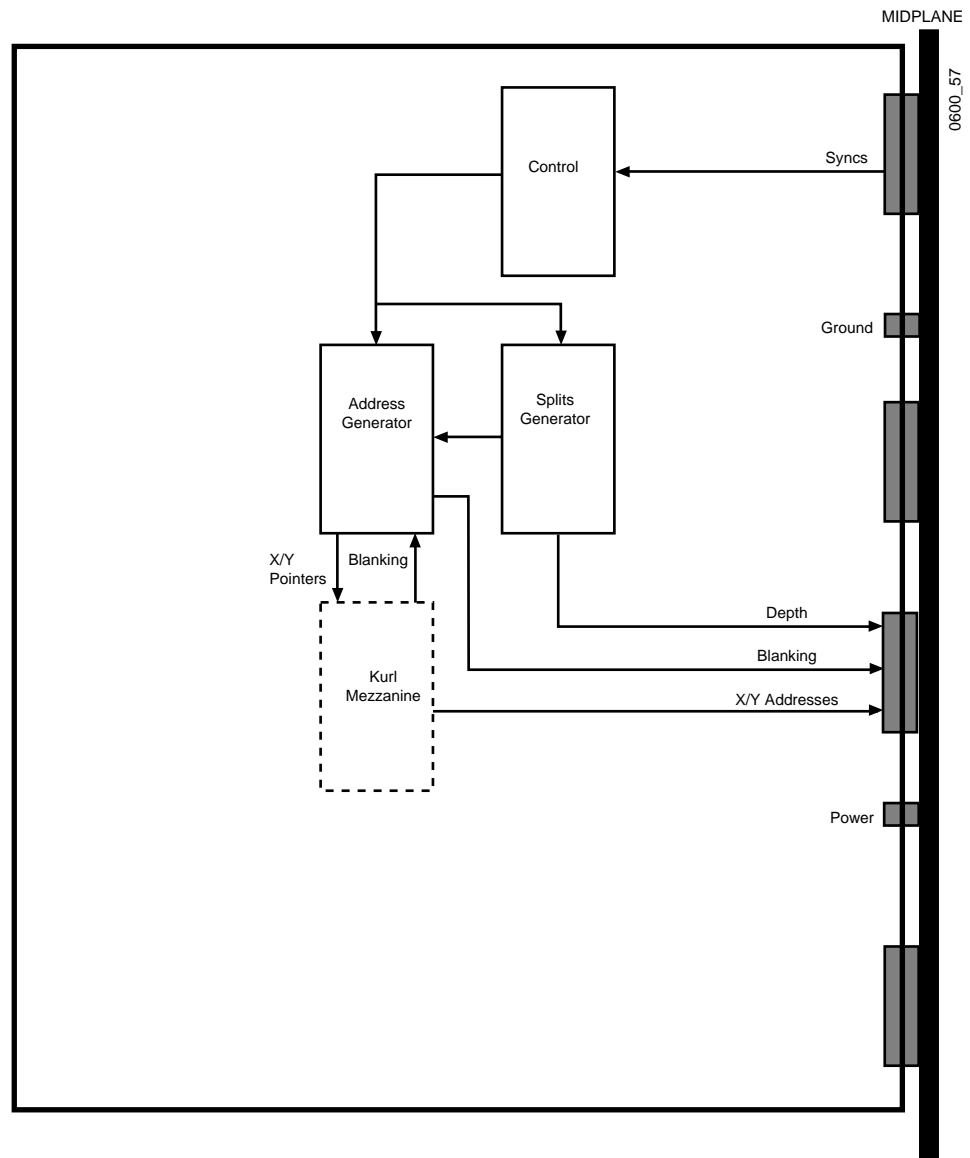


Figure 4-34. Reverse Address Generator (RAG) Module Block Diagram

Kurl Mezzanine (066221)

The Kurl (2D Warp) mezzanine mounts on the RAG module. The RAG addresses that are sent to the Post Transform module are also sent to the mezzanine. This mezzanine modifies the addresses to create the desired effect.

If the generated pixel source addresses from either the RAG module or the Kurl mezzanine are not valid (that is, within the range allowed by the address number format) a blanking signal is asserted for that pixel.

Slot 15: Output Recursive Module (066258)

The Output Recursive module provides the circuitry to create the recursive mode effects such as freeze, motion decay, montage and trails, including strobe, on the output video.

Test points and Indicators

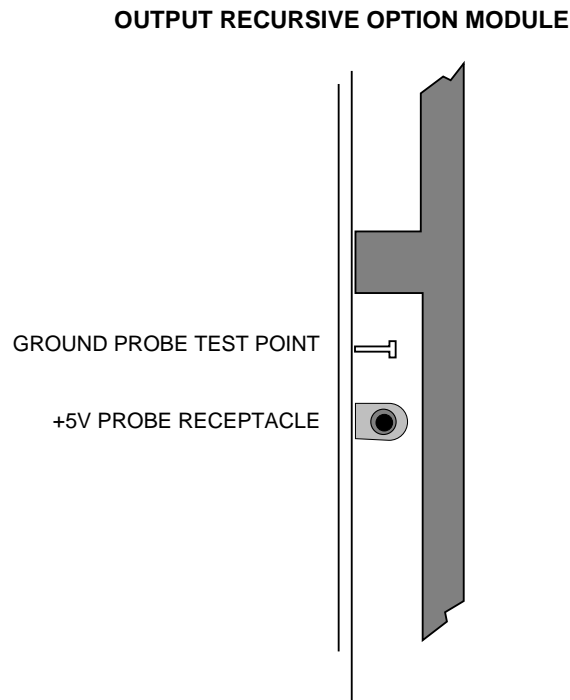


Figure 4-35. Output Recursive Module Test Points and Indicators

Major Functions

The major functions of the module include the following:

- Freeze
- Montage
- Motion decay
- Trails

As shown in the block diagram in [Figure 4-36](#), the basic generation of the noise reduction, freeze, montage, trail, and motion decay functions involves a recursive loop which is accomplished by mixing the current video/key with the recursive frame delayed video in the output memory combiner circuitry. The data paths for luma, chroma and key are almost identical and what is done to one path is also be done to all three.

The memory combiners pass the mixed data to the low pass filter circuitry. Then the data is delayed and read out one frame later from the recursive memory creating a recursive loop.

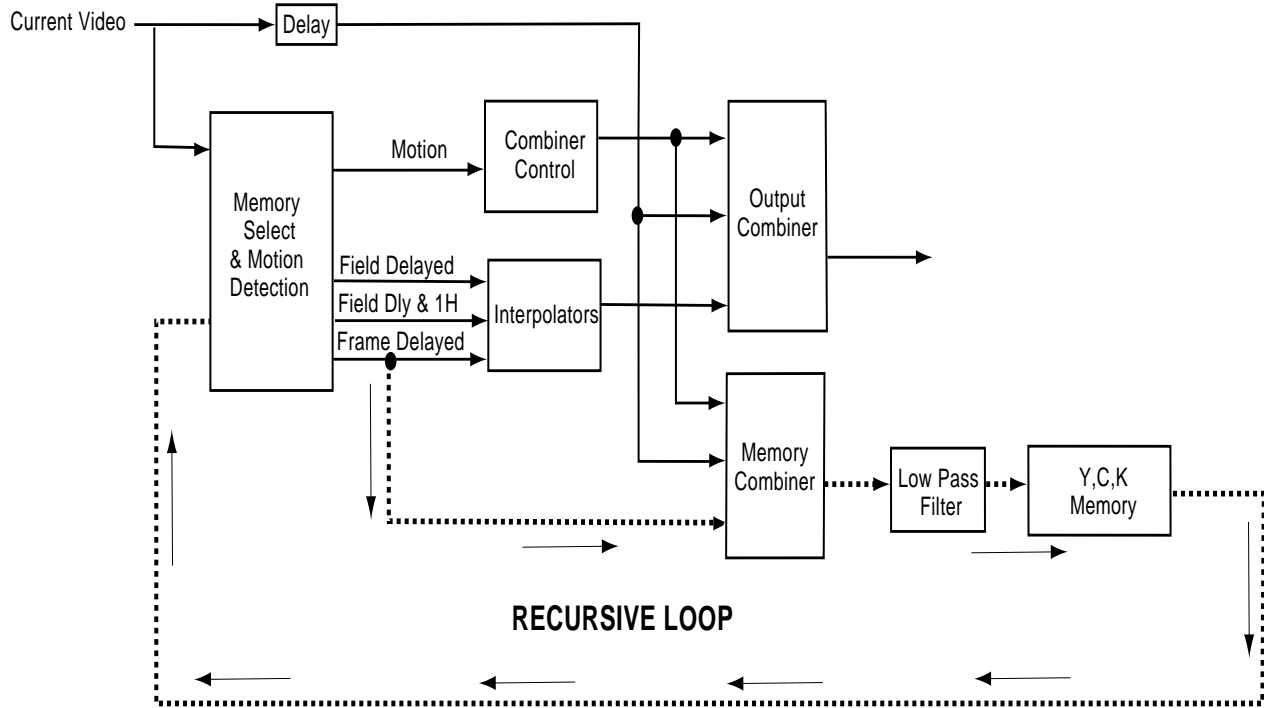


Figure 4-36. Output Recursive Module Simplified Block Diagram

Slot 16: Video Processor CPU Module (066223)

The Video Processor CPU module controls the operation of Video Processor Frame modules, and handles serial communications with video routers and diagnostic terminals.

Test points and Indicators

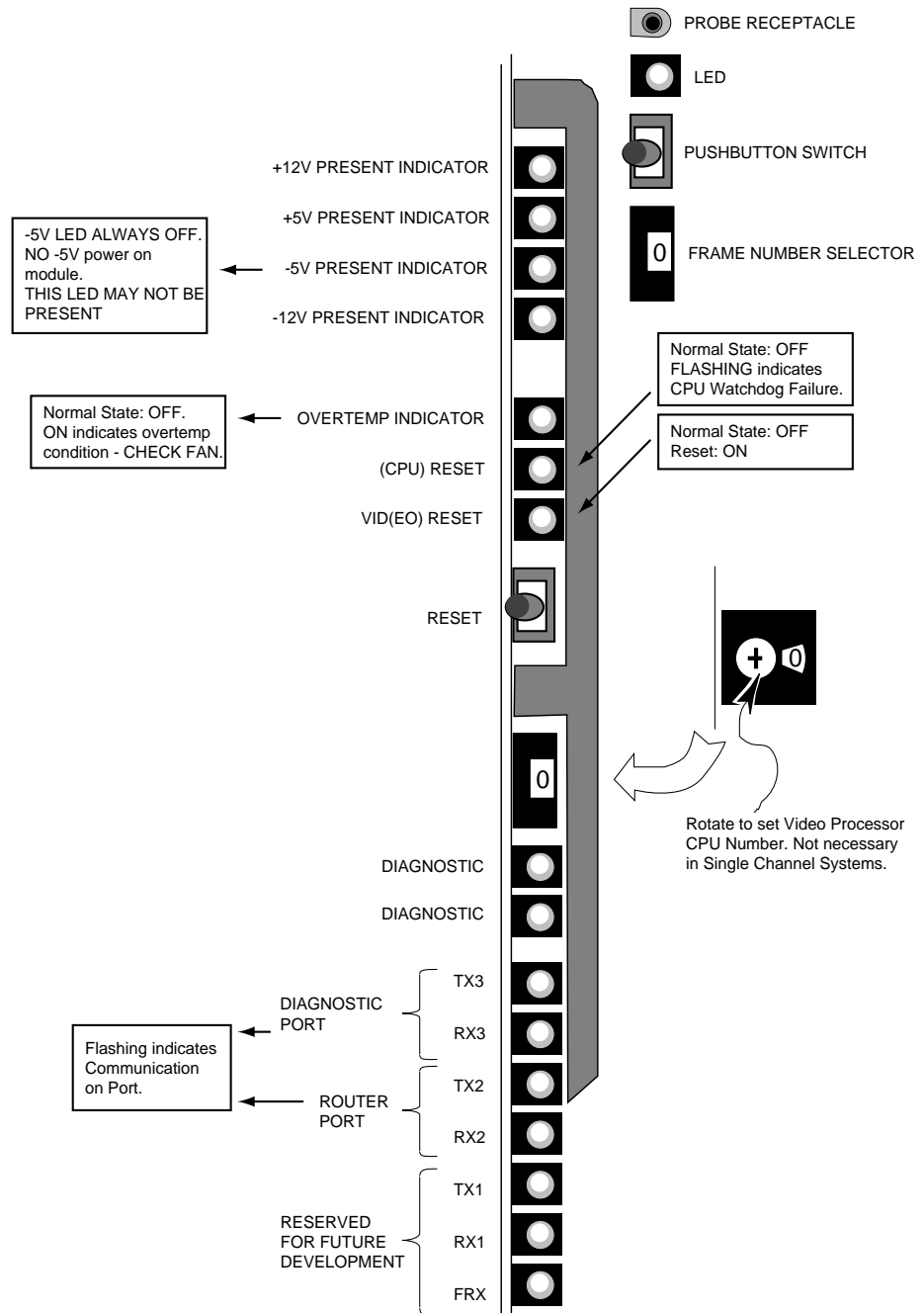


Figure 4-37. Video Processor CPU Test Points and Indicators

Major Functions

Functions performed by the module include:

- Module initialization
- Control signal distribution
- Monitoring
- External router and diagnostics terminal communication

This module is a microprocessor card with serial communications I/O, flash and static memory, and reset and clock generator.

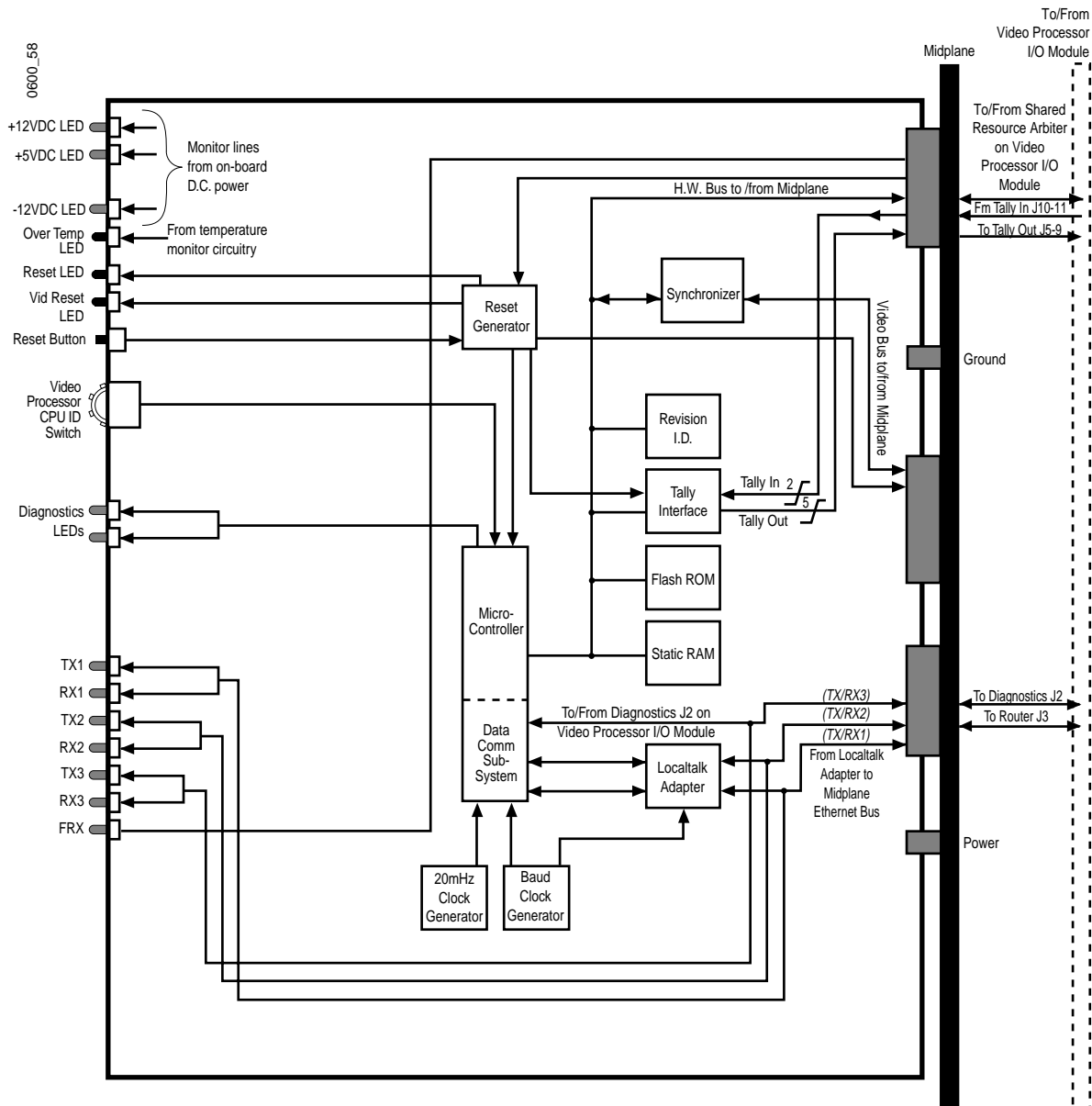


Figure 4-38. Video Processor CPU Module Block Diagram

Slot 17: Effect Manager CPU Module (066224)

The Effect Manager CPU module calculates the parameters needed to produce a video effect, and communicates those values to a Video Processor. In a multi channel system, the Effect Manager CPU is in the Controller frame.

Test points and Indicators

EFFECT MANAGER CPU MODULE

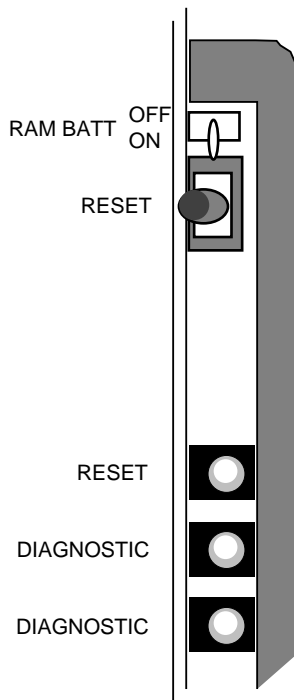


Figure 4-39. Effect Manager CPU Module Test points and Indicators

The Reset LED is normally OFF. If it is flashing, there has been a CPU watchdog timer failure. The Reset Button is used to manually reset the module.

Major Functions

The Effect Manager provides:

- Keyframe (Effects Memory) storage and editing
- Keyframe interpolation
- Diagnostic and reset LEDs
- Keyframe data to hardware control data conversion

CAUTION The Effect Manager contains rechargeable batteries which are used to retain the E-MEM information during short periods when the module is powered Off. Do not set the module on a conductive surface as this may discharge the battery. Always store the E-MEM to disk before you make any changes to the Krystal hardware or software.

This module contains two microprocessors with serial communications I/O, memory, and reset and clock generator. The shared resource arbiter controls the flow of data to the area of the module which is controlled by both processors.

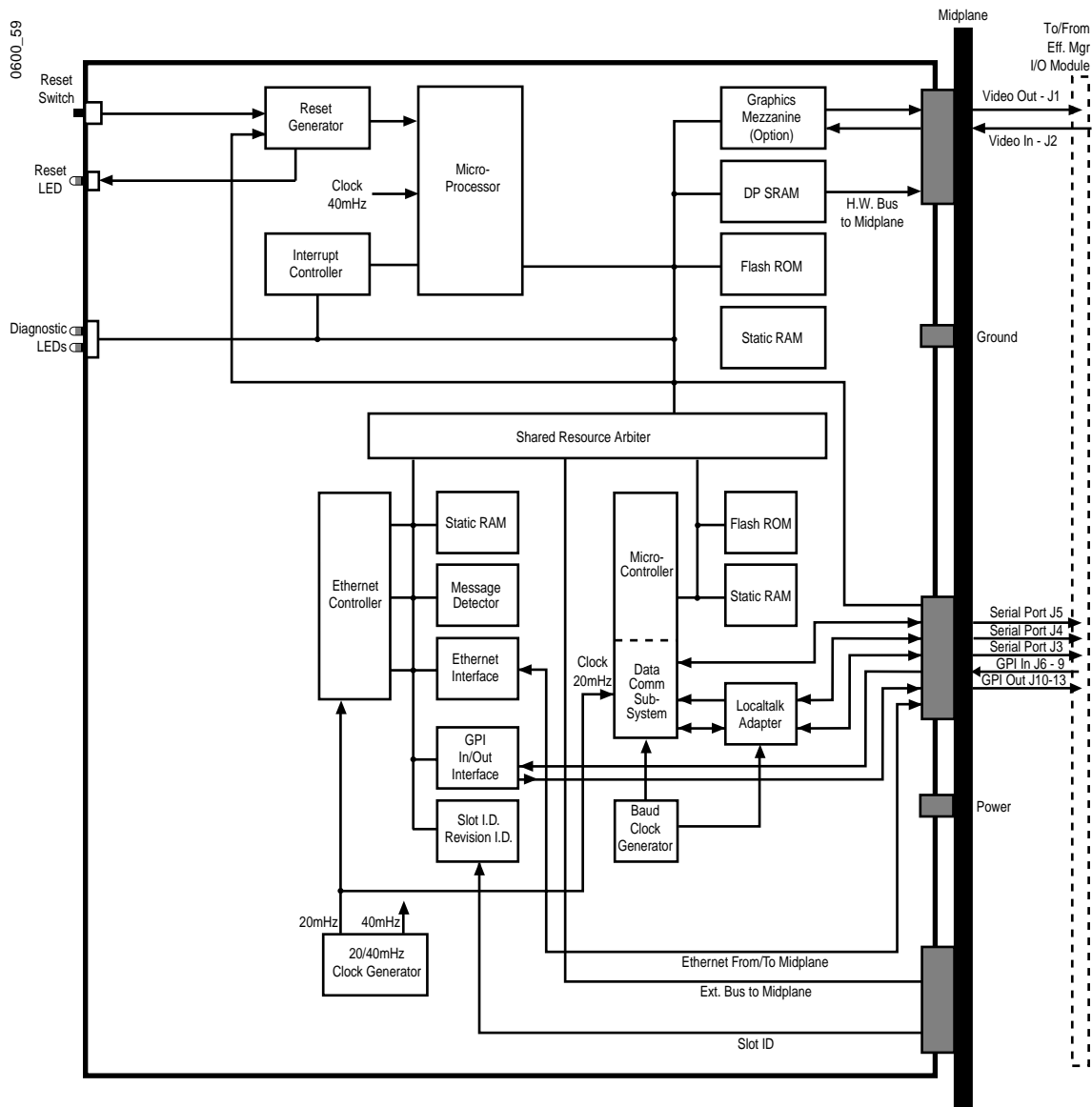


Figure 4-40. Effect Manager CPU Module Block Diagram

Graphics Mezzanine (066239)

The Graphics mezzanine is an optional component that installs on the Effects Manager module.

Test Points and Indicators

There are no user accessible test points or indicators on this mezzanine.

Major Functions

This mezzanine creates graphical wire frame proxies for physical video outputs, screen positioning grids, coordinate and orientation references, and other tools to aid in the creation of complex single or multi-channel effects. Krystal effects may be planned and keyframed with the graphics option without acquiring a physical channel (wireframe channels may be used).

Graphics MPU / VRAM buffer – The graphics microprocessor creates the vector images to be keyer over a (preview) video signal. The VRAM buffer is an image buffer for holding and rasterizing the information drawn by the graphics processor.

Keyer – A video signal is brought onto this mezzanine to serve as a background image that the graphics will key over. Generally this is a Krystal Preview Output.

D1 Video Decoding/Encoding – The background (preview) video signal is deserialized and the keyed output reserialized on the Effects manager I/O. The parallel signal requires D1 decoding and encoding in conjunction with the serial I/O components to add or strip SAV /EAV sequences, prevent data from falsely signally sync words, and so forth. These encoders and decoders are located on the Graphics mezzanine.

Rear Slot 1: Serial Inputs Module (066229)

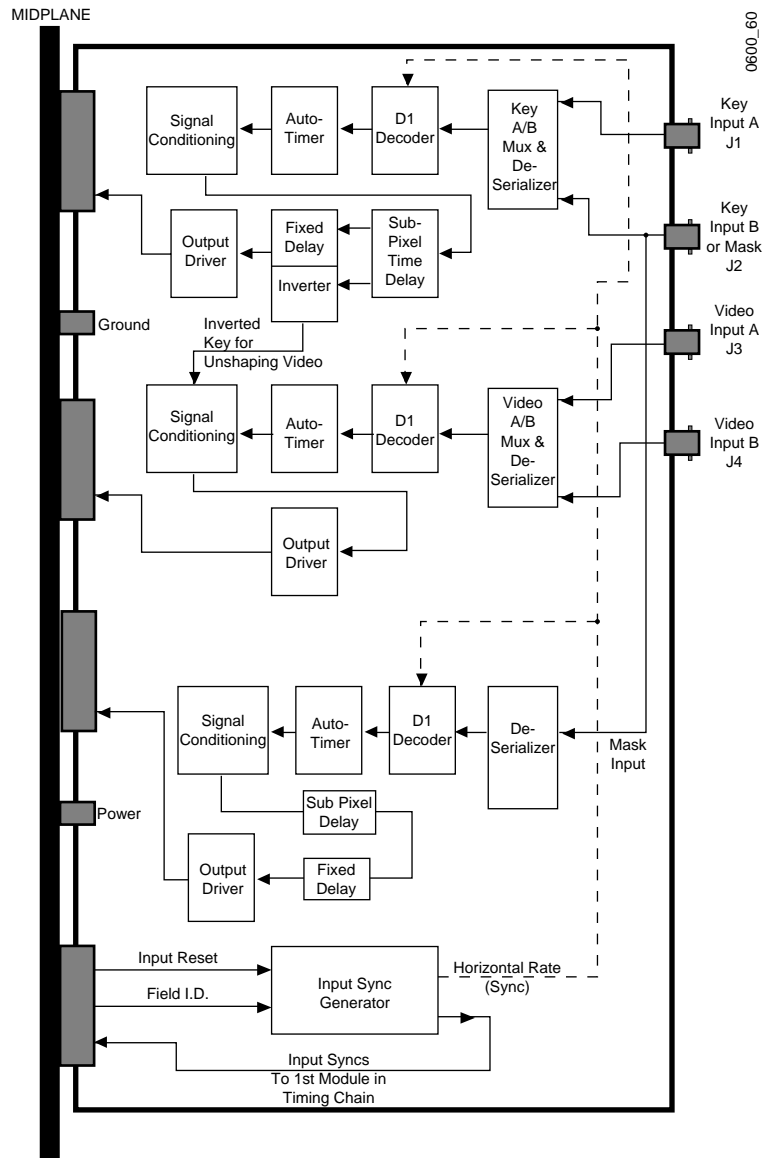


Figure 4-41. Serial Inputs Module Block Diagram

The Serial Inputs module converts serial digital video inputs to parallel format for processing within the Video Processor Frame.

Major Functions

The Serial Inputs module accepts video, key, and mask information in 525 or 625 component digital serial format via four BNC connectors. The incoming video can, optionally, be unshaped by the incoming key signal.

Key input A (J3) is always a key signal. Key input B (J4) may be software configured as either a key or mask input signal.

The video and key/mask inputs first pass through independent A/B selectors, where either of the two external signals (A or B), for video and key, may be selected. Signals then pass through a decoder, where a timing error signal is extracted and passed to on-board auto-timing hardware. A variable delay, determined by the Control Microprocessor and auto-timing hardware, is applied to the signal. Signal conditioning is then applied followed by a sub-pixel delay. The signals are then adjusted for delay offset and passed to an output driver.

Under software control, the video output of the Serial Inputs module can be replaced with a selected test pattern.

All signals leaving the module have the same timing.

Rear Slot 3: Reference Generator Module (066228)

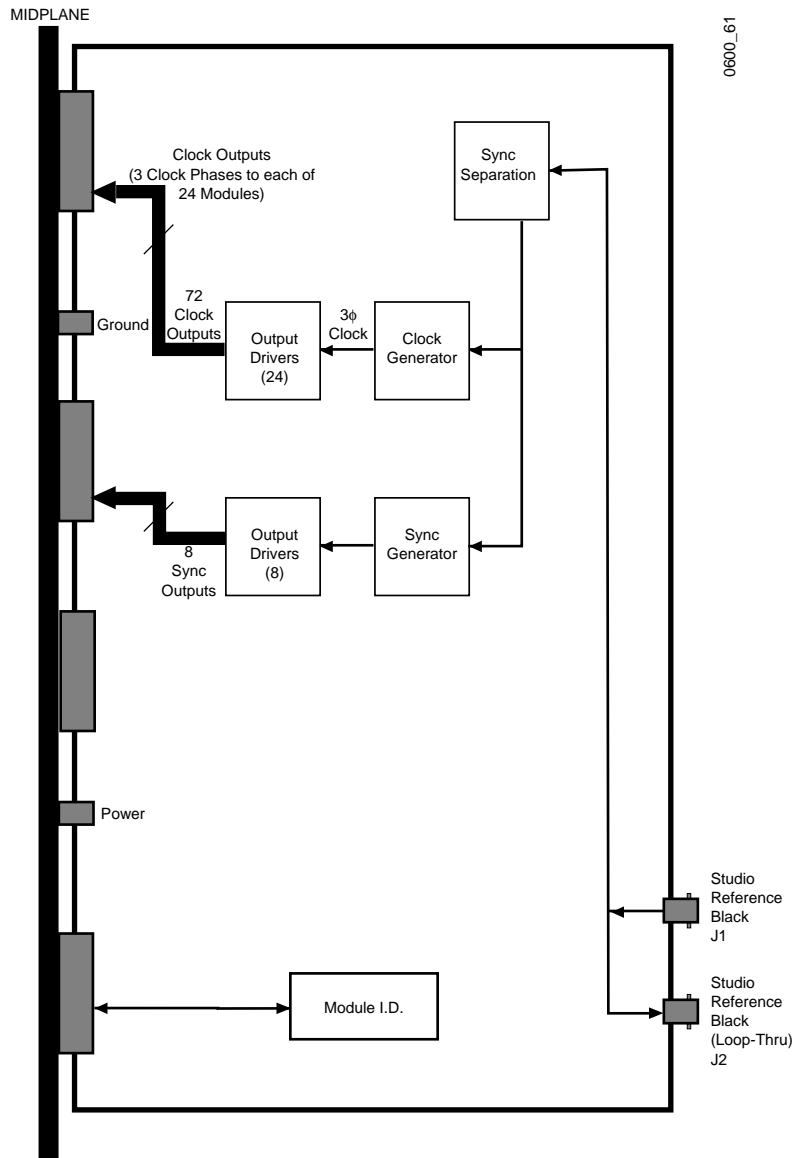


Figure 4-42. Reference Generator Module Block Diagram

The Reference Generator module derives the clock pulses needed by the modules in the Video Processing Frame from a PAL or NTSC analog reference input.

Major Functions

The Reference Generator module accepts a studio black video reference source via a loop-through back panel BNC pair. BNC connectors allow “daisy-chaining” of the reference black to additional equipment. If the loop-through BNC is not used, it should be terminated in 75 ohms. The ref-

erence signal may be a PAL, NTSC, or monochrome video signal whose field and line frequencies correspond with those of PAL or NTSC television standards. The signal should have a nominal amplitude of 1.0Vp-p (sync tip to white). Color reference burst and active video information are superfluous.

The module produces pixel rate clock signals synchronized to the analog reference black input. The module also produces sync signals which are distributed to other modules in the frame. Each module in the chain adds appropriate delay, allowing the signals to remain in sync. Sync information is also sent to the Serial Inputs module which houses the input sync generator. This data re-synchronizes the generator once per field, and also provides a field reference to the input generator. This field information is then passed to the Video Processor CPU. The clock frequency is 13.5 MHz. Synchronization signals are adjustable from five lines early to five lines late (relative to the input reference).

Rear Slot 15: Serial Outputs Module (066227)

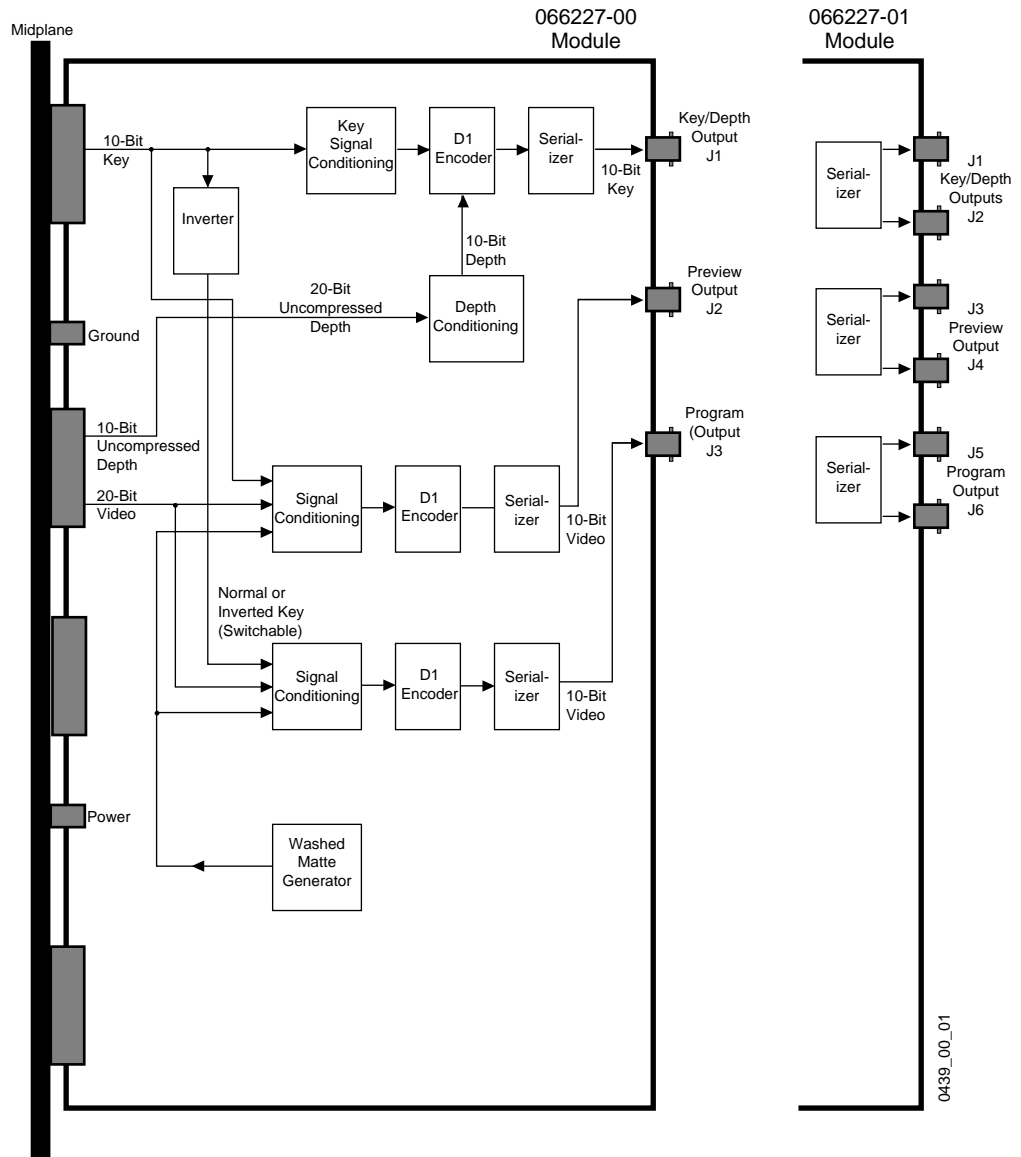


Figure 4-43. Serial Outputs Module Block Diagram

The Serial Video Output module converts the internally processed parallel format video into serial digital video for output on the frames BNC connectors. Two types of Serial Output modules exist that are functionally identical except for the number of connectors available. Older versions (066227-00) have one Program, one Preview, and one Key signal output BNC connectors. Newer versions (066227-01) have two Program, two Preview, and two Key output BNC connectors (Figure 4-43). The newer version module requires v3.0.1 or later software.

Major Functions

The Outputs module processes video, key, and depth inputs from the interpolators for component serial output. It takes horizontally oriented parallel video signals as inputs and outputs standard component serial video signals conforming to CCIR 610 standards.

Video input signals are, under software control, conditioned and mixed with a washed matte, encoded, and converted to serial format before being output as Program and Preview outputs via BNC connectors on the back panel of the Video Processor frame.

The Key signal is passed through an inverter. The output of the inverter is passed to signal conditioning for both the preview and program video outputs. Under software control, the inverter output to program video output may be either inverted or non-inverted.

A 20-bit depth input is encoded to a standard 10-bit signal and replaces the chroma information on the key signal before being output. The key signal is then serialized and output to a BNC connector on the back panel of the frame.

Note The Krystal depth format is identical to the Kaleidoscope depth format.

Rear Slot 16: Video Processor I/O Modules (066226, 066237)

The Video Processor I/O module is the main interface between the Video Processor module and the Effect Manager module. There are two versions of Video Processor I/O modules, a Single Channel System VP I/O (066226) and a Multi Channel System VP I/O (066237)

Major Functions

- Receives VP PARAM data (field-based, real-time hardware data) and VP COMM (polled serial data) from the Effect Manager and translates and sends this information to the Video Processor.
- External serial communications (Router, Diagnostics port).
- GPI inputs
- Ethernet communication with Control Panel (Single Channel system only)

The differences between the single and multi channel versions are described below.

Single Channel VP I/O

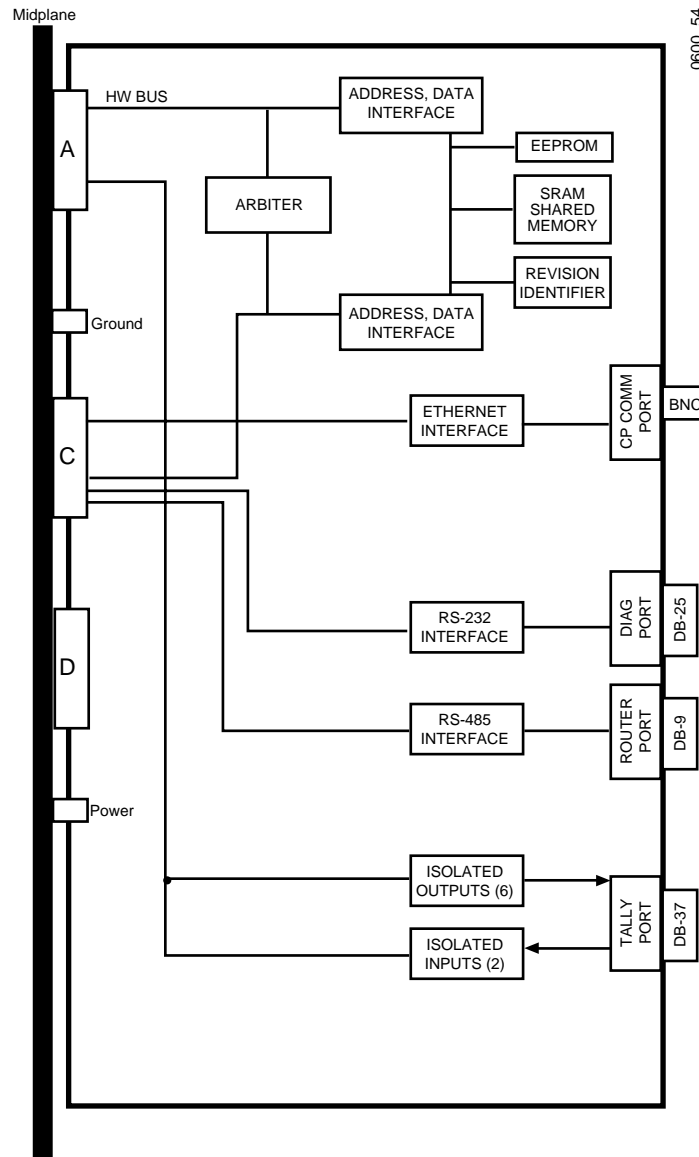


Figure 4-44. Single Channel Video Processor I/O Block Diagram

The Single Channel VP I/O module (Figure 4-44) buffers communication signals between the Video Processor and external devices (except for Ethernet messages which are relayed to the Effect Manager through the backplane). This module also contains shared memory which is used as a communication interface between the Effect Manager, Video Processor, and the Com Proc located on the Effect Manager.

In a single channel system, system parameters are stored in non-volatile RAM on the VP I/O module.

Multi-Channel VP I/O

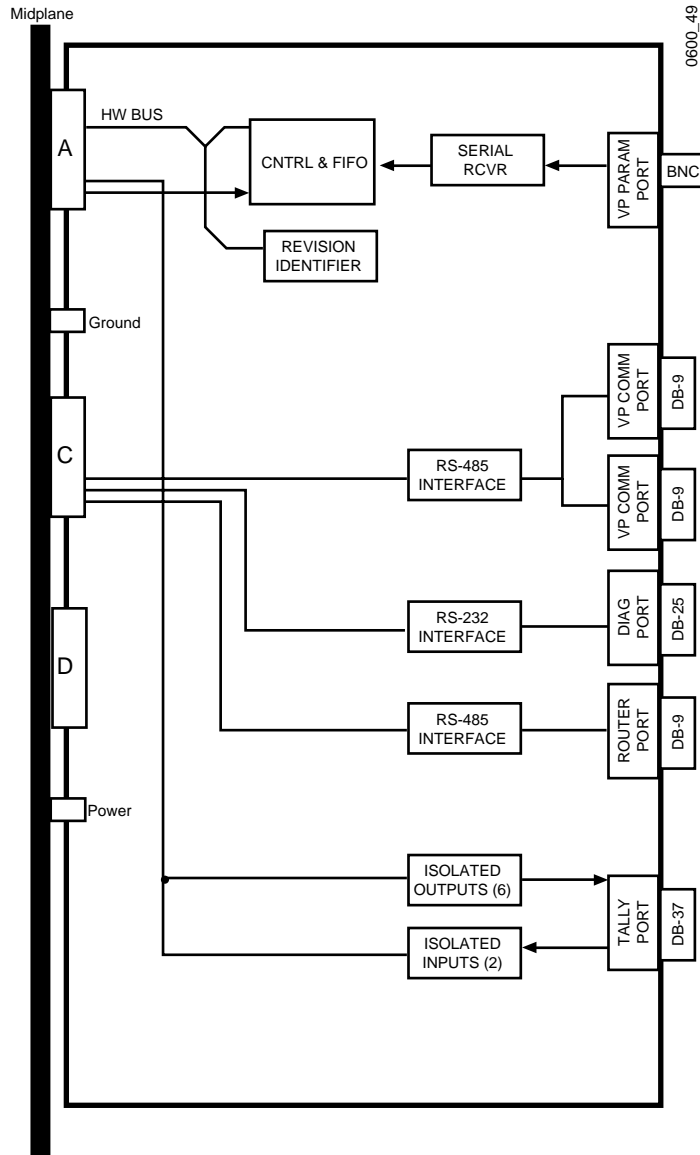


Figure 4-45. Multi-channel Video Processor I/O Block Diagram

The multi-channel VP I/O module (Figure 4-45) receives the VP Parameter data (field-based, real-time hardware data) through a 75 ohm coaxial cable connection from the Resource Manager I/O module which resides in the System Controller frame. It then translates and sends this information to the Video Processor through the midplane.

The multi-channel module sends and receives VP Communication information through an RS-485 (DB-9) connection to and from the Resource Manager I/O in the System Controller frame. Two DB-9 ports are available

on each VP I/O module to for looping between Video Processor frames if more than one frame is present. The VP communications link requires a termination at the last VP I/O module.

In a multi-channel system, system parameters are stored in non-volatile RAM on the Resource Manager module.

Rear Slot 17: Effect Manager I/O Module (066225)

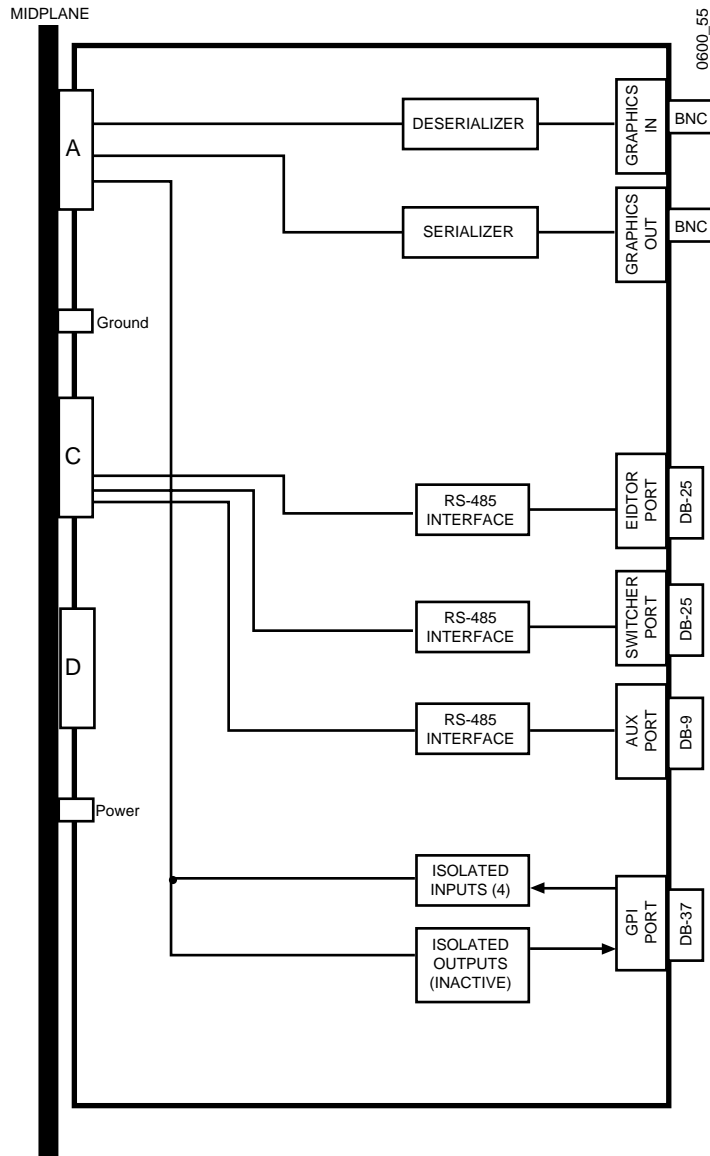


Figure 4-46. Video Processor I/O Block Diagram

The Effect Manager I/O module contains buffers, level shifters, serializers, and deserializers which translate signals between internal Krystal and the external connectors on the module.

Large System Controller Frame Modules

The Large System Controller frame contains the following modules, some of which are the same as those in the Small System Controller frame:

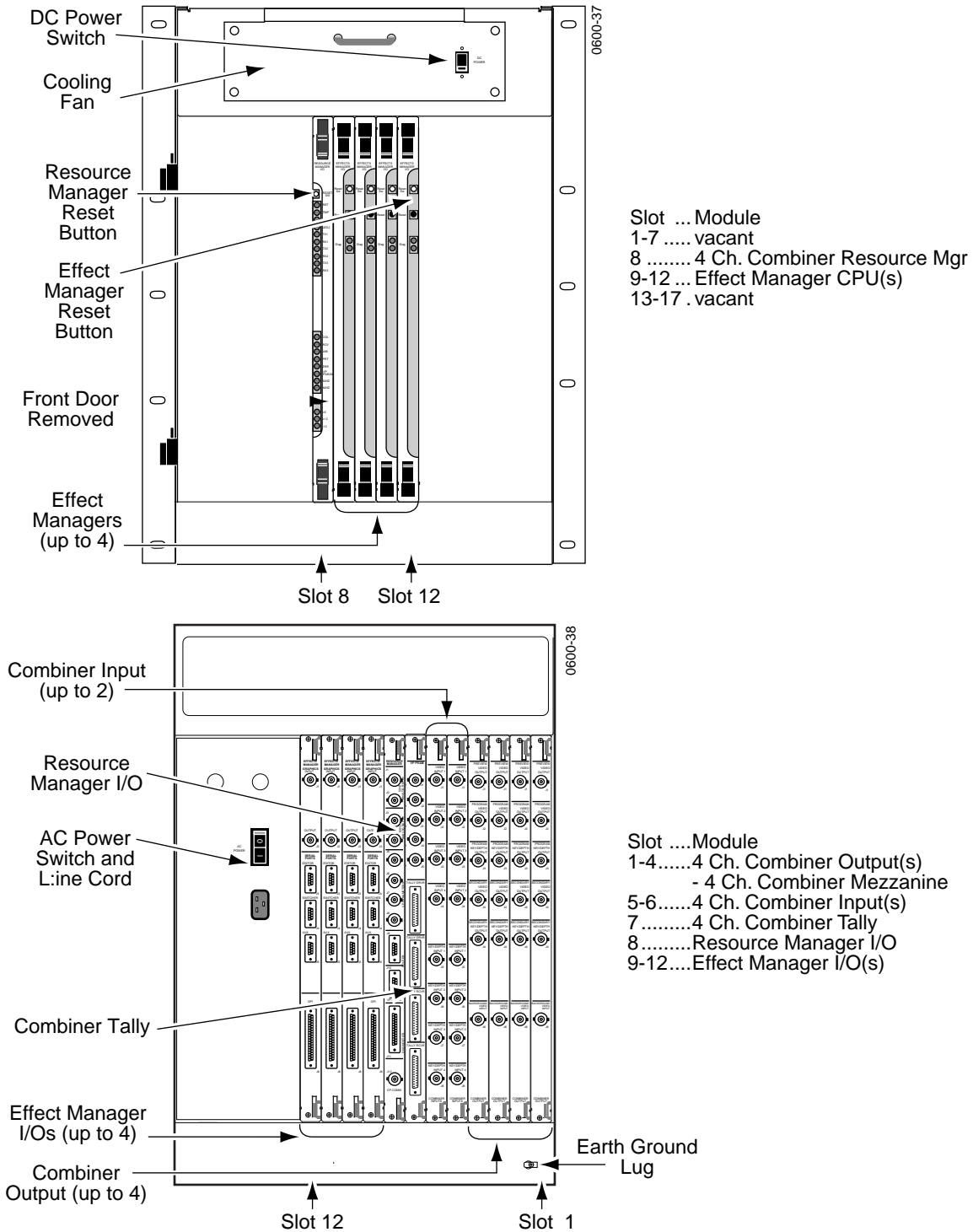


Figure 4-47. Large System Controller Modules

Slot 8: Four Ch. Combiner Resource Manager CPU Module (066295)

The Large System Controller uses a different Resource Manager CPU module from that used in a Small System Controller. These modules are functionally identical, with only a few significant differences noted below.

The Large System Controller Resource Manager CPU communication with up to four Effect Managers, while the Small System Controller Resource Manager communicates with up to two Effect Managers. The Large System Controller Resource Manager communicates with the Four Channel Combiner modules via a parallel bus interface, while the Small System Controller Resource Manager communicates with the 2 x 2 Combiner modules via a serial interface (TAXI). See *Slot 3: Resource Manager CPU Module (066230)* on page 4-69 and see [Figure 4-2](#) on page 4-3 for more information.

Slots 9 to 12: Effect Manager CPU (066224)

On multi-channel systems equipped with a Large System Controller up to four Effect Manager CPU modules can be installed. Install multiple modules in ascending order, as labeled on the Large System Controller frame. The number of Effect Managers installed determines the number of concurrent users.

The Effect Manager CPU module is described in *Slot 17: Effect Manager CPU Module (066224)* on page 4-47

Rear Slots 1 to 4: Four Channel Combiner Output Module (066294)

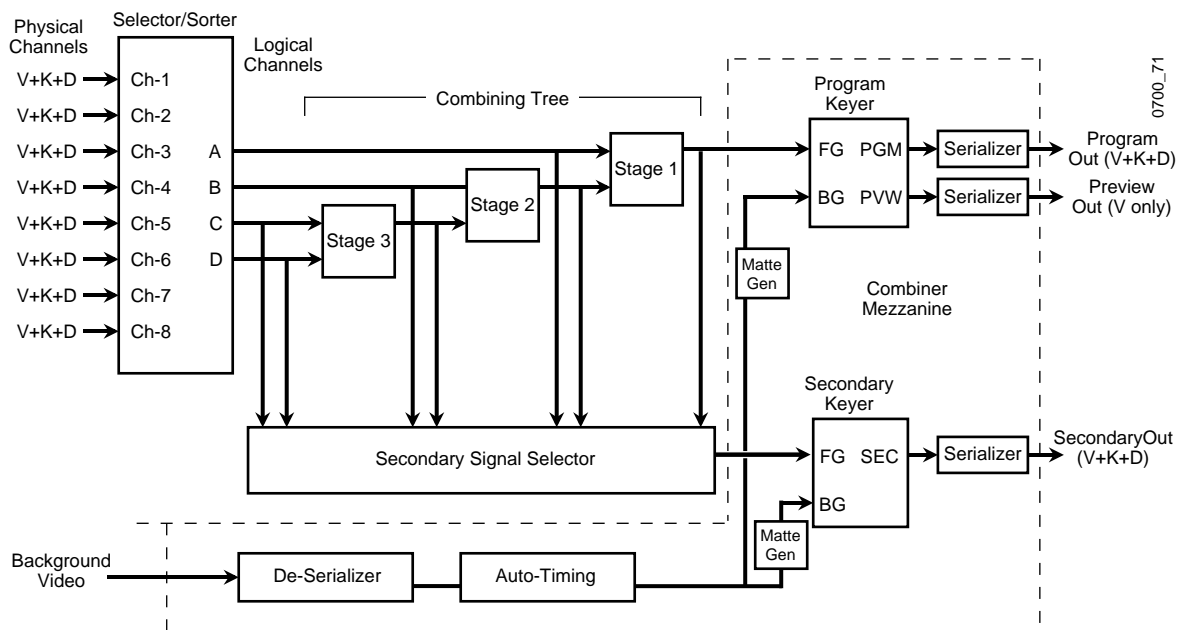


Figure 4-48. Four Channel Combiner Output Block Diagram

The Four Channel Combiner/Output Module combines video images from (up to) four Krystal DPM frames into a single program output. It also creates Preview and Secondary output signals to augment the primary (program) output increasing utility of the system. Typically each Four Channel Combiner/Output Module within a large system controller frame correspond to a dedicated user site (edit suite). Up to four combiner output modules may reside in a single frame. They all share the same set of input signals. Install multiple modules in ascending order, as labeled on the Large System Controller frame. The number of Combiner Output modules installed should match the number of installed Effect Managers.

Test Points and Indicators

There are no user accessible indicators or test points.

Major Functions

Virtually all signal processing occurring within the combiner system happens on these modules (and their companion mezzanines, the Four Channel Combiner mezzanines). The block diagram illustrates the signal path for both the main module and mezzanine together. Both are required for the system to function.

Video, Depth, and Key information for each of up to eight Krystal Channels are brought to this module from the mid-plane signal buses. Four of the eight inputs may be selected for combining. A selector / sorter re-maps the physical channels into logical channels based on fixed or depth priority and feeds them to a three stage combiner tree. The combiner tree merges these video signals into a single shaped video stream that is fed to the Combiner mezzanine. The Combiner mezzanine has a downstream keyer that superimposes the video signal over a background signal according to the video's key channel. The background signal is either an internally generated matte or an external video source. The program video keyer also provides a preview signal output.

A secondary output channel exists. It is fed from a selector that can duplicate the program output, tap any stage within the combiner tree, or select any logical channel. The secondary output has its own keyer and can superimpose the selected video/key over its own matte source or the external background video signal.

All output signals are serialized and transmitted according to SMPTE-259M serial digital protocol.

Channel Selector / Sorter – The selector / sorter converts physical channel assignments (CH 1-8) into four logical channels (A-D). Connections from physical to logical buses may be fixed assignment or dynamically swapped (depth sorted). The sorter forms the heart of the true depth combiner modes as dynamic priority rearrangement occurs on a pixel by pixel basis based on the relative depths of all the pixels involved.

Combiner Stages 1-3 – All combiner elemental stages are 2 input, 1 output mixer / compositors. They are capable of performing the full set of compositing operations (Lucas Film / Porter-Duff operators). The combiner elements in the tree are arranged in fixed order. Layer re-prioritizing is accomplished with the Channel Selector / Sorter. All three combiners may have their respective modes set independently. The user interface allows complete flexibility in assigning each stage's mode (e.g. Stage 1 might be in depth mode, while stage 2 can be set to "Channel OVER Previous" and so forth).

Secondary Output Selector – The secondary selector function allows a variety of internal signals to be routed to the secondary output of the combiner. Any of the assigned logical channels or combiner stage outputs may be chosen. In addition to the simple signal tapping function the Secondary Output Selector can cooperate with the combiner tree to isolate pathways placing them onto the secondary and removing them from the primary/program path, (ISO modes). In this way four acquired channels may be organized into two groups to effectively yield a dual, multichannel system. For example the secondary output is set to isolate the output of the Stage 3 combiner logical channels C and D combine and drive the secondary output. The stage 2 simply passes logical channel B, effectively ignoring the stage 3 output. Stage 1 combines channels A and B. The system is now effectively partitioned into two dual-channel systems. The program output is the A/B system and the secondary is the C/D system.

When the Secondary path selects a logical channel as its source the effects of the dynamic channel re-assignment (due to depth sorting) does not affect the observed signal. The true logical channel is always viewed on the secondary output regardless of how it may be instantaneously fed into the combiner tree. But the combiner stage outputs are subject to this dynamic reassignment. Viewing the combiner stage outputs while depth sorting is occurring can produce unusual and unintuitive looking images.

The Four Channel Combiner Mezzanine (066297)

The Four Channel Combiner mezzanine is an extension of the main Four Channel Combiner Output Module. Both boards are required in a functioning system. For a description of its place in the signal path see the Four Channel Combiner Block Diagram ([Figure 4-48](#)).

Major Functions

The mezzanine provides two major functions: Background keying for the primary and secondary outputs, and serial digital transmission. The Primary and Secondary outputs can produce Video + Key + Depth, each two BNC connectors are required to support each output. Transmission of depth information may be blocked creating a key only output signal. This may be necessary for some types of receiving equipment that do not inter-

pret the depth data correctly (e.g. a serial digital to component analog video converter). The Preview output provides shaped video only without a key.

Background Deserializer and Auto-timing – An external video source is brought onto the mezzanine in serial digital form. The deserializer converts the signal to a parallel digital format. The auto-timer re-synchronizes the signal to the nearest horizontal blanking interval of the reference, setting the output timing to match the combiner stage output at the inputs to the keyers.

Program / Preview Keyer – This block furnishes a background keying function. The combined video signal may simply be passed on through the block, keyed over a matte signal generated in the block, or keyed over a background video signal. The internal matte generator produces either a flat or wash matte. The program output video can be formatted as “shaped” or “unshaped”. The preview output is a shaped copy of the program output; its chief intent is to supply a feed to the graphics overlay option.

Secondary Keyer – The secondary output path has a separate and independent keyer. It is identical to the program keyer except that it does not have a preview output. The matte generator is separate and independent from the program keyer matte generator. The background video signal is common to both keyers. The secondary output video can be formatted as “shaped” or “unshaped”. The output may be suppressed entirely (providing a “clear” output signal).

Serializers – These convert the parallel digital CCIR-601 video and key/depth streams into serial digital streams (SMPTE-259M) at 270Mbits/sec. The key signals are modified by scaling and offset to map the key value numeric range into a black to white luminance range of values for transmission. Depth codes are adjusted to prevent an inadvertent insertion of sync words into the signals.

Rear Slots 5 and 6: Four Channel Combiner Input Module (066293)

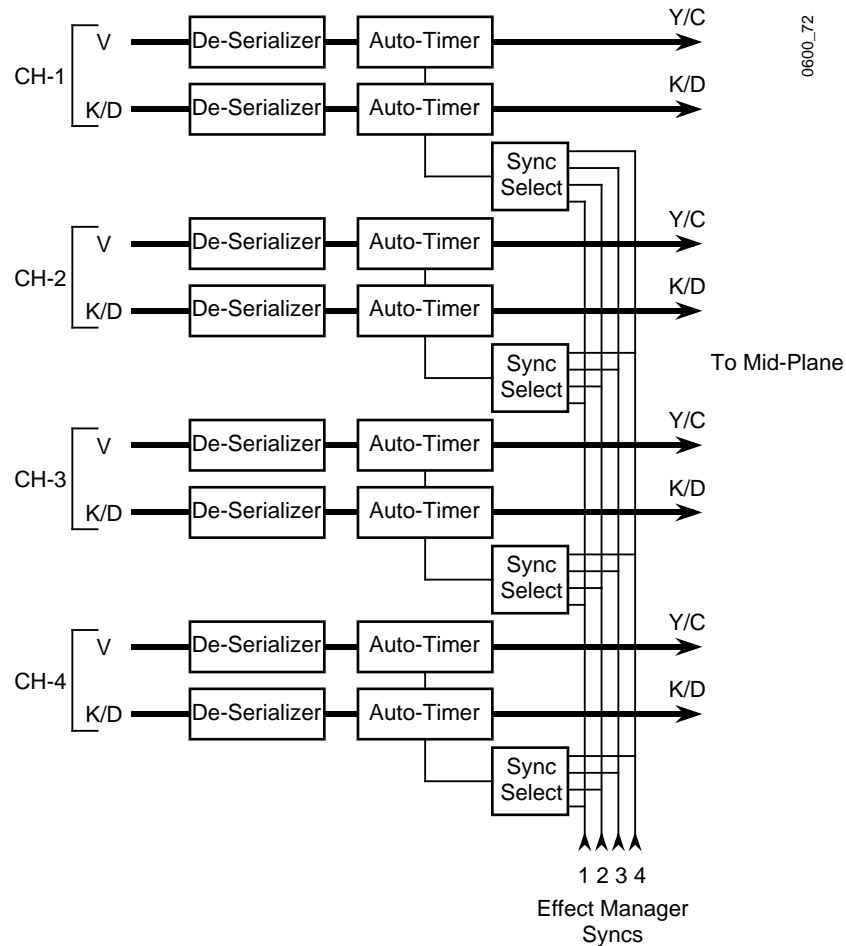


Figure 4-49. Four Channel Combiner Input Block Diagram

The Four Channel Combiner Input Module accepts four Video + Key/Depth data signals from Krystal Channels. Two inputs modules provide a Large System Controller frame with a full complement of eight input channels. Install multiple modules in ascending order, as labeled on the Large System Controller frame.

Test Points and Indicators

There are no user accessible indicators or test points.

Major Functions

Incoming Video, Key, and Depth information is in serial digital (SMPTE 259M) format @ 270Mbits/sec. The Four channel Combiner deserializes the inputs data, re-times it to a selected reference, and drives the resulting parallel data onto the combiner frame mid-plane.

De-Serializer – This block accepts SMPTE-259M, 270 MBits/sec serial digital video and key/depth data and creates 10 bit parallel (CCIR-601) video data streams.

Auto-Timer – Auto-timers delay the input sequence and produce an output time that is time matched with the selected H sync reference.

Sync Selector – Each Effect Manager (EM) in the system has its own reference timing pulses. When a particular input is acquired by one of the EMs, its corresponding sync is selected by this block. There is no required sync timing relationship between EM reference syncs; in fact it is possible to have one EM operating at 525/60 and another at 625/50 (of course input signals selected by an EM should matched the EM's video standard).

Rear Slot 7: Four Channel Combiner Tally Module (066298)

The Four Channel Combiner Tally module controls system tally signaling for the Large System Controller.

Test Points and Indicators

There are no user accessible test points or indicators on this module.

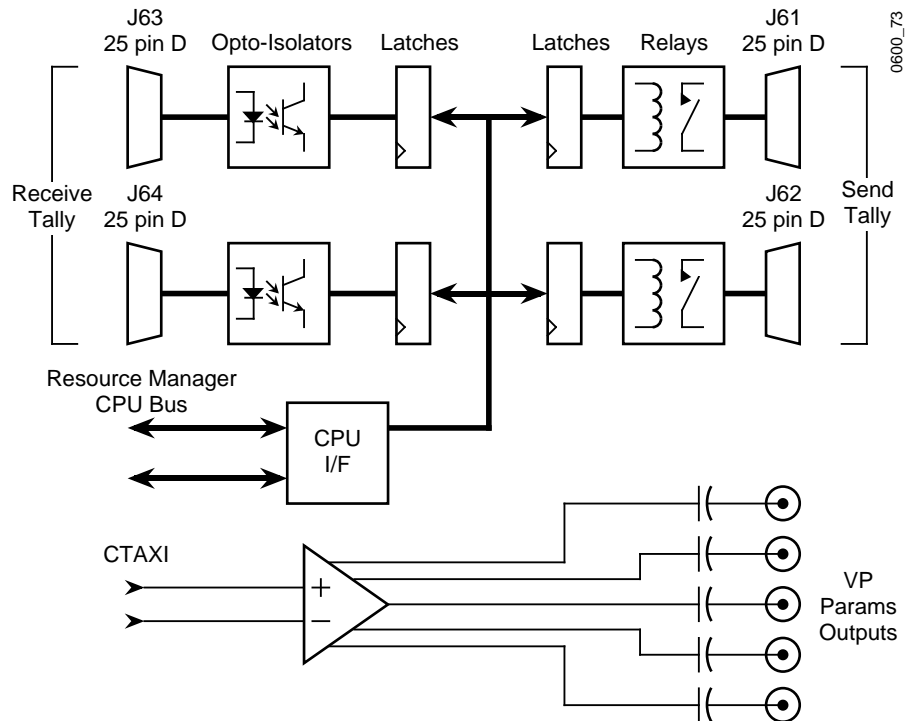


Figure 4-50. Four Channel Combiner Tally Block Diagram

Major Functions

This module receives tally signals (“Tally Sources”) from outside the system and passes this status on to the Resource Manager CPU. It also provides tally relay closures (to “Tally Destinations”) in order to send a tally status to signal origination equipment. Tally inputs and outputs are interfaced to the module through four 25 pin “D” connectors.

Auxiliary distribution outputs for the Resource Manager “VP Parameters” serial data output are located on this module. This circuit is separate from, and does not interact with, the tally functions of the module.

MPU Decoding – There is no on-board processor. The module receives CPU control from the Resource Manager bus. Local address decoding and data I/O allows module identification, tally relay control, and tally source status to be accessed by the Resource Manager CPU.

Tally Source Receivers – Tally sources are simple binary signals that can originate from a wide variety of equipment; but there is no standard format or protocol. They might be voltage driven binary signals or switched DC power signals intended to light tally lamps. To maximize the interface for various possibilities, tally is detected through opto-isolators. Two input wires per incoming signal allow for differential reception. Headers and jumpers on the module allow for a variety tally formats and polarities to be accommodated by reconfiguring the opto-isolator connections to the tally wires. Differential and single ended signals of any polarity can be detected.

Separate Key and Video tally signals for primary and secondary video sources for four combiner systems are provided (16 in all).

Tally Relay Outputs – Tally signals are switched using relays. Each tally relay is driven from a CPU controlled latch. Setting these latches energizes the relays causing their contacts to close. As with the tally receivers each relay is wired out through headers and jumpers to allow two signaling arrangements. Tally output can be simple contact closure (a switch), or jumpers can be set to provide a (current limited) +5V logic output.

Tally output is provided for all video sources to the Large System Controller frame. Wires pairs exist for each of the eight video and key sources, four background sources, a combiner tally, and a “spare” tally relay.

VP Params Driver – A differential high speed serial output signal (TAXI) is buffered and driven from this module. An ECL driver acts as a distribution amplifier creating five “VP Params” signals from the differential TAXI signal. These signals emerge from five BNC connectors mounted on the module. All five outputs are identical copies of the same serial stream.

Rear Slot 8: Resource Manager I/O (066231)

The same Resource Manager I/O module is used in both the Small and Large System Controller. This module is described in *Rear Slot 3: Resource Manager I/O Module (066231)* [on page 4-75](#)

Rear Slots 9 to 12: Effect Manager I/O (066225)

On multi-channel systems equipped with a Large System Controller up to four Effect Manager I/O modules can be installed. Install multiple modules in ascending order, as labeled on the Large System Controller frame.

The Effect Manager I/O module is described in *Rear Slot 17: Effect Manager I/O Module (066225)* [on page 4-59](#).

Small System Controller Frame Modules

The Small System Controller Frame contains the following modules:

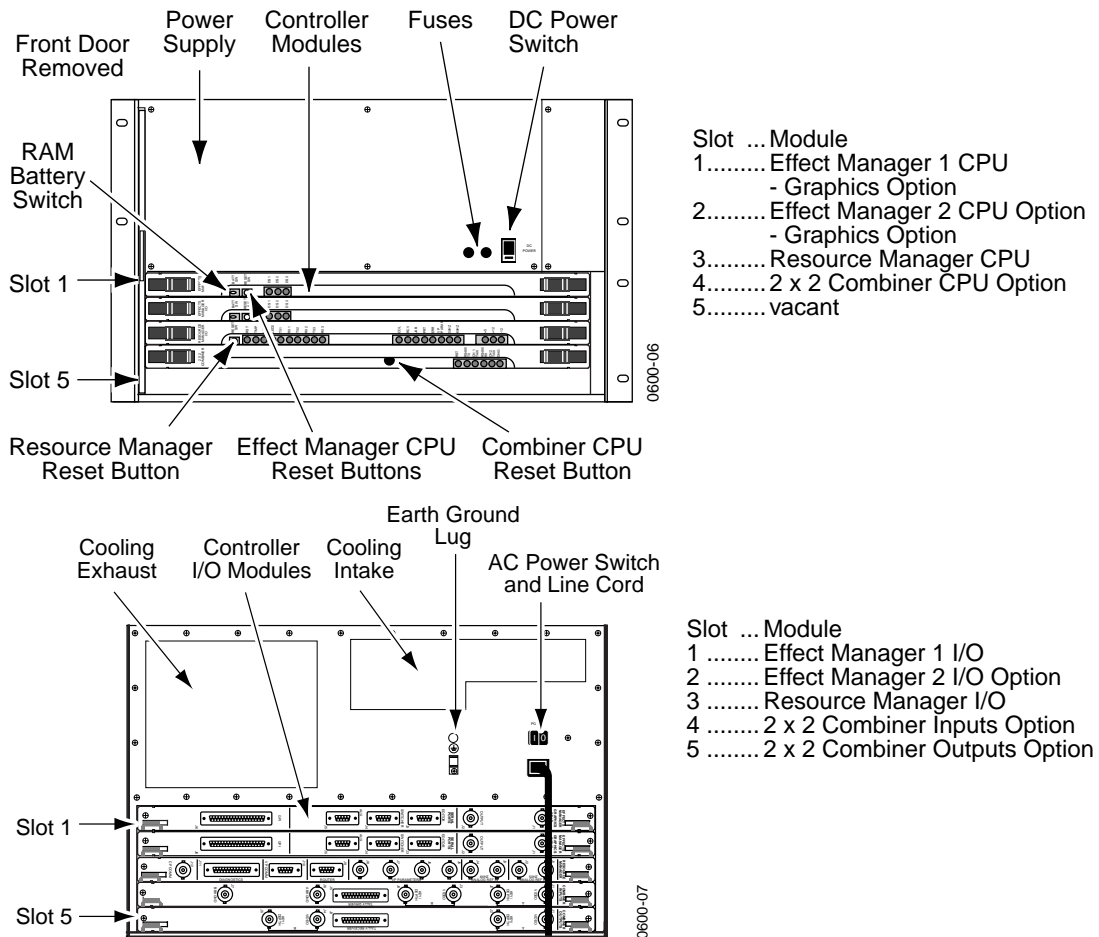


Figure 4-51. Small System Controller Modules

Slots 1 and 2 Effect Manager CPU Module (066224)

On multi-channel systems equipped with a Small System Controller up to two Effect Manager CPU modules can be installed.

The Effect Manager CPU module is described in *Slot 17: Effect Manager CPU Module (066224)* on page 4-47.

Slot 3: Resource Manager CPU Module (066230)

The Resource Manager CPU module is the center of the systems communications between the Control Panel, the Video Processor frames, and Small System Controller frame. The Small System Controller uses a different Resource Manager CPU module from that used in a Large System Controller, though these two modules are functionally similar.

Test points and Indicators

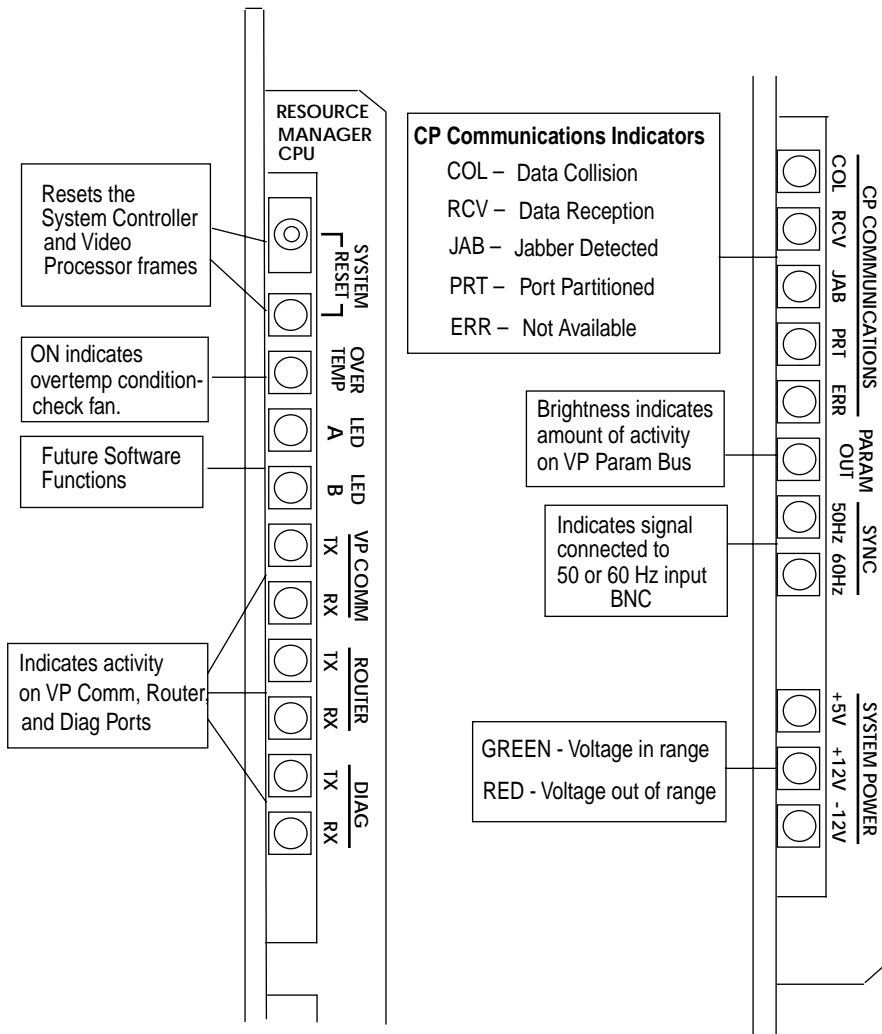


Figure 4-52. Resource Manager Test Points and Indicators

Major Functions

Major functions of this module are listed below. Refer to the Resource Manager CPU module block diagram in [Figure 4-53](#).

System Communication — The Resource Manager CPU module is the center of system communications in a multi-channel Krystal system. One important communication function is that of the VP Param which is the field-based, real-time hardware data parameters sent to each Video Processor frame and Combiner module in the system.

Storage of Non-volatile RAM — This module contains EEPROM circuitry which contains the essential system parameter information.

Sync Generators — This module provides independent sync generators for generating video clocks signals and sync pulses for the system based on the 50 and/or 60 Hz analog input reference signals fed to the Resource Manager I/O module.

System Reset — A system reset function is provided by this module. This allows the System Controller frame and Video Processor frames and Combiner module to be reset from this control. The Control Panel is not included in this reset operation.

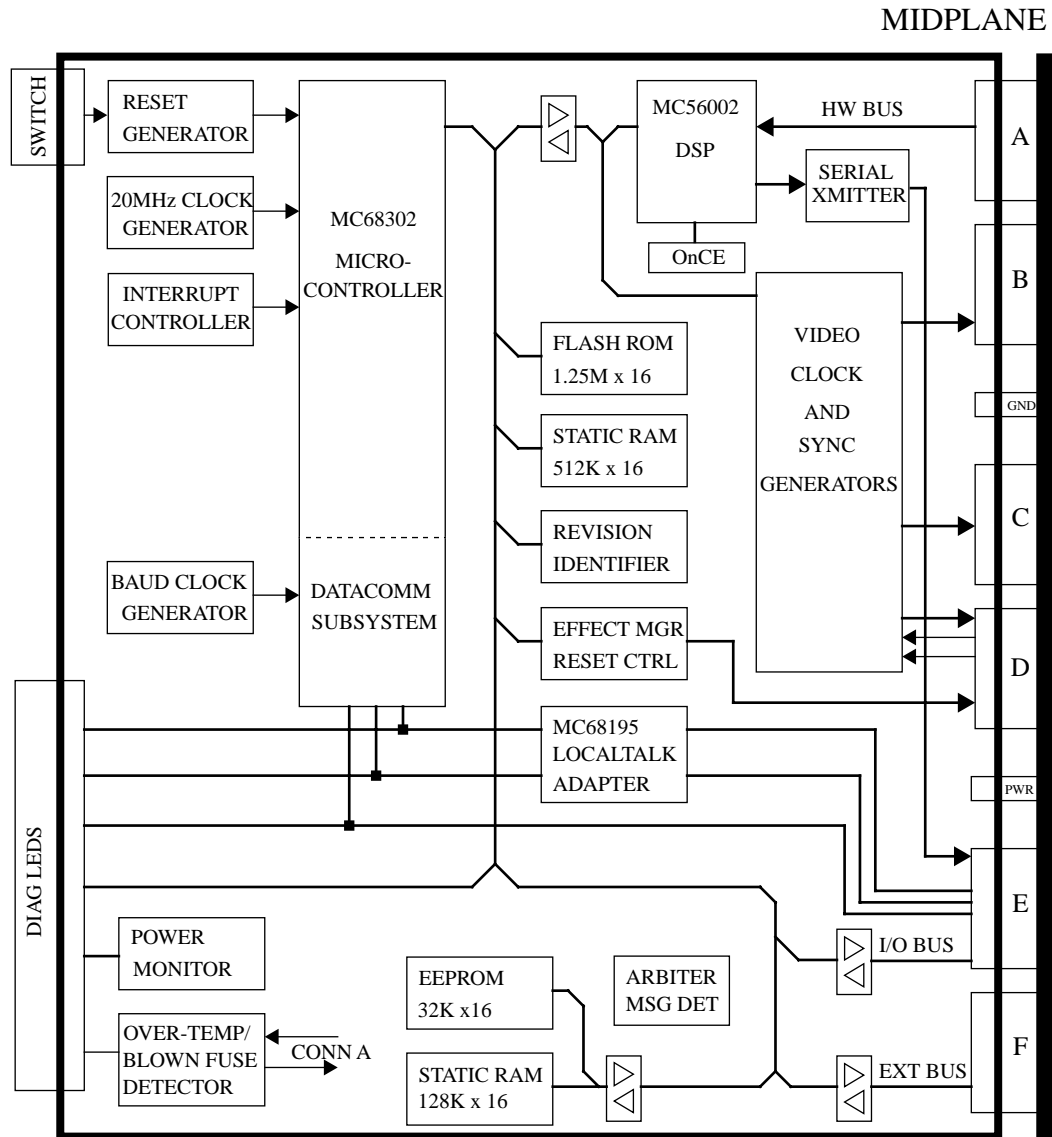


Figure 4-53. Resource Manager CPU Module Block Diagram

Slot 4: 2 x 2 Combiner Module (066240)

The 2 x 2 Combiner module provides mixing and keying circuitry for combining two foreground video and key inputs and a background video-only input in various ways

Test points and Indicators

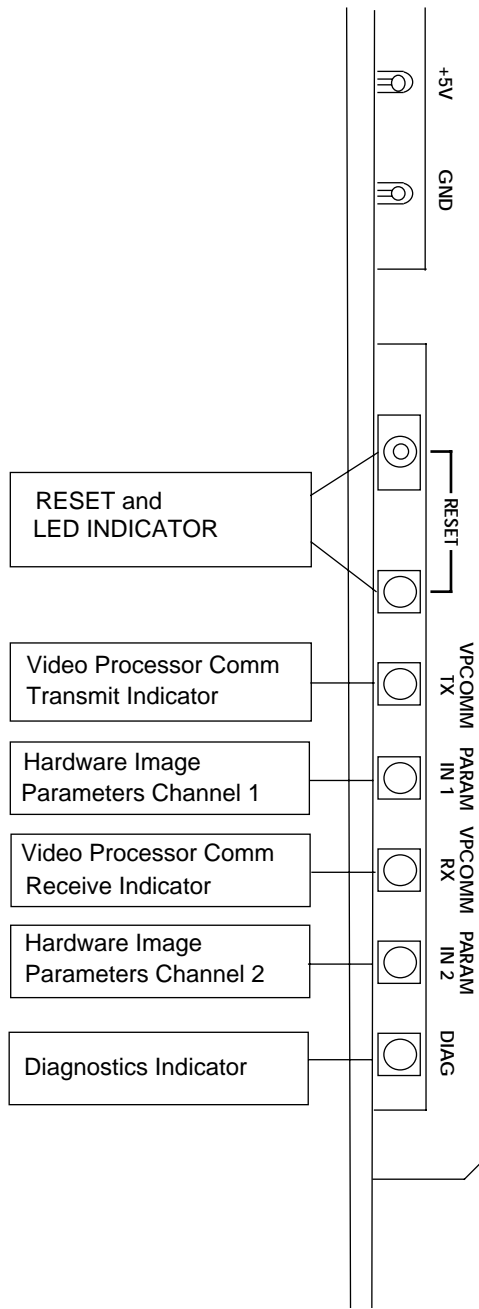


Figure 4-54. 2 x 2 Combiner Test Points and Indicators

Major Functions

Refer to the 2 x 2 Combiner module block diagram in [Figure 4-55](#) for this section. The major functions of this module include the following:

D1 Decoding and Auto Timing — Video enters the module as parallel video from the 2 x 2 Combiner Inputs module. All inputs are then demultiplexed into separate luminance and chrominance or key and depth data streams. The inputs are also auto-timed with respect to horizontal blanking.

Depth Decoding — The depth information has been compressed to fit the data path bandwidth available. The depth information is decompressed and decoded by utilizing Field Programmable Gate Array (FPGA) circuitry. The decoded depth information is converted to a priority signal which is used by the 2 x 2 Combiner circuitry.

2 X 2 Combiner — The 2 x 2 Combiner ASIC circuitry can be set up with software to determine how the incoming Key and Video are combined.

Background Mixers — The output from each 2 x 2 Combiner goes to separate background mixers. Each mixer either passes the foreground video through, unshapes the foreground video, or mixes the background with the foreground video.

Depth Compression — The depth information from the 2 x 2 Combiner circuitry passes through a depth encoding and compression block which consists of FPGA circuitry.

D1 Encoding — The outputs from the Background Mixers and the Depth Compression circuits then pass to D1 Encoders where data is converted back to parallel D1 data streams and are buffered to the 2 x 2 Combiner Outputs module.

Control Circuitry — The microprocessor (MC68302) and related circuitry controls the functions of the module and controls communications with the Resource Manager through a local talk port and a high speed serial data port. Two serial ports also exist that are used for engineering development.

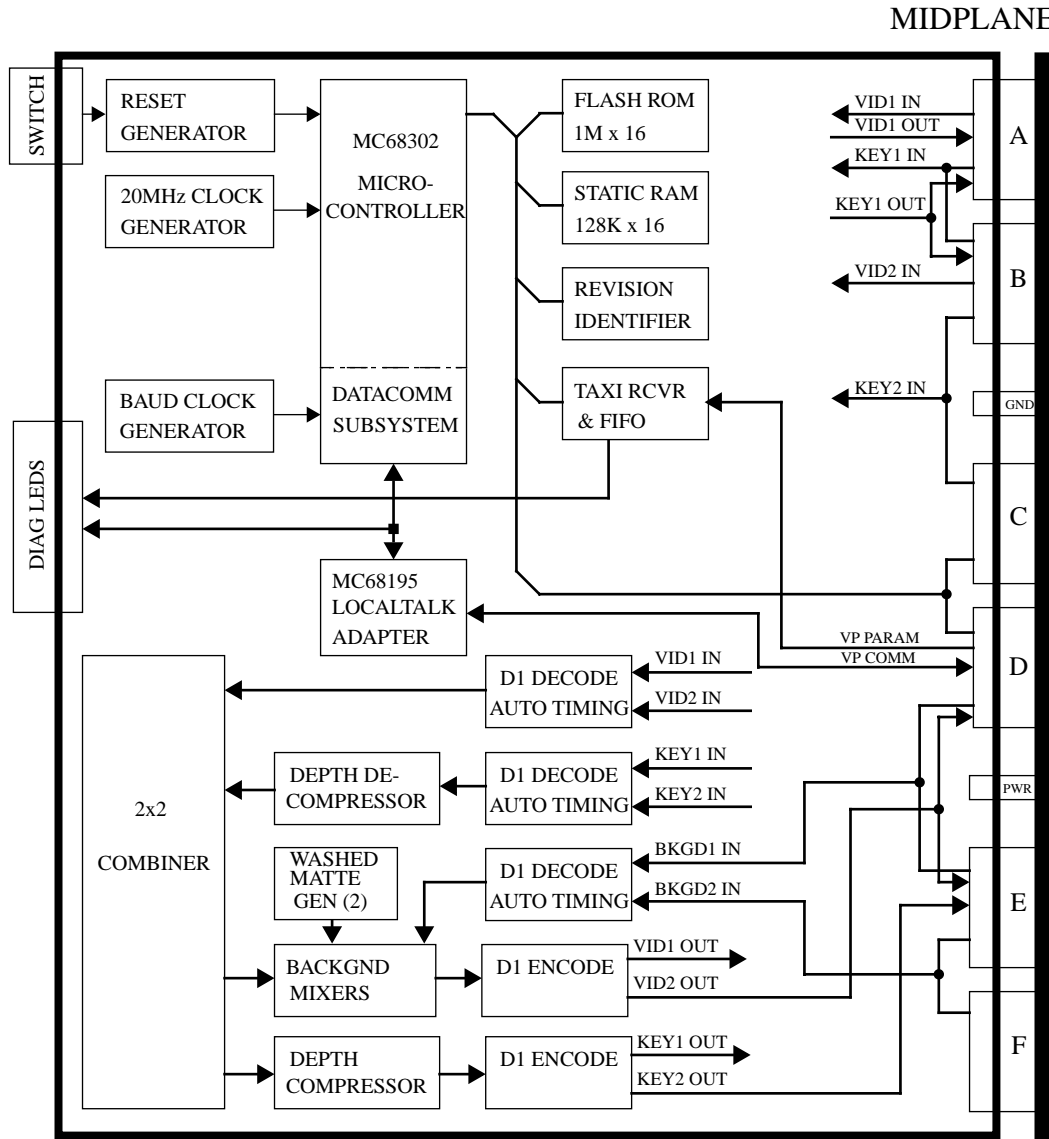


Figure 4-55. 2 X 2 Combiner Module Block Diagram

Rear Slots 1 and 2: Effect Manager I/O (066225)

The Effect Manager I/O module is described in *Rear Slot 17: Effect Manager I/O Module (066225)* on page 4-59.

Rear Slot 3: Resource Manager I/O Module (066231)

The Resource Manager I/O module interfaces between the Resource Manager CPU module and the rest of the Krystal system.

MIDPLANE

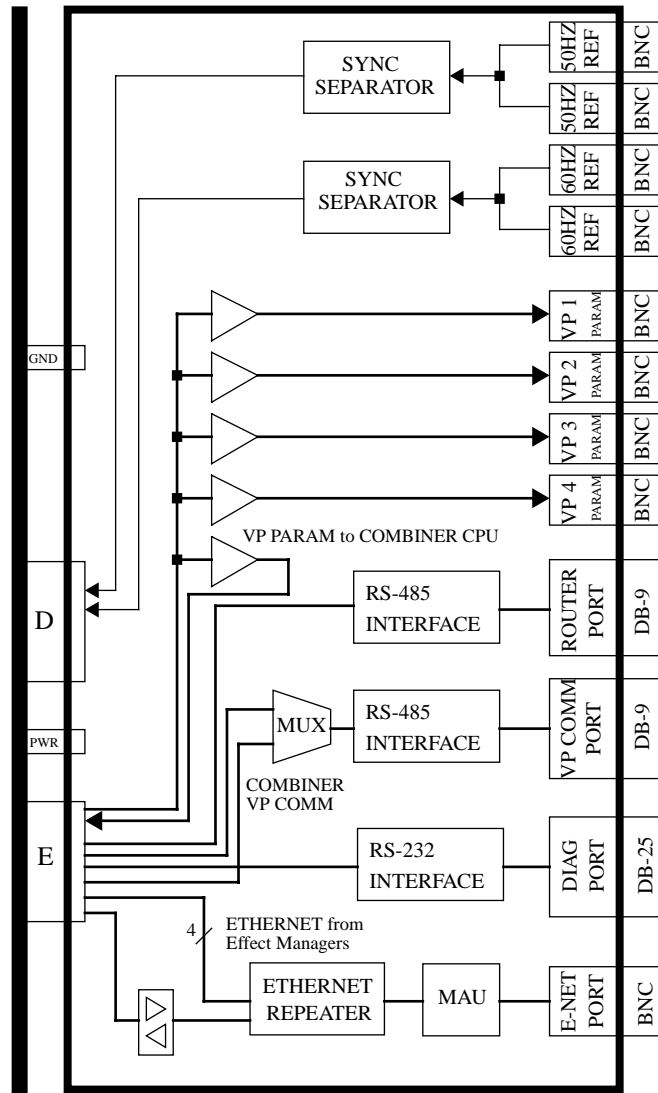


Figure 4-56. Resource Manager I/O Module Block Diagram

Major Functions

The major functions of the module are listed below. The Resource Manager I/O module block diagram is illustrated in [Figure 4-56](#).

50 and 60 Hz Sync Separators — Two sets of looping BNC connectors provide the 50 or 60 Hz reference signal inputs which go through sync separator circuitry then pass through the midplane to the Resource Manager CPU Sync Generator circuitry.

VP Parameter Inputs — There are four output BNCs on the module to send the VP Parameter information (field-based, real-time hardware data) to the Video Processor I/O module in each Video Processor frame present.

VP Comm Port — An RS-485 DB-9 connector port provides the VP communications link between the Resource Manager and the Video Processor I/O (VP I/O). The 2 x 2 Combiner VP Comm connection is also implemented on this module.

Control Panel Communication — A BNC is provided for the sending and receiving of information over the Control Panel Ethernet connection.

Other Ports — Two other serial communication ports are present on the module. One is the Router RS-485 (DB-9) connection and the other is an RS-232 Diagnostic Port (DB-25).

Rear Slot 4: 2 x 2 Combiner Inputs Module (066204)

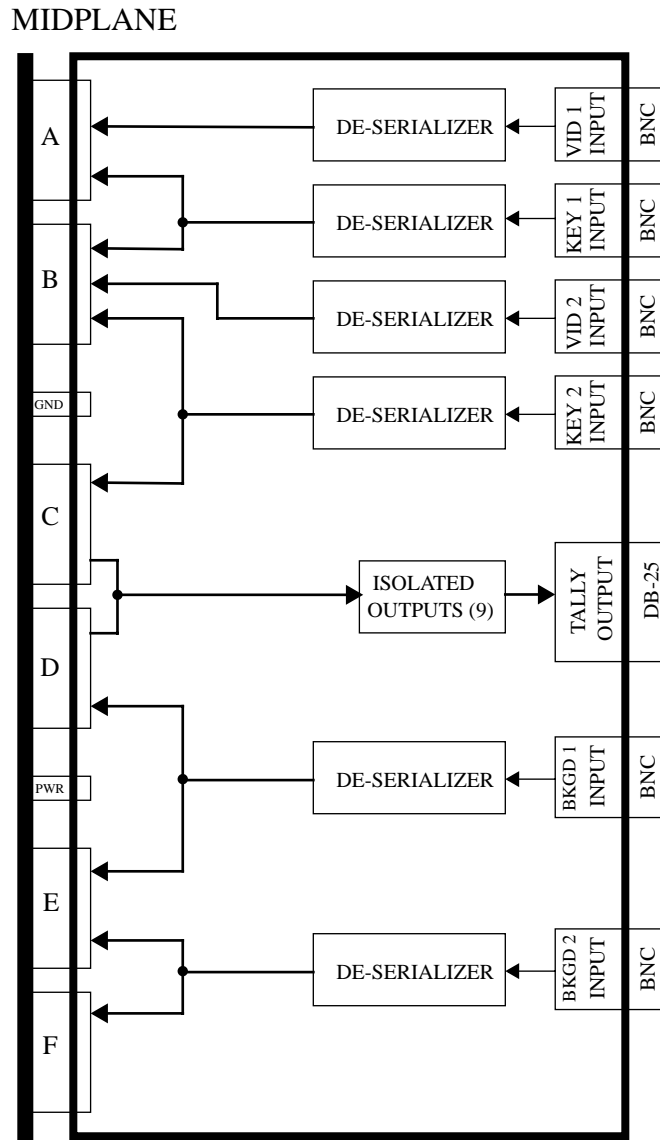


Figure 4-57. 2 x 2 Combiner Inputs Module Block Diagram

The 2 x 2 Combiner Inputs module has six serial video input channels, VID 1, KEY 1, VID 2, KEY 2, BKGD 1, each with a BNC connector (the BKGND 2 input is not active). The video from the Serial Output module in a Video Processor frame is fed to these inputs. Each input deserializes and descrambles the serial video, then sends this parallel data to the 2 x 2 Combiner module through the midplane.

This module also provides 9 tally outputs accessible through a single 25-pin D connector (not functional at this time).

Rear Slot 5: 2 x 2 Combiner Outputs Module (066205)

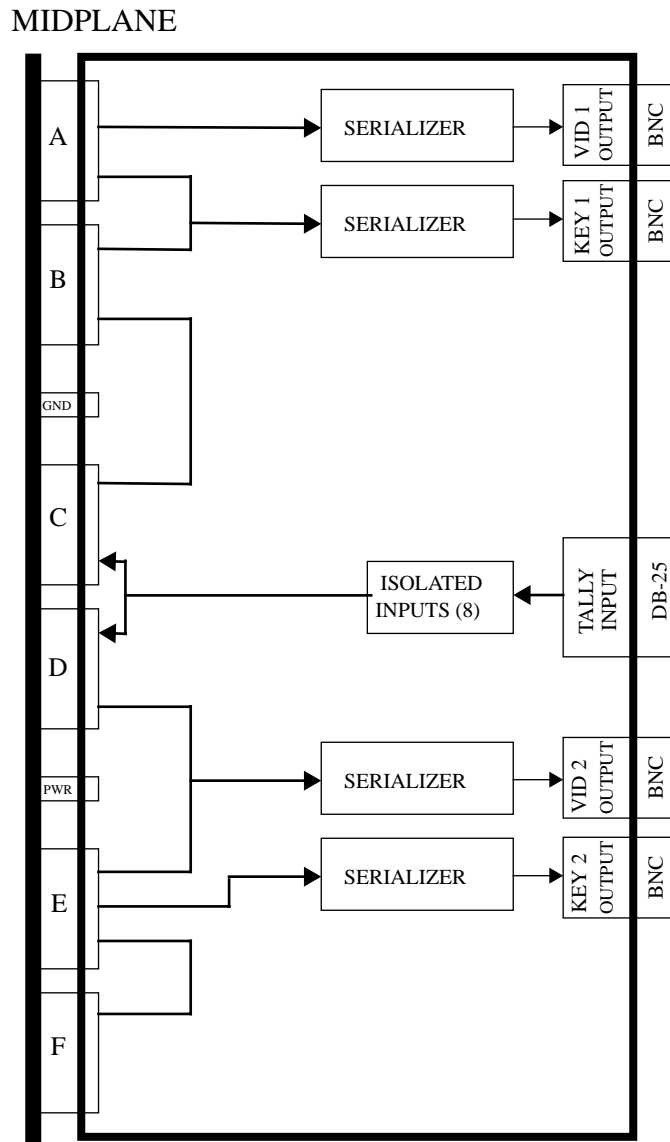


Figure 4-58. 2 x 2 Combiner Outputs Module Block Diagram

Refer to the block diagram in [Figure 4-58](#). The 2 x 2 Combiner Outputs module routes the output video from the 2 x 2 Combiner to BNC connectors on the back of the System Controller frame. There are four serial video output channels, VID 1, KEY 1, VID 2, and KEY 2, each with a BNC connector. Each channel is serialized and scrambled before it is sent to the output BNCs as serial 270Mbit video. Each output channel has a cable driver adjustment which is set at the factory to put the output level at 800mV.

The module also provides 8 opto-isolated tally inputs from a single 25-pin D connector (not functional at this time).

Maintenance

Introduction

This section provides maintenance and safety information for servicing Krystal Video Processors frames, System Controller frames, and Control Panels.

Refer to the Diagnostics and Troubleshooting section for procedures to isolate and resolve specific problems.

Safety Precautions

WARNING Unless specifically directed to do otherwise by a maintenance procedure, turn power off before removing, inserting, or repairing any circuit module or assembly in this system.

Before working on any power supply assembly, turn off the power and disconnect the power cord from the AC power source.

CAUTION When circuit modules are removed, place them on a flat static-controlled surface. Failure to follow this precaution can result in component damage due to electrostatic discharge.

CAUTION Do not operate the electronics frames with their doors open for an extended period of time. Failure to observe this precaution may result in overheating of components.

Note When power to the frame is turned off or modules are removed, data stored in Random Access Memory (RAM) may be lost. To ensure that E-MEM and system configuration data are not lost during maintenance procedures, it is recommended that this data be backed up to diskette before beginning any repair or maintenance procedure.

Service Limitations

Circuit Modules

Krystal DPM circuit modules are *not* designed to be repaired in the field. Failed modules should be replaced.

Multi-layer circuit board and surface-mount manufacturing techniques have been used in these circuit modules. Specialized equipment and training are required to properly repair these modules.

CAUTION Use of improper tools, equipment, or techniques to try to repair Krystal modules could result in potentially expensive damage not covered by warranty.

Power Supplies

Tektronix/Grass Valley Products does not recommend or support field repair of Krystal power supplies. Failed power supplies should be replaced.

WARNING Hazardous currents are present in the power supplies, on the mid-plane, and on circuit modules. Only qualified service personnel should work on the power supply assemblies. Remove all rings and other jewelry when working on equipment that is powered up. Failure to follow this precaution could result in severe shock or potentially expensive damage to your equipment.

Routine Maintenance

Tools Required

Many of the screws used on the Control Panel, Krystal frames, and modules are slotted for torx or flat blade screwdrivers. Some power supply wire connectors are use Phillips head screws. Frame front panel doors are opened and locked using a Phillips screwdriver. LED replacements will require a pair of needlenose pliers.

LED Replacement

During Normal operation, the buttons on the Control Panel light up to indicate their activated state. If an LED in any button fails to illuminate, it should be investigated and replaced if necessary. There are several reasons

lamps in the Control Panel could fail to illuminate. If replacement of the LED fails to restore proper operation, refer to Section 6 – Diagnostics and Troubleshooting for additional techniques to isolate the fault.

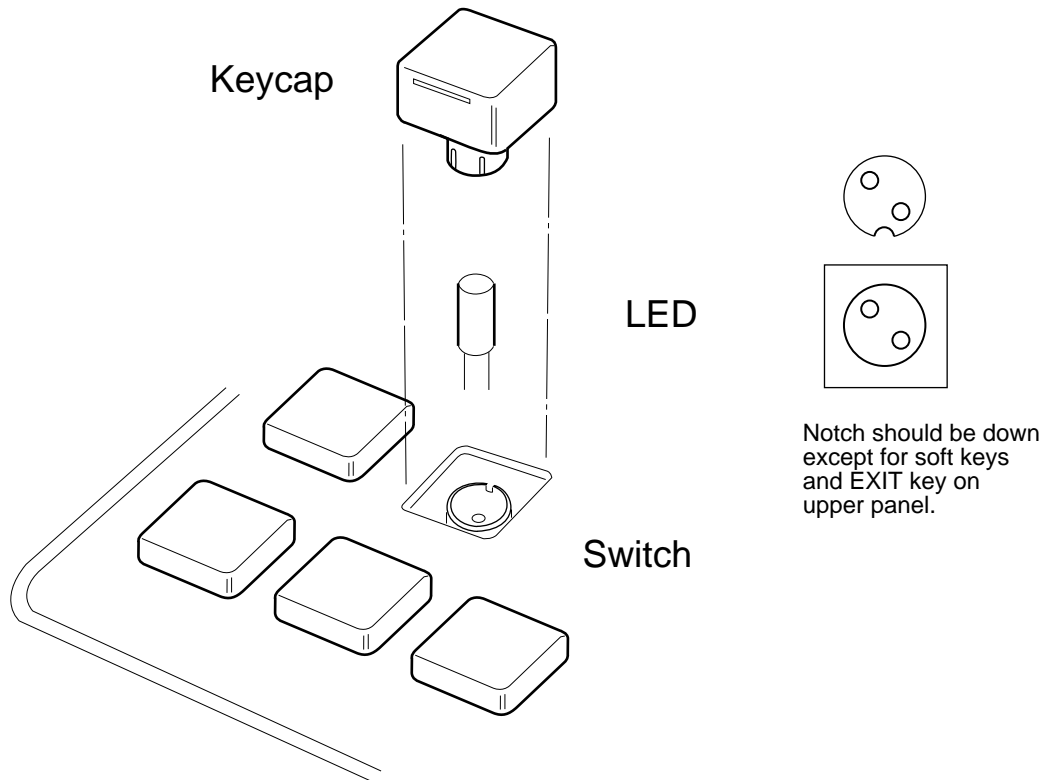


Figure 5-1. LED Replacement (Typical)

To replace a burned-out LED:

1. Pull the keycap up and out of the Control Panel.
2. Pull the LED out of the switch using needle nose pliers.
3. Replace with a new LED, making sure the replacement LED is properly seated in the switch with the correct polarity.
4. Replace the keycap, making sure it is properly seated in the body of the switch.

Cleaning Air Filters

As part of your routine maintenance, you should periodically clean the filters in the Video Processor and System Controller frames.

Video Processor and Large System Controller Frame Filters

1. Open the frame door. The filter is located in a slot below the circuit modules. It has a small, plastic tab-handle (Figure 5-2).

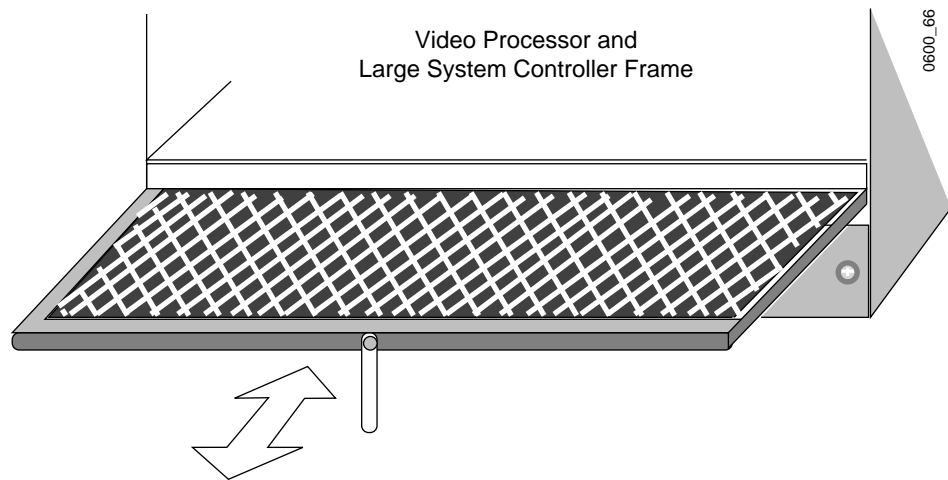


Figure 5-2. Video Processor, Large System Controller Filter Cleaning

2. Grasp the filter tab-handle and pull the filter straight out.
3. Vacuum from the dirty side.
4. If the filter has stubborn stains, wash with soap (no detergent) and water and allow the filter to dry thoroughly before returning it to the frame.
5. Replace the filter in the frame with the metal netting on top.

Small System Controller Frame Filter

1. Open the Small System Controller frame door and remove the filter on the left side of the power supply (Figure 5-3).

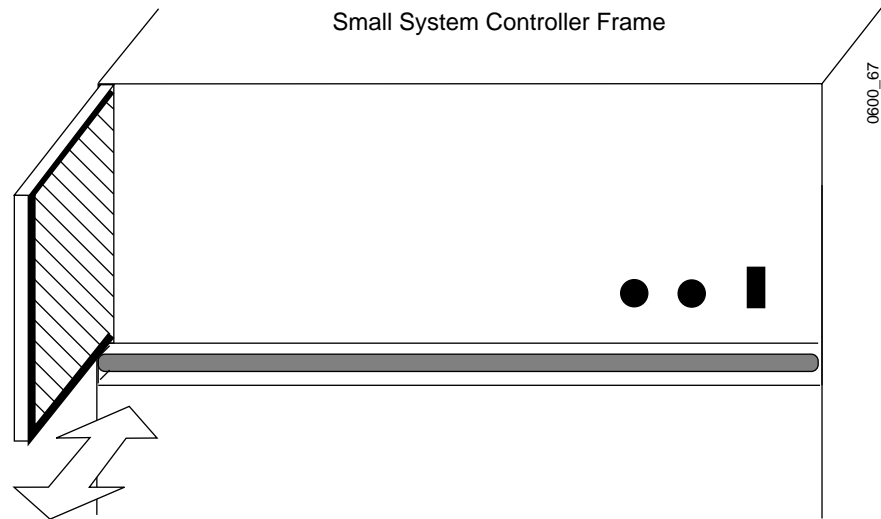


Figure 5-3. Small System Controller Filter Cleaning

2. Clean as described above.
3. Replace the filter in the frame with the metal netting on the inside (right).

Cleaning Control Panel

The surface of the Control Panel should be cleaned with a damp (not wet) soft cloth. Do not use any cleaners and do not spray anything onto the panel. The flat panel display should be cleaned with a damp (not wet) soft cloth using light pressure and a circular motion. Do not use alcohol or other cleaners on the flat panel display.

Cleaning Cooling Fan

In the Video Processor and Large System Controller frame,s the DC switch and the cooling fan are both mounted in a metal assembly which “plugs” into the front of the frame. If the fan is removed, the Protection Board reacts just as though the DC switch had been placed in the “0” position, shutting down the power supply. Otherwise, if the power supply were allowed to continue running with the fan removed, the frame could overheat.

As part of your maintenance routine, the cooling fan should be periodically checked.

To remove the fan:

1. Turn the frame's AC power off and wait for the fan to stop.
2. Open the frame's front door.
3. Remove the two fan door screws shown in step 3 of [Figure 5-4](#)
4. Grasp the fan door handle and pull straight out.

To replace the fan:

5. Engage the fan assembly with the slides shown in step 5 of [Figure 5-4](#).
6. Slide the fan assembly straight into the frame; replace the retaining screws

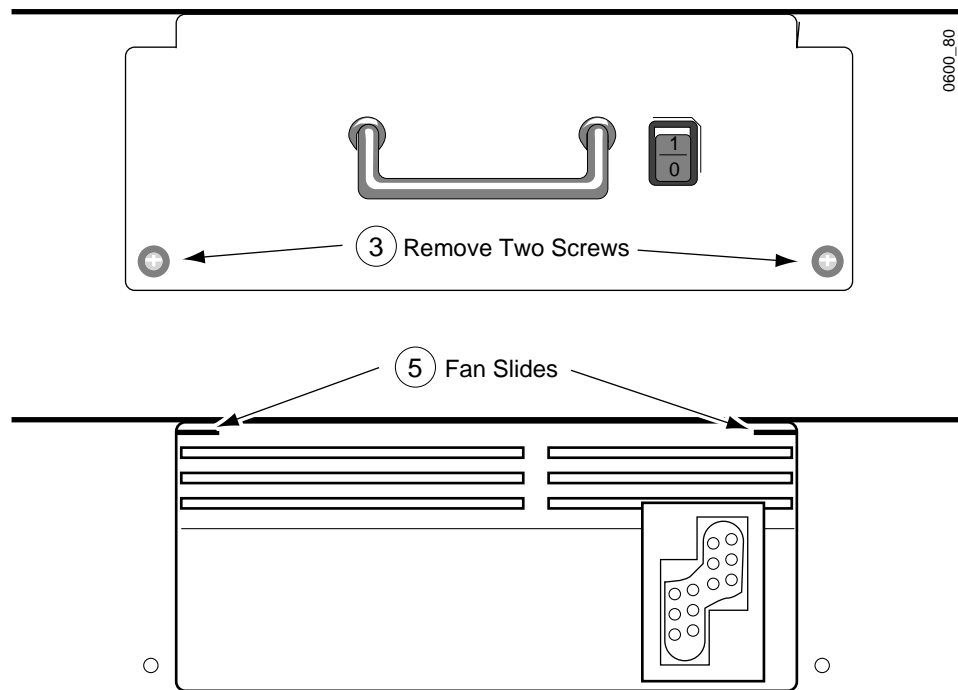


Figure 5-4. Removing Video Processor Frame Fan

Setting the Control Panel Clock

The Krystal Control Panel has a time-date clock, used only to timestamp saved files. The Krystal clock is set at the factory and may not need to be changed. The clock has its own internal battery and is designed to operate for 10 years without external power.

This clock can be set using an ASCII terminal. To do this you stop the clock, enter data at specified addresses, and then restart the clock.

1. Connect the ASCII terminal via a null modem RS-232 DB-25 cable to the Diagnostics port (J3) on the rear of the Krystal Control Panel. Set the terminal to 9600 baud, 8 data bits, 1 stop bit, no parity, Xon/Xoff flow control.

2. Press <Return>, and at the > prompt type:

```
m 0xf71ff8,1 <Return>
```

3. At the following addresses enter the appropriate numeric values and press <Return> to move to the next address.

```
m 0xf71ff8      control      80 (stops clock)
m 0xf71ff9      seconds     00-59
m 0xf71ffa      minutes     00-59
m 0xf71ffb      hours       00-23
m 0xf71ffc      day         01-07 (1=Sunday)
m 0xf71ffd      date        01-31
m 0xf71ffe      month       01-12
m 0xf71fff      year        00-99
```

4. Type . <Return> (Dot Return) to escape this mode, and at the > prompt type:

```
m 0xf71ff8,1 <Return>
```

5. Turn the clock back on at the following address:

```
m 0xf71ff8      Control      00 (starts clock)
```

6. Type . <Return> (Dot Return) to escape the mode.

Each Krystal Control Panel has its own real-time clock that runs independently. If you wish to synchronize the timestamping of multiple panels you must set the clock on each panel individually.

Power Protection Devices

CAUTION 30 amp fuses are soldered in place on the 5 volt lines of each Video Processor and System Controller Frame module. These are provided for fire protection only. If any of these soldered fuses fail, do NOT replace them. Any voltage/current fluctuation sufficient to cause these fuses to fail will damage other components on the module. Replace the defective module with a known good spare after you have identified and corrected cause of the failure.

Automatic Power Protection

The Krystal Video Processor and System Controller frame power supplies have control inputs that shut off the power supply in the event of:

- DC power switch (located on the front of the frame) is turned off.
- Over temperature condition detected.
- Any module has blown its +5V fuse.
- Fan housing is removed (Video Processor and Large System Controller frames only).

If any of these occur, the power supply will not restart until the problem is fixed and the DC power switch is turned off and back on again.

Fuse Replacement

Fuses are provided in the Krystal power system to protect personnel and equipment from excessive AC and DC power levels. When replacing fuses, ensure that the replacement fuse is of the exact type and rating recommended (See [Table 5-1](#)).

Table 5-1. Fuse, Switch, and Breaker Locations

| Location | Fuse | Rating | Type |
|--|-----------------|--------------------------|--|
| Control Panel, Rear | 2 Fuses | 2.5 AMP | 5 X 20 (T) |
| Control Panel, Rear | AC SW | | Switch Only |
| Control Panel CPU Board (Near Connectors) | 1 Fuse | 1/2 AMP | Ceramic Bipin |
| Video Proc Frame Power Protection Bd | 2 Fuses | 6 AMP | 3AG Fast Blow 250 Volt |
| Video Proc Frame Rear | Circuit Breaker | 15 AMPS | |
| Video Proc Frame Front Fan Housing | DC SW | | Switch Only |
| Small System Controller Frame Rear | Circuit Breaker | 6 AMPS | |
| Small System Controller Frame Front Use one of these fuse types | 2 Fuses | 6 AMPS or 6.3 AMPS | 3AG Fast Blow 250 Volt or 5X20 mm Fast Blow 520 Volt |
| Large System Controller Frame Rear | Circuit Breaker | 6 AMPS | |
| Large System Controller Frame Rear Use one of these fuse types | 2 Fuses | 6 AMPS or 6.3 AMPS | 3AG Fast Blow 250 Volt or 5X20 mm Fast Blow 520 Volt |
| Lg. Sys. Controller Frame Front Fan Housing | DC SW | | Switch Only |

Control Panel

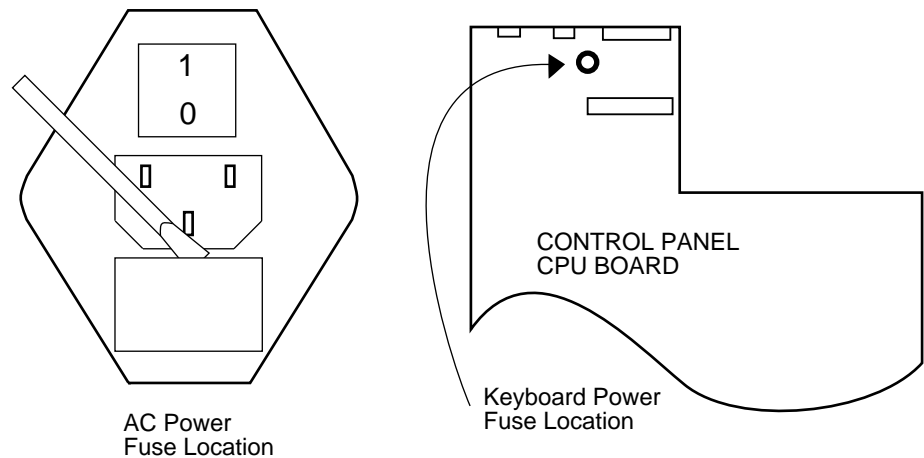


Figure 5-5. Control Panel Fuse Locations

The two AC fuses are located in the fuse holder below the power cord socket. (Figure 5-5). To change these fuses:

1. Turn off the power and unplug the power cord from the Control Panel.
2. Use a screwdriver to pry the fuse holder open. The fuse holder may have direction arrows for 110 and 220 Volts, however, the power supply is autoranging and the position of the arrows is irrelevant. Replace with 2.5 Amp 220 Volt (T) fuses.
3. Close the Control Panel.

A keyboard power supply fuse is mounted near the keyboard connector on the Control Panel CPU Board (Figure 5-5). To change this fuse:

1. Turn off the power and unplug the power cord from the Control Panel.
2. Open the Control Panel, remove and replace the old fuse (the fuse is a 1/2 Amp 120 Volt ceramic bipin in a socket).
3. Close the Control Panel.

Video Processor Frame

Two fuses are located on the ± 12 volt lines on the Power Protection board, which is mounted next to the Video Processor frame power supply. To change these fuses:

1. Open the front door and turn off the DC switch.
2. Go to the rear of the frame and turn the unit off the AC breaker.

3. Unplug the power cord.
4. Remove the five screws holding the power supply door closed and open the door (Figure 5-11 on page 5-18).
5. Remove and replace the fuses on the Power Protection board.
6. Close the power supply drawer and replace the screws.

Small System Controller Frame

Two fuses are located on the ± 12 volt lines to the midplane. To change these fuses:

1. Go to the rear of the frame and turn off the AC breaker.
2. Unplug the power cord.
3. Open the front door and turn off the DC switch.
4. Use a flat blade screwdriver to open the fuse covers.
5. Remove and replace the fuses.

Large System Controller Frame

Two fuses are located on the ± 12 volt lines to the midplane. To change these fuses:

1. Open the front door and turn off the DC switch.
2. Go to the rear of the frame and turn off the AC breaker.
3. Unplug the power cord.
4. Use a flat blade screwdriver to open the fuse covers.
5. Remove and replace the fuses.

Service Procedures

Control Panel

Opening Control Panel

WARNING High voltages are present inside the Control Panel when it is powered up.

1. Turn power off and disconnect the power cord from the rear of the Control Panel.
2. Remove the panel from the table cutout.
3. Remove the 4 screws holding the lid down.

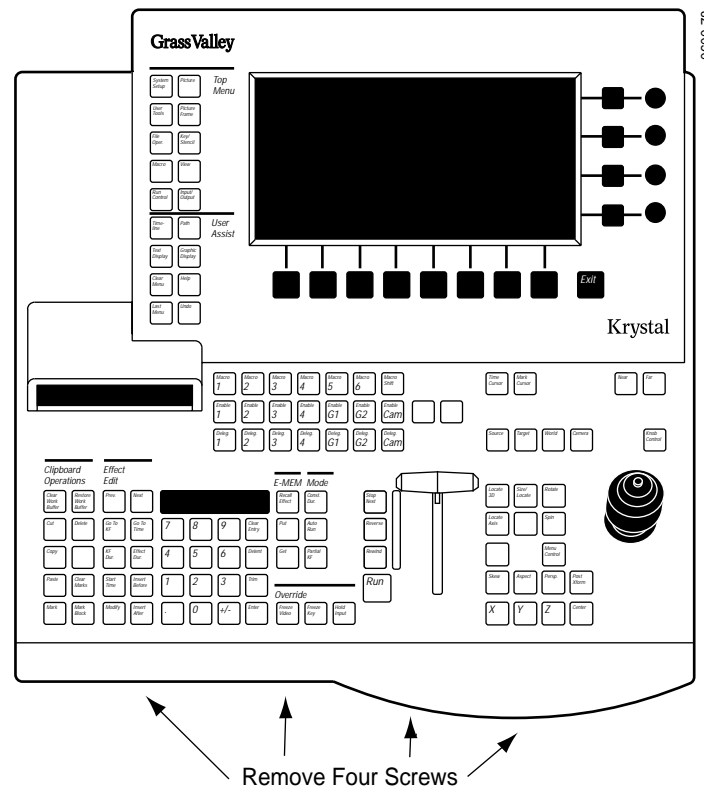


Figure 5-6. Control Panel Lid Screws

4. Open the lid.

Removing Control Panel Modules

WARNING Before removing any Control Panel modules, disconnect the power cord from the Control Panel.

CAUTION When circuit modules are removed, place them on a flat static-controlled surface. Failure to follow this precaution can result in component damage due to electrostatic discharge.

General Procedure

1. Open the Control Panel. See *Opening Control Panel on page 5-11*.

Note It may be easier to work on the Control Panel if it is removed from the cutout in the console.

2. Remove all cables from the board. See below for specific information for each board.
3. Remove the board by removing the mounting screw (#6 Torx unless otherwise specified).

Control Panel CPU Board

Before removing the mounting screws, remove the following hardware from the rear of the Control Panel:

1. The nut and washer on J1.
2. The two screws, nuts, and washers on J2.
3. The two jack screws on J3.

Main Switch Board

1. Before removing the screws holding down the main switch board, remove the handle of the lever arm by removing the hex screw on each end of the lever arm handle.

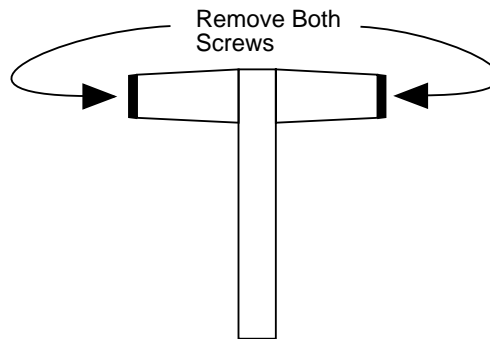


Figure 5-7. Lever Arm Screws

When reinstalling the main switch board, insert and snug down two or three of the screws. Verify that all of the switches operate without rubbing, and then tighten these screws. Verify again that the switches operate freely, and then insert and tighten all of the screws.

Upper Switch Board

1. Remove the Control Panel lid. See [Removing Control Panel Lid on page 5-14](#).
2. Remove the floppy drive. See [Removing Floppy Drive on page 5-14](#).
3. Remove the floppy drive bracket by removing the three mounting screws.
4. Remove the four knobs located to the right of the flat panel display.
5. While removing the board, it may be helpful to press in the switches to make it easier for them to clear the panel.

When reinstalling the board, insert and snug down two or three of the screws. Verify that all of the switches operate without rubbing, and then tighten these screws. Verify again that the switches operate freely, and then insert and tighten all of the screws.

Low Profile Switch board

1. Remove the Upper Switch Board. See [Upper Switch Board on page 5-13](#).
2. Unscrew the mounting screws (#4 Torx) and unplug the Low Profile Switch Board from the Upper Switch Board.

Removing Flat Panel Display

1. Open the Control Panel. See *Opening Control Panel on page 5-11*.
2. Remove the Control Panel lid. See *Removing Control Panel Lid on page 5-14*.
3. Remove the four screws going through the panel display frame.

CAUTION Do not attempt to disassemble the flat panel display.

Removing Power Supply

WARNING Before removing the power supply, verify that the power cord has been removed from the rear of the Control Panel.

1. Open Control Panel. See *Opening Control Panel on page 5-11*
2. Remove the four screws holding down the power supply shield.
3. Disconnect the two cables attached to the power supply.
4. From the back of the Control Panel, remove the four screws holding down the power supply.

Removing Floppy Drive

1. Open the Control Panel. See *Opening Control Panel on page 5-11*.

Note The ribbon connector going into the disk drive is not polarized. Make a note of the pin 1 stripe position before removing the disk drive cable.

2. Remove the control and power cables from the disk drive.
3. Remove the two screws on each side of the disk drive. See *Figure 5-8 on page 5-15*
4. Remove the drive.
5. When installing drive, make sure the control cable is put back so the pin 1 stripe is in the same position as it was before.

Removing Control Panel Lid

Some operations are easier if the Control Panel lid is removed. To remove the lid:

1. Remove the four screws holding the lid closed, see *Opening Control Panel on page 5-11*.

Note The connector going into the disk drive is not polarized. Make a note of the stripe position before removing the disk drive cable.

2. Open the Control Panel and disconnect all cables going between the bottom and the top of the Control Panel.
3. Remove the three screws holding the lid to the hinge plate.

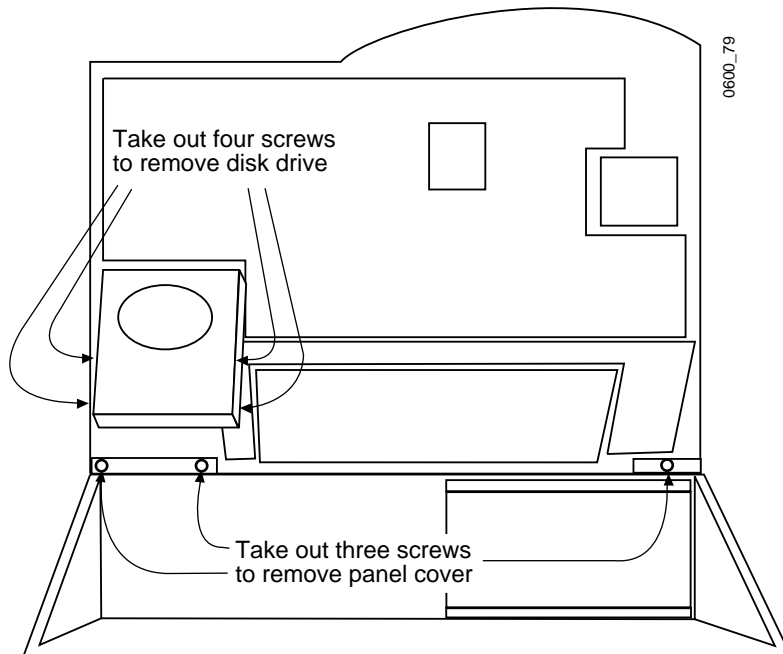


Figure 5-8. Inside Control Panel Screw Locations

CAUTION Do not attempt to remove the hinge plate from the hinge.

4. Close the lid and remove the four screws in the back.

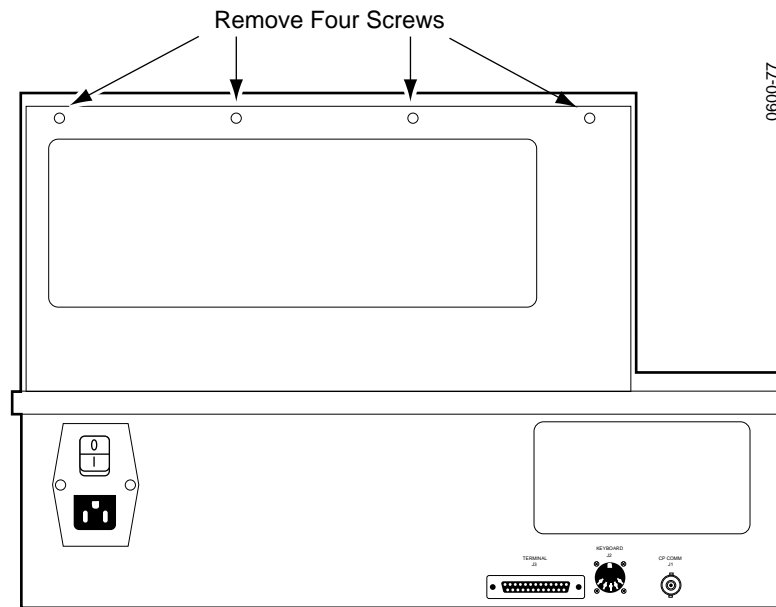


Figure 5-9. Control Panel Rear Screw Locations

5. Remove the lid and set it on a soft nonabrasive surface.

Video Processor and System Controller Frame Modules

CAUTION When circuit modules are removed, place them on a flat static-controlled surface. Failure to follow this precaution can result in component damage due to electrostatic discharge.

Removing Front Module

1. Turn the AC power off.
2. Open the door and pull out on the latches located at the top and bottom of the module.
3. Slide the module out of its slot.

Removing Rear Module

1. Turn the AC power off.
2. Remove the two screws located at the top and bottom of the module.
3. Pull out on the latches located at the top and bottom of the module.

- Slide the module out of its slot.

Removing Mezzanine

- Remove the module that the mezzanine is attached to.
- Remove the screws holding the mezzanine to the module. On most mezzanines these screws are located at the bottom of the module (Figure 5-10), but exceptions exist.

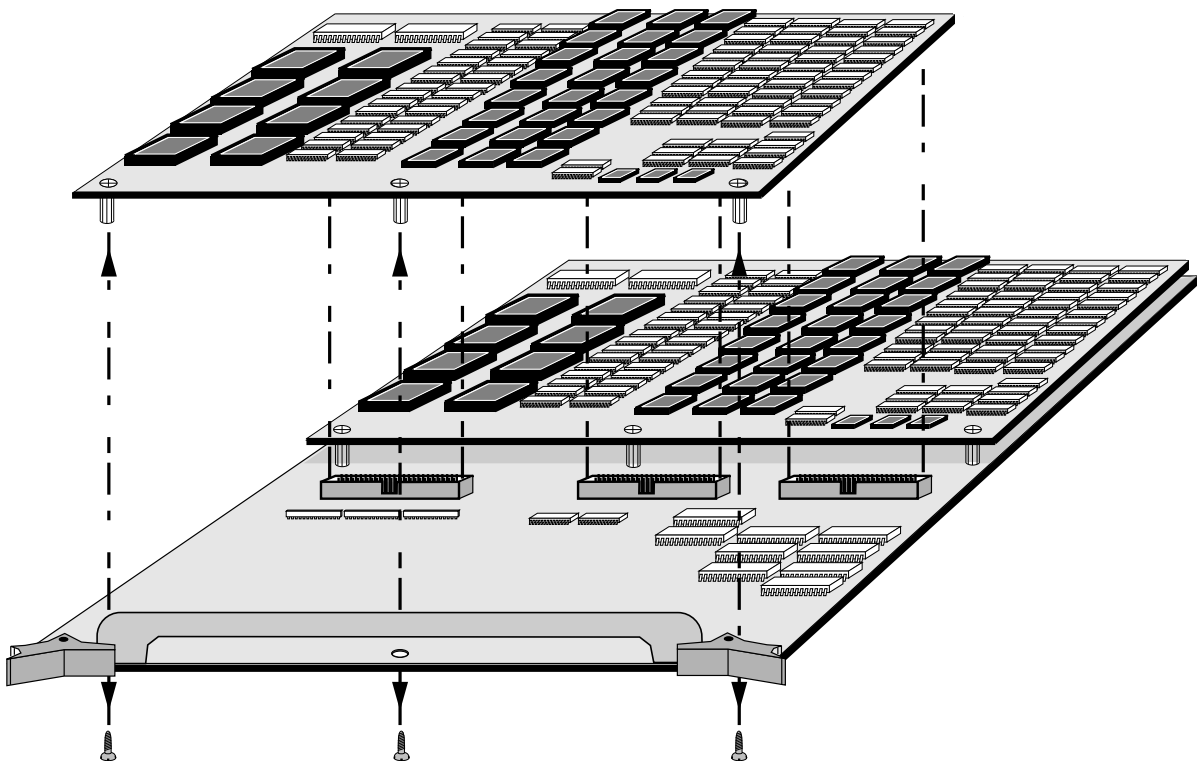


Figure 5-10. Removing Mezzanines

Power Supplies

WARNING Hazardous currents are present in the power supplies, on the mid-plane, and on circuit modules. Only qualified service personnel should work on the power supply assemblies. Remove all rings and other jewelry if you must work on equipment that is powered up. Failure to follow this precaution could result in severe shock or potentially expensive damage to your equipment.

Removing Video Processor Frame Power Supply

- Open the front door and turn off the DC switch.

2. Go to the rear of the frame and turn the unit off at the AC breaker.
3. Unplug the power cord.
4. Remove the five screws holding the power supply door closed and open the door (Figure 5-11).

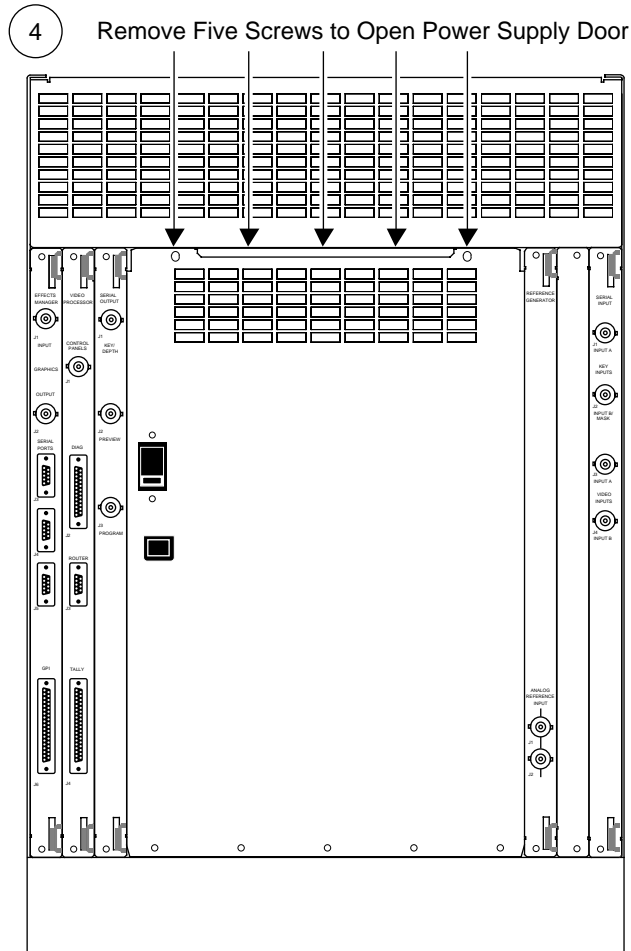


Figure 5-11. Opening Video Processor Frame Power Supply Door

5. Remove the nuts holding down the large cables (two red, two black cables). Open the plastic clamp holding down the cables.
6. There are two connectors on the front of the power supply. Unplug the one located below the large cables. It may be necessary to move the large cables slightly to accomplish this.
7. Unplug the long thin connector which is plugged into the board located to the left of the power supply. This is the connector closest to the power supply.
8. Unscrew the four bolts holding the power supply to the door.

9. Remove the power supply with the cables still connected and return the entire assembly to Tektronix/Grass Valley Products. The entire assembly will be replaced.

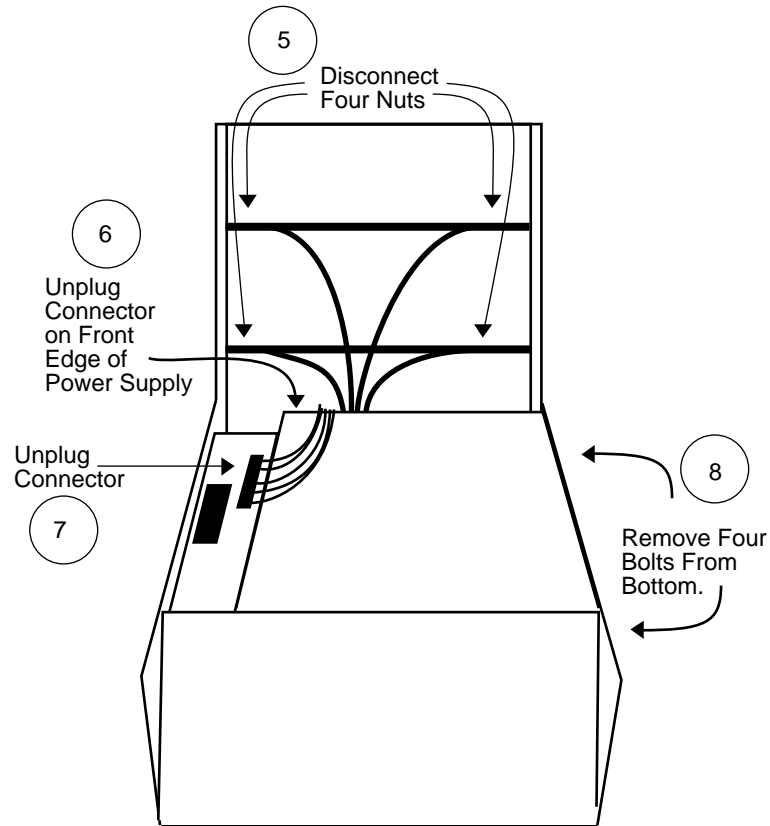


Figure 5-12. Removing the Video Processor Frame Power Supply

Removing Power Protection Board

1. Turn the AC power off.
2. Open the power supply door (see *Removing Video Processor Frame Power Supply on page 5-17*). Locate the board to the right of the power supply.
3. Remove the two cables attached to this board
4. Remove the five screws holding down the board and then remove the board.

Removing Small System Controller Power Supply

1. Open the door and turn off the DC power switch.
2. Go to the rear of the frame and turn off the AC circuit breaker.

3. Unplug the power cord from the frame.
4. Loosen the thumbscrew that is near the power connector.
5. Go to the front of the frame and remove the air filter.
6. Remove the six screws that are holding the power supply door and remove the door.

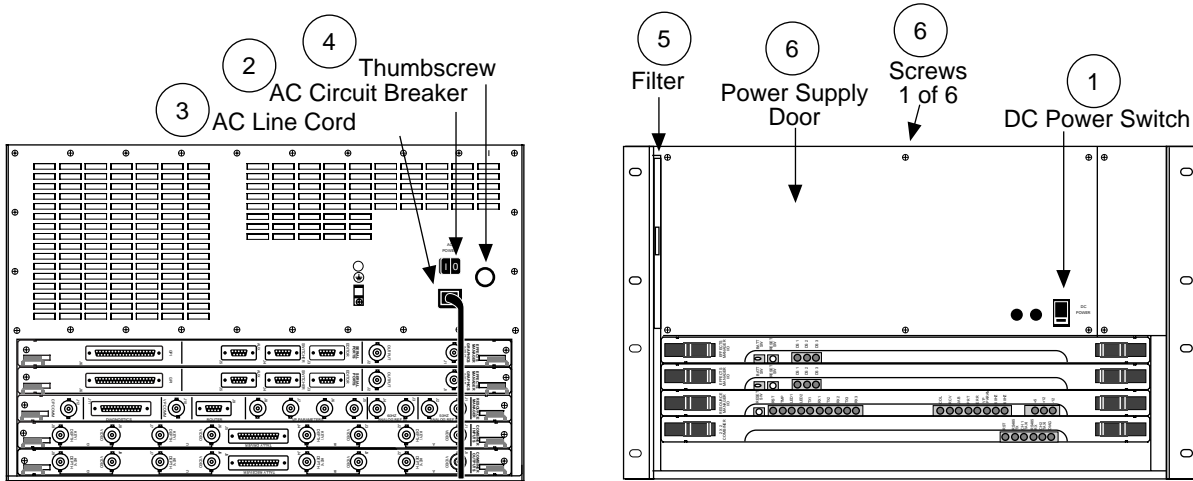


Figure 5-13. Opening Small System Controller Frame Power Supply Door

7. Remove the screws holding down the two heavy cables.
8. Disconnect the connector.
9. Remove the screw that holds in the power supply.

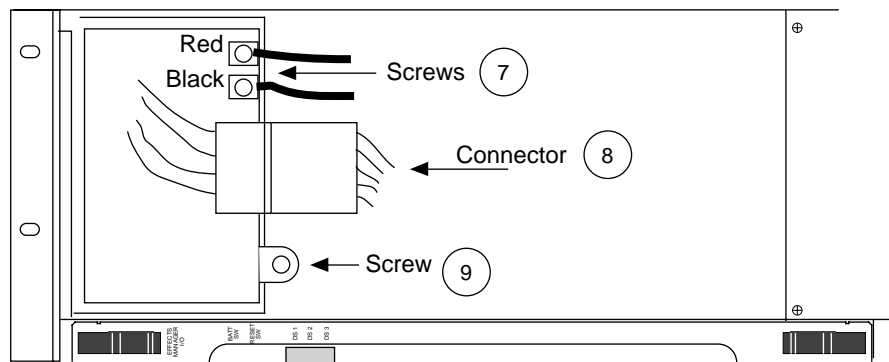


Figure 5-14. Small System Controller Power Supply

10. Slide the power supply out of the front of the frame.

Removing Large System Controller Power Supply

1. Open the front door and turn off the DC switch.
2. Go to the rear of the frame and turn the unit off at the AC breaker.
3. Unplug the power cord.
4. Unscrew the three screws holding the power supply door closed.

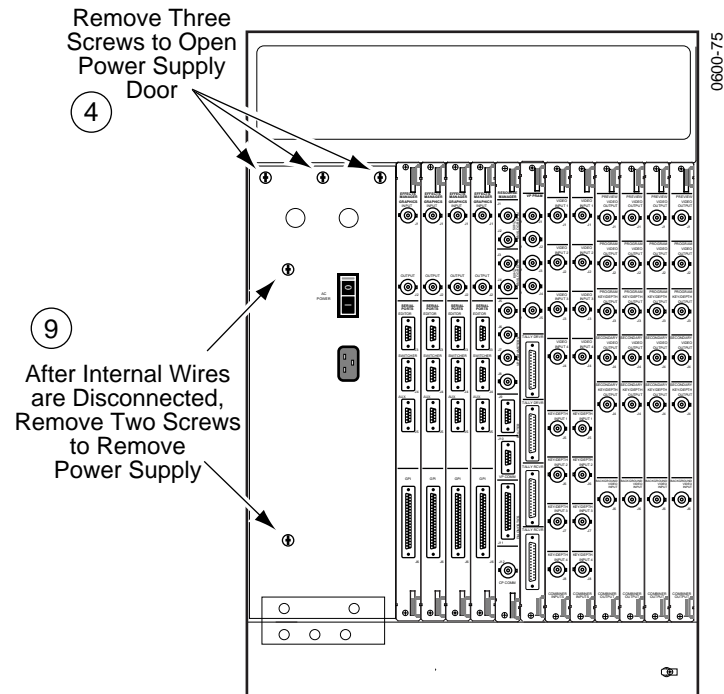


Figure 5-15. Opening Large System Controller Power Supply Door

5. Open the power supply door. It will be held in place by a cable.

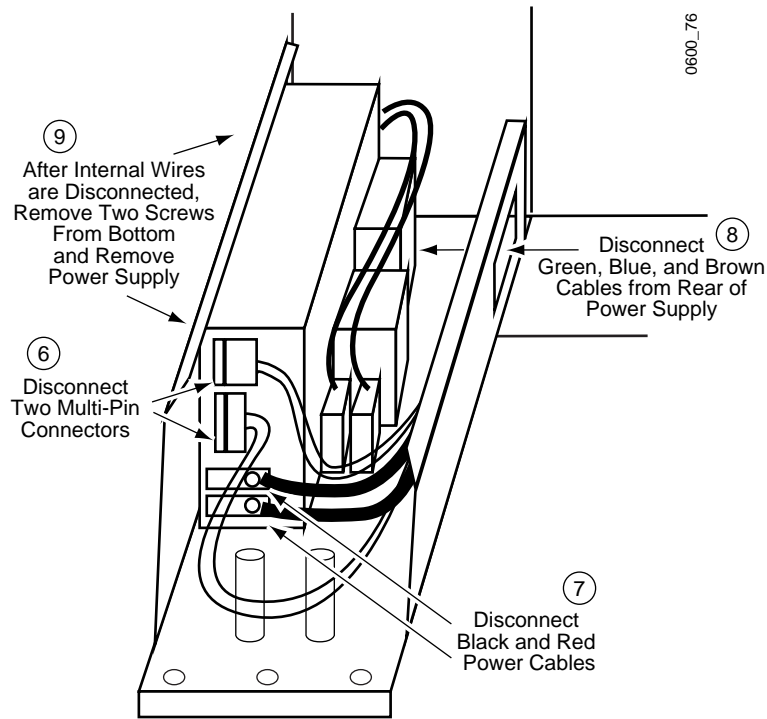


Figure 5-16. Large System Controller Power Supply

6. Unplug the two multi-pin connectors located in the front of the power supply.
7. Remove the two screws (#20 torx or flat blade) holding down the two large cables at the front of the power supply (Black cable on top, Red on bottom). After removing the wires, replace the screws in the power supply.
8. Loosen but do not remove the screws (Phillips) holding the three cables at the back of the power supply (Green on top, Blue in middle, Brown on bottom). Access is through a cutout on the right side of the drawer. Remove the wires from the power supply.
9. From below the extended drawer, remove the two screws holding the Power Supply to the tray.
10. Lift out the power supply and return the unit to Tektronix/Grass Valley Products. The entire assembly will be replaced.

Diagnostics

Introduction

This sections contains Krystal system diagnostics and troubleshooting information.

Power Protection Circuit

The Krystal Video Processor and System Controller frame power supplies have control inputs that shut off the power supply in the event of:

- DC power switch (located on the front of the frame) is turned off.
- Over temperature condition detected.
- Any module has blown its +5V fuse.
- Fan housing is removed (Video Processor and Large System Controller frames only).

If any of these occur, the power supply will not restart until the problem is fixed and the DC power switch is turned off and back on again.

Control Cable Terminations

Control Panel Ethernet

The cable(s) connecting the Control Panel(s) and Krystal frame must be 50 Ohms. The cable must be terminated at each end of the run with 50 ohm terminators. Failure to do this may cause the system to malfunction.

VP COMM Termination

The VP COMM communications path on multi-channel systems must be terminated by placing a special 9-pin terminator (#050991-00) on the open connector at the last Video Processor frame in the chain. Failure to do this may cause the system to malfunction.

Startup Diagnostics

The Krystal Control Panel runs a series of diagnostic tests each time it is turned on. When the panel is turned on or reset, the top two and bottom two LEDs light, then, as each test passes, the LED associated with that test is turned off. After all the tests pass, the panel goes into its normal operating mode. If a test fails, that LED stays on and the diagnostics loops on that test until it passes.

Figure 6-1 shows what test is associated with each LED.

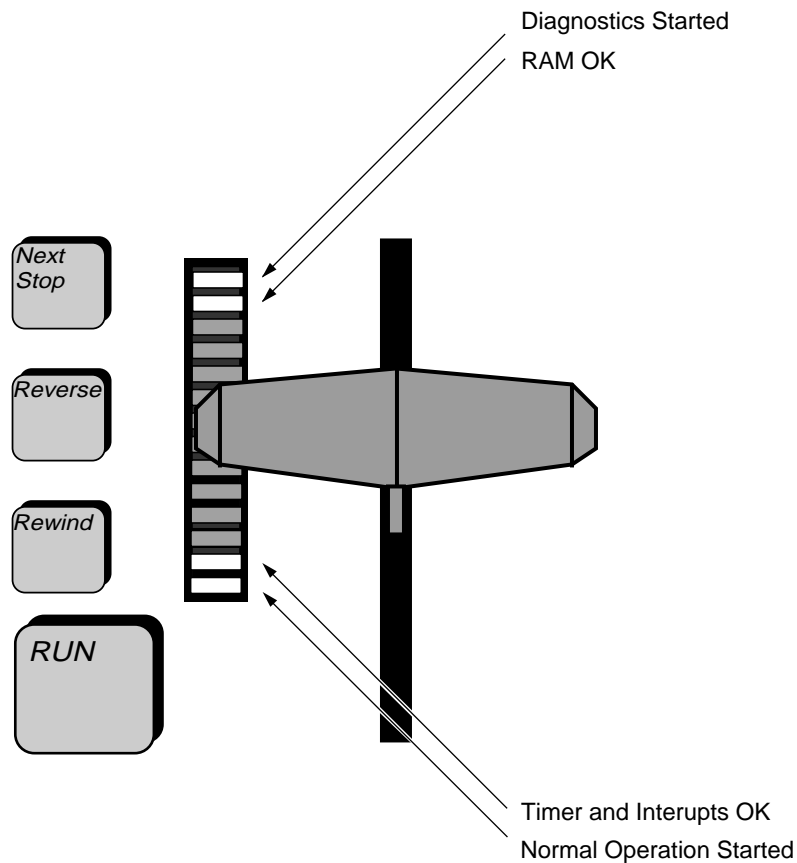
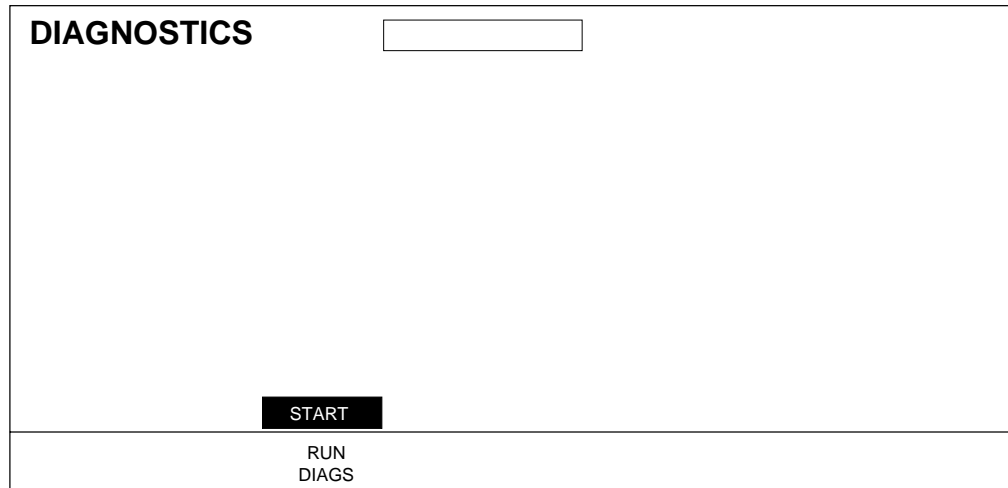


Figure 6-1. Start-Up Diagnostic Indicator LEDs

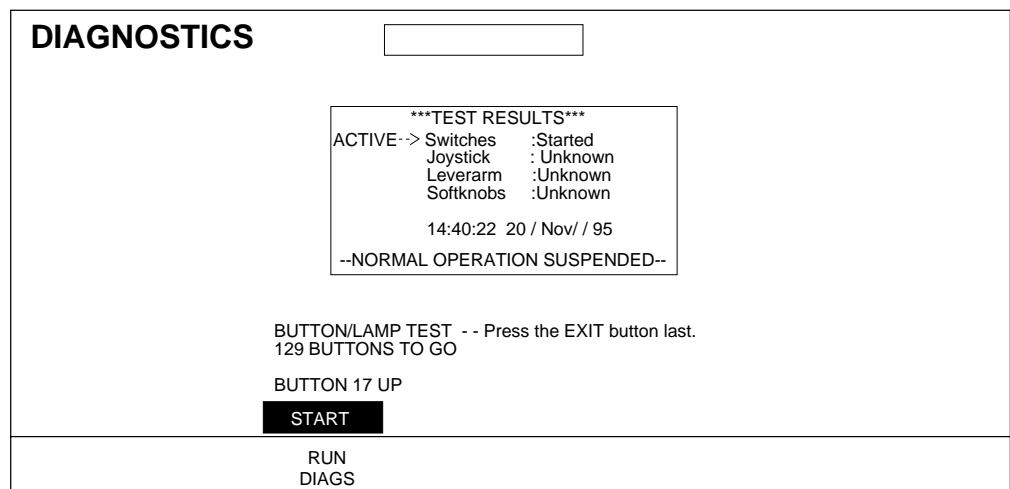
Run Time Diagnostics

Panel Diagnostics

To get to the Diagnostics Menu, press the System Setup top menu button, then press **PANEL CONFIG > \ DIAGS > .**



At the Diagnostics Menu press the **RUN DIAGNOSTICS** soft button to enter the diagnostics routine.



The panel diagnostics allow you to run four checks of the Control Panel. These are: Switches (and LEDs), Joystick, Leverarm, and Softknobs (the four knobs to the right of the flat panel display). To move from one test to another, press the Exit button located at the right bottom corner of the display panel. To exit the tests, press Exit one more time.

For a general test of the panel all of the tests may be run, or, if a specific area of the panel is thought to be bad, only that test can be run.

The TEST RESULTS area of the menu shows the results of the tests and also which test is active. The results of a test will not be shown in the TEST RESULTS area until you have moved to the next test.

There are two ways to move from one test to the next.

- Press the Exit button located near the lower right corner of the display panel.
- Do not move any of the controls being tested for 60 seconds and the test will automatically move to the next test.

There are five possible test results.

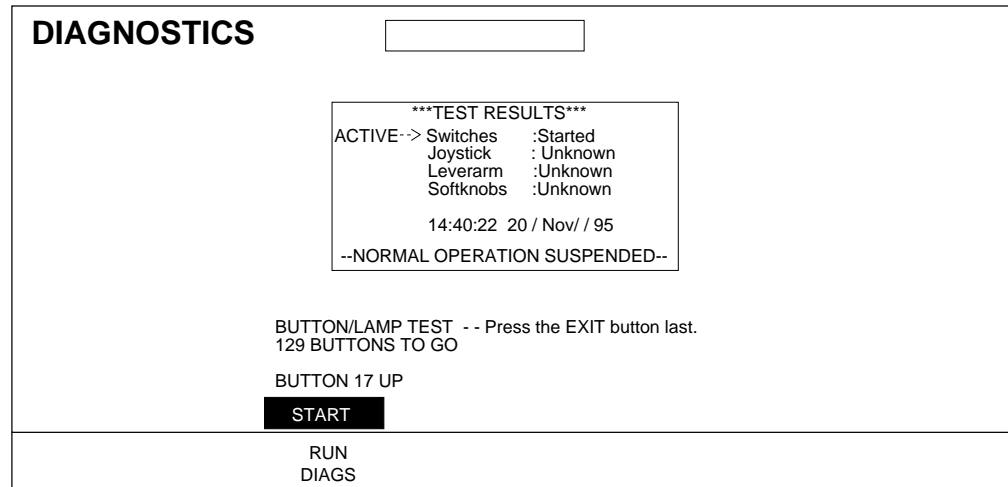
1. Unknown. This is the result when that diagnostic test has not yet been entered and the test has not been run.
2. Started. The test is still being run. The TEST RESULTS will not change until you have moved to the next test.
3. Passed. This is the result when the test has passed and you have moved to the next test.
4. Failed-Timeout. This is the result when the test did not pass and the test was stopped by the 60 second time-out.
5. Test-Aborted. This is the result when the test did not pass and the test was stopped by pressing the Exit button.

During a test, the panel display area which is displaying the results of the test will flicker each time new data is sent to it. This allows you to tell if area of the panel under test is sending data.

When the last test has been exited, it takes one more press of the Exit button to stop the diagnostics and return to the normal mode. At this point the panel should be in the same state it was in before the diagnostics were started.

Switches Test

The switches test is automatically entered when the diagnostics are started. This tests all LEDs and switches, including the switches without LEDs such as the black buttons around the panel display and the button on the joystick.



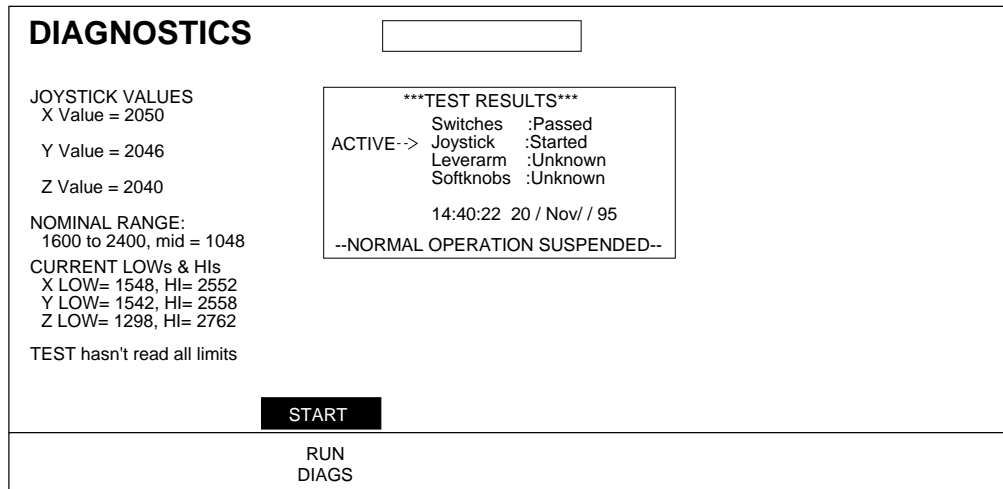
When this test is started, all of the LEDs on the panel will be on. Pressing a switch will turn off its LED. Once an LED has been turned off, pressing the switch again will turn the LED on for as long as the switch is held down. This allows testing for intermittents. Pressing the Exit switch will stop the test, so Exit should be the last switch pushed.

The panel display will show the number of switches left to test, the number of the last switch pressed, and if that switch is down or up. If more than one switch is pressed, only the first switch will register, however, if the switches are pressed simultaneously, neither of the switches will register.

During the test, the LED readout for the panel keypad will read “XXX buttons to go” until all of the switches except the Exit have been pressed, then the display will read “press EXIT done.”

Joystick Test

The joystick test is started when you leave the switches test.



The joystick test requires you to move the joystick to its limit on all three axes. Once the joystick has been moved a little, a JOYSTICK VALUES display area will show what the reading of the joystick is, the expected values for each axes, and the actual maximum and minimum values reached for each axis. There is also a note indicating if all axes have reached their limit.

The reading for the actual position can be used to find dead spots on the joystick by moving the joystick slowly and watching the numbers for any jumping. The number will increment in steps larger than one, but the incrementing should be smooth. The reading for the center position of the joystick may vary depending on how it was moved the last time.

The LED display for the panel keypad indicates by a “<-” or “->” when each axis reaches its limit.

Leverarm Test

When you leave the joystick test, the leverarm test starts.

| DIAGNOSTICS | |
|--|--|
| <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> ***TEST RESULTS*** Switchest :Passed Joystick :Passed ACTIVE-> Leverarm :Started Softknobs :Unknown 14:40:22 20 / Nov / 95 --NORMAL OPERATION SUSPENDED-- </div> | |
| <div style="background-color: black; color: white; padding: 2px 10px; display: inline-block; margin-top: 10px;">START</div> | LEVERARM VALUE: --> 3378 <-- NOMINAL RANGE: 800 TO 3500 LIMITS READ: Low= 690, Hi= 3390 READING LEVERARM |
| RUN DIAGS | |

The leverarm test requires you to move the leverarm to both limits. Once the leverarm is moved, the LEVERARM VALUE area displays the actual reading of the leverarm, the high and low limit read, and the high and low limits expected.

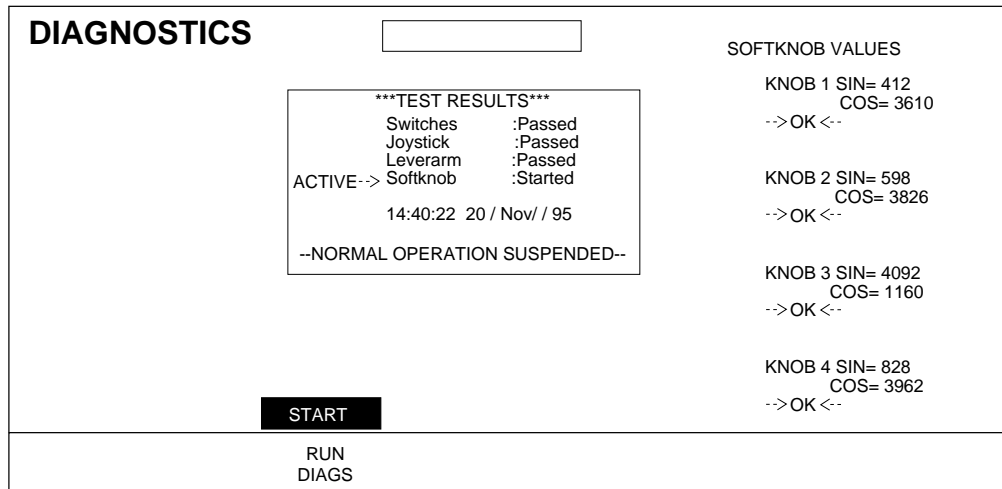
The reading for the actual position can be used to find dead spots on the leverarm by moving the leverarm slowly and watching the numbers for any jumping. The number will increment in steps larger than one, but the incrementing should be smooth.

The 16 LEDS that indicate leverarm position are each lit as the leverarm passes through its zone. If the leverarm is moved very fast or there is a dead spot in the leverarm, the test may not detect movement through all of the zones and the test will then fail.

The keypad LEDs say “Leverarm test” during this test.

Soft Knobs Test

The Softknobs test starts when you leave the leverarm test.



Each of the knobs has two potentiometers and the readings for both potentiometers show up on the display as “sin” and “cos.” Each of the potentiometers is divided into 16 zones and a reading must be detected in each of these 32 zones for the knob to pass. If the knob is moved very fast or there is a dead zone in one of the potentiometers, the test may not pass with only one turn. Once a knob passes “-->OK<--” is displayed by that knob.

The reading for the actual position can be used to find dead spots on the pots by turning the pots slowly and watching the numbers for any jumping. The number will increment in steps larger than one, but the size of the increment should not jump.

The keypad LEDs say “Knobs OK-->,” then, as each knob passes, it’s number is added to the display.

Module LEDs

Many of the modules in the system have LEDs and test points that indicate the status of that module. For information on the LEDs and test points for each module, see *Section 4-Functional Description*.

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