K2 Lx0 RAID Storage

Instruction Manual

SOFTWARE VERSION 3.2

071-8614-00
SEPTEMBER 2007

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Trademarks

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Revision Status

Rev Date	Description
September 7, 2007	Initial release of the K2 Lx0 RAID Instruction Manual — 071-8614-00 for K2 Software Version 3.2.5

Contents

Safety Summaries

General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety summary* in other system manuals for warnings and cautions related to operating the system.

Injury Precautions

Use Proper Power Cord

To avoid fire hazard, use only the power cord specified for this product.

Ground the Product

This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Do Not Operate Without Covers

To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.

Do Not operate in Wet/Damp Conditions

To avoid electric shock, do not operate this product in wet or damp conditions.

Do Not Operate in an Explosive Atmosphere

To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Avoid Exposed Circuitry

To avoid injury, remove jewelry such as rings, watches, and other metallic objects. Do not touch exposed connections and components when power is present.

Product Damage Precautions

Use Proper Power Source

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

Provide Proper Ventilation

To prevent product overheating, provide proper ventilation.

Do Not Operate With Suspected Failures

If you suspect there is damage to this product, have it inspected by qualified service personnel.

Battery Replacement

To avoid damage, replace only with the same or equivalent type recommended by the circuit board manufacturer. Dispose of used battery according to the circuit board manufacturer's instructions.

Safety Terms and Symbols

Terms in This Manual

These terms may appear in this manual:

WARNING: Warning statements identify conditions or practices that can 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, or which may cause equipment crucial to your business environment to become temporarily non-operational.

Terms on the Product

These terms may appear on the product:

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

WARNING indicates a personal injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product

The following symbols may appear on the product:

DANGER high voltage

Protective ground (earth) terminal

ATTENTION – refer to manual

Service Safety Summary

WARNING: The service instructions in this manual are intended for use by qualified service personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries before performing service.

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power

To avoid electric shock, disconnect the main power by means of the power cord or, if provided, the power switch.

Use Care When Servicing With Power On

Dangerous voltages or currents may exist in this product. Disconnect power and remove battery (if applicable) before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

Certifications and Compliances

FCC Emission Control

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications not expressly approved by Grass Valley can affect emission compliance and could void the user's authority to operate this equipment.

Canadian EMC Notice of Compliance

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A préscrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

This product complies with Class A (E4 environment). In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Emission Limits

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, and (2) this device must accept any interference received, including interference that may cause undesirable operation.

Laser Compliance

Laser Safety Requirements

The device used in this product is a Class 1 certified laser product. Operating this product outside specifications or altering its original design may result in hazardous radiation exposure, and may be considered an act of modifying or new manufacturing of a laser product under U.S. regulations contained in 21CFR Chapter 1, subchapter J or CENELEC regulations in HD 482 S1. People performing such an act are required by law to recertify and reidentify this product in accordance with provisions of 21CFR subchapter J for distribution within the U.S.A., and in accordance with CENELEC HD 482 S1 for distribution within countries using the IEC 825 standard.

Laser Safety

Laser safety in the United States is regulated by the Center for Devices and Radiological Health (CDRH). The laser safety regulations are published in the "Laser Product Performance Standard," Code of Federal Regulation (CFR), Title 21, Subchapter J.

The International Electrotechnical Commission (IEC) Standard 825, "Radiation of Laser Products, Equipment Classification, Requirements and User's Guide," governs laser products outside the United States. Europe and member nations of the European Free Trade Association fall under the jurisdiction of the Comité Européen de Normalization Electrotechnique (CENELEC).

Disposing of your used product

In the European Union — EU-wide legislation as implemented in each member state requires that used electrical and electronic products carrying the mark at left must be disposed of separately from normal household waste. The equipment with this mark may include electrical accessories (e.g. memory cards). When you dispose of such products, please follow the agreements made between you and Grass Valley. The mark on the electrical and electronic products only applies to the current European Union Member States. This statement is in compliance with European Commission Directive 2002/96/EC Waste Electrical and Electronic Equipment.

Outside the European Union — If you wish to dispose of used electrical and electronic products outside of the European Union, please contact your local authority and ask for the correct method of disposal.

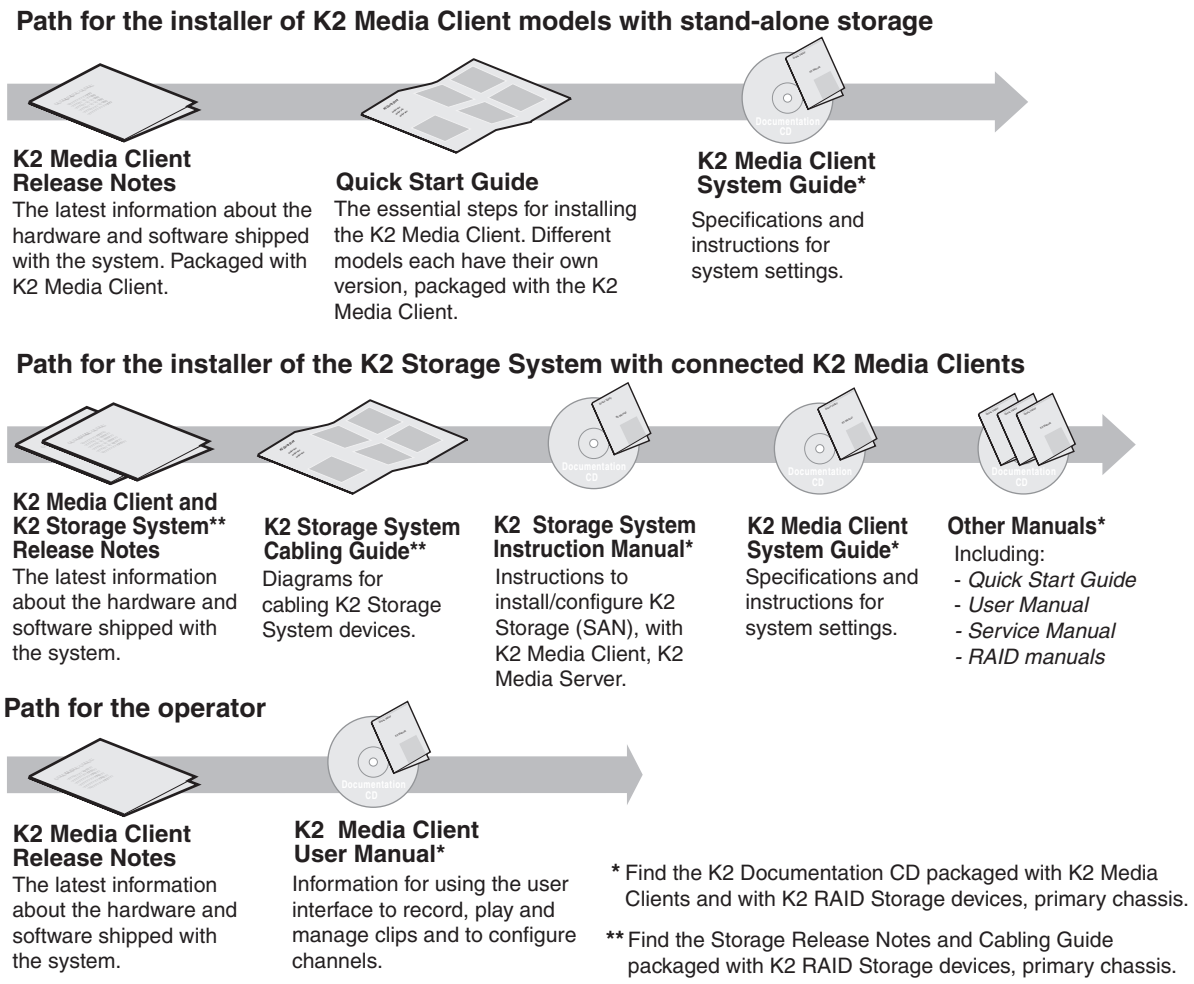
Preface

About this manual

The K2 Lx0 RAID Storage Chassis provides RAID protected storage for the K2 Storage System. If you are responsible for installing and servicing K2 Lx0 RAID, you should read this manual.

Using the K2 Documentation Set

The following illustration shows the recommended order in which to reference the documentation.



Documentation descriptions

Use the following descriptions to choose the other documentation you need as you install, operate, and maintain your system.

K2 Storage System Release Notes

The release notes contain the latest information about the software shipped on your system. The information in this document includes software upgrade instructions, software specifications and requirements, feature changes from the previous releases, and any known problems. Because release notes contain the latest information, they are printed out rather than included in the Documentation CD-ROM. You can find the release notes packaged with the RAID storage chassis.

K2 Storage System Cabling Guide

The cabling guides provide diagrams for storage system cabling and external configuration, such as setting addresses on RAID devices. There is a cabling guide for each pre-defined level of K2 Storage System. Each cabling guide covers both redundant and non-redundant systems. You can find the cabling guide packaged with the primary RAID storage chassis.

K2 Media Client Quick Start Guides

The Quick Start Guides provides step-by-step installation instructions for basic installation and operation of the K2 Media Client, including recording and playing clips. You can find the Quick Start Guide for your particular model packaged with the K2 Media Client.

Documentation CD-ROM

Except for the release notes and Quick Start guide, the full set of support documentation, including this manual, is available on the Documentation CD-ROM that you receive with your K2 Media Client. You can find the Documentation CD-ROM packaged with the RAID storage chassis.

The Documentation CD-ROM includes the following:

- **K2 Storage System Instruction Manual** — Contains installation, configuration, and maintenance procedures for shared storage options.
- **RAID Instruction Manuals** — There is an Instruction Manual for the RAID storage device that can be a part of a K2 Media Client. This manual contains procedures for configuring and servicing the device.
- **K2 Media Client System Guide** — Contains the product specifications and step-by-step instructions for modifying system settings. Includes instructions for adding a K2 Media Client to the K2 Storage System.
- **K2 Media Client User Manual** — Describes the K2 Media Client and provides instructions for configuring and operating the product.
- **K2 Media Client Service Manual** — Contains information on servicing and maintenance.

How this manual is organized

The *K2 Lx0 RAID Storage Instruction Manual* is organized around the tasks you'll be performing to install and service your K2 RAID External Storage System. You can see this reflected in the chapter titles chosen for this manual. The following identifies and describes the chapters included in this manual:

Chapter 1, *About the K2 Lx0 RAID*
Introduces the K2 Lx0 RAID Storage. You can read this chapter to get familiar with the K2 Lx0 RAID external storage key features and components.

Chapter 2, *K2 Lx0 RAID Installation Information*
Describes how to install a K2 Lx0 RAID Storage and K2 Lx0 Expansion Chassis, including rack mounting. Refer to the *K2 Storage System Instruction Manual* for connection and configuration information.

Chapter 3, *Servicing the K2 Lx0 RAID*
Describes how to replace FRUs, such as disk modules, and add disk modules and redundant FRUs.

Chapter 4, *K2 Lx0 RAID Technical Specifications and Operating Limits*
This appendix consists of electrical and environmental specifications.

Glossary
The Glossary explains terms used throughout this manual.

Terminology used in this manual

In order to avoid confusion between the storage types, the following terms will be used consistently throughout the K2 documentation:

Internal storage — K2 Media Client models with internal storage access their own internal media storage drives, as a “stand-alone” system.

Direct-connect storage — K2 Media Client models with direct-connected (i.e. not shared) storage access their own external media storage drives that are contained in a Lx0 RAID chassis, and are also considered stand-alone systems.

Shared storage — K2 Media Client models with shared storage access RAID protected media storage drives that are part of a K2 Storage System (SAN). The K2 Storage System incorporates one or more RAID chassis, such as K2 Lx0 RAID.

K2 Storage System — specifically refers to the shared K2 Storage System (SAN).

Stand-alone K2 Media Client — refers to K2 Media Clients with internal storage or direct-connect storage.

Getting more information

Product information is readily available at the following sources:

On-line Help Systems

K2 Media Client Help — You can access the on-line help through the AppCenter user interface as follows:

- In the menu bar select **Help,** then choose **AppCenter Help Topics** from the drop-down menu.

NetCentral Help — From the NetCentral interface access on-line help as follows:

- For general help with NetCentral manager, select **Help | NetCentral Help Topics.**
- For help specific to monitoring K2 Media Client system devices, select **Help | Device Providers** and then select the monitored device.

Thomson Grass Valley Web Site

This public Web site contains all the latest manuals and documentation, and additional support information. Use the following URL.

http://www.thomsongrassvalley.com.

Grass Valley Product Support

To get technical assistance, check on the status of a question, or to report new issue, contact Grass Valley Product Support via e-mail, the Web, or by phone or fax. Contact Grass Valley first regarding problems with third party software on Grass Valley products, such as the Microsoft® Windows® operating system, Windows Media® player, Internet Explorer® internet browser, and SQL Server™.

Web Technical Support

To access support information on the Web, visit the product support Web page on the Grass Valley Web site. You can download software or find solutions to problems by searching our Frequently Asked Questions (FAQ) database.

World Wide Web: http://www.thomsongrassvalley.com/support/
Technical Support E-mail Address: gvgtechsupport@thomson.net.

Phone Support

Use the following information to contact product support by phone during business hours. Afterhours phone support is available for warranty and contract customers.

International (France)	+800 80 80 20 20 +33 1 48 25 20 20	Italy	+39 02 24 13 16 01 +39 06 87 20 35 42
International (United States, Canada)	+1 800 547 8949 +1 530 478 4148	Belarus, Russia, Tadzikistan, Ukraine, Uzbekistan	+7 095 258 09 20 +33 (0) 2 334 90 30
Hong Kong, Taiwan, Korea, Macau	+852 2531 3058	Indian Subcontinent	+91 11 515 282 502 +91 11 515 282 504
Australia, New Zealand	+61 1300 721 495	Germany, Austria, Eastern Europe	+49 6150 104 444
Central, South America	+55 11 5509 3440	Near East, Africa	+33 1 48 25 20 20
China	+861 066 0159 450	Netherlands	+31 (0) 35 62 38 421
Belgium	+32 (0) 2 334 90 30	Northern Europe	+45 45 96 88 70
Japan	+81 3 5484 6868	Singapore	+65 6379 1313
Malaysia	+603 7805 3884	Spain	+41 487 80 02
Middle East	+971 4 299 64 40	UK, Ireland, Israel	+44 118 923 0499

Authorized Support Representative

A local authorized support representative may be available in your country. To locate the support representative for your country, visit the product support Web page on the Grass Valley Web site.

grass valley

END-OF-LIFE PRODUCT RECYCLING NOTICE

Grass Valley's innovation and excellence in product design also extends to the programs we've established to manage the recycling of our products. Grass Valley has developed a comprehensive end-of-life product take back program for recycle or disposal of end-of-life products. Our program meets the requirements of the European Union's WEEE Directive, the United States Environmental Protection Agency, and U.S. state and local agencies.

Grass Valley's end-of-life product take back program assures proper disposal by use of Best Available Technology. This program accepts any Grass Valley branded equipment. Upon request, a Certificate of Recycling or a Certificate of Destruction, depending on the ultimate disposition of the product, can be sent to the requester.

Grass Valley will be responsible for all costs associated with recycling and disposal, including freight. However, you are responsible for the removal of the equipment from your facility and packing the equipment to make it ready for pickup.

For further information on the Grass Valley product take back system please contact Grass Valley at + 800 80 80 20 20 or +33 1 48 25 20 20 from most other countries. In the U.S. and Canada please call 800-547-8949 or 530-478-4148, and ask to be connected to the EH&S Department. Additional information concerning the program can be found at: www.thomsongrassvalley.com/environment

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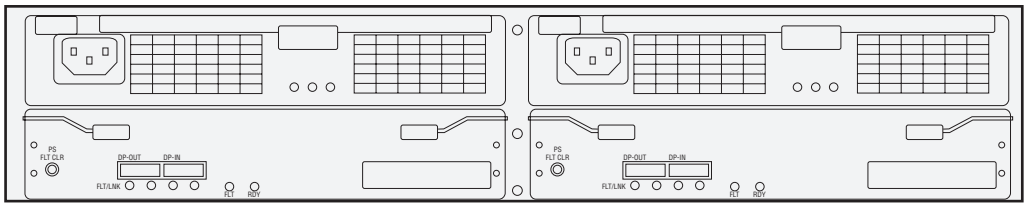
Chapter 1

About the K2 Lx0 RAID

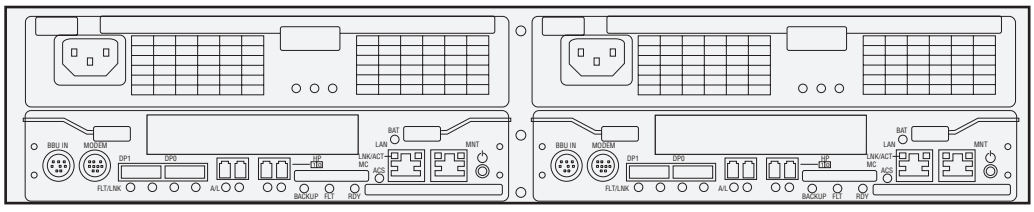
This chapter introduces the K2 Lx0 RAID Storage. Topics include:

K2 Lx0 RAID features

The K2 Lx0 RAID is a high performance, high availability mass storage system used in K2 Lx0 and K2 Lx0 Expansion K2 Storage Systems. The K2 Lx0 chassis 4 Gb/s host interface supports industry-standard technology.



Condor RAID Expansion Chassis



Condor RAID Chassis

The K2 Lx0 RAID has a minimum of two host ports per controller. Each chassis is equipped with two power supplies. Individual high-speed SAS links connect drives.

Depending on your configuration, the K2 Lx0 RAID chassis contains:

- Two or six host ports
- Up to 12 SAS or SATA disk drives
- One or two hardware RAID Controllers in a 2U high rack-mountable chassis

The K2 Lx0 RAID Expansion Chassis provides additional storage capacity. It contains:

- Two Expansion Adapters
- Up to eleven K2 Lx0 RAID Expansion Chassis can be connected to a single K2 Lx0 RAID chassis
- A single disk-array storage system with up to 144 drives

K2 Lx0 RAID components

The K2 Lx0 RAID components are:

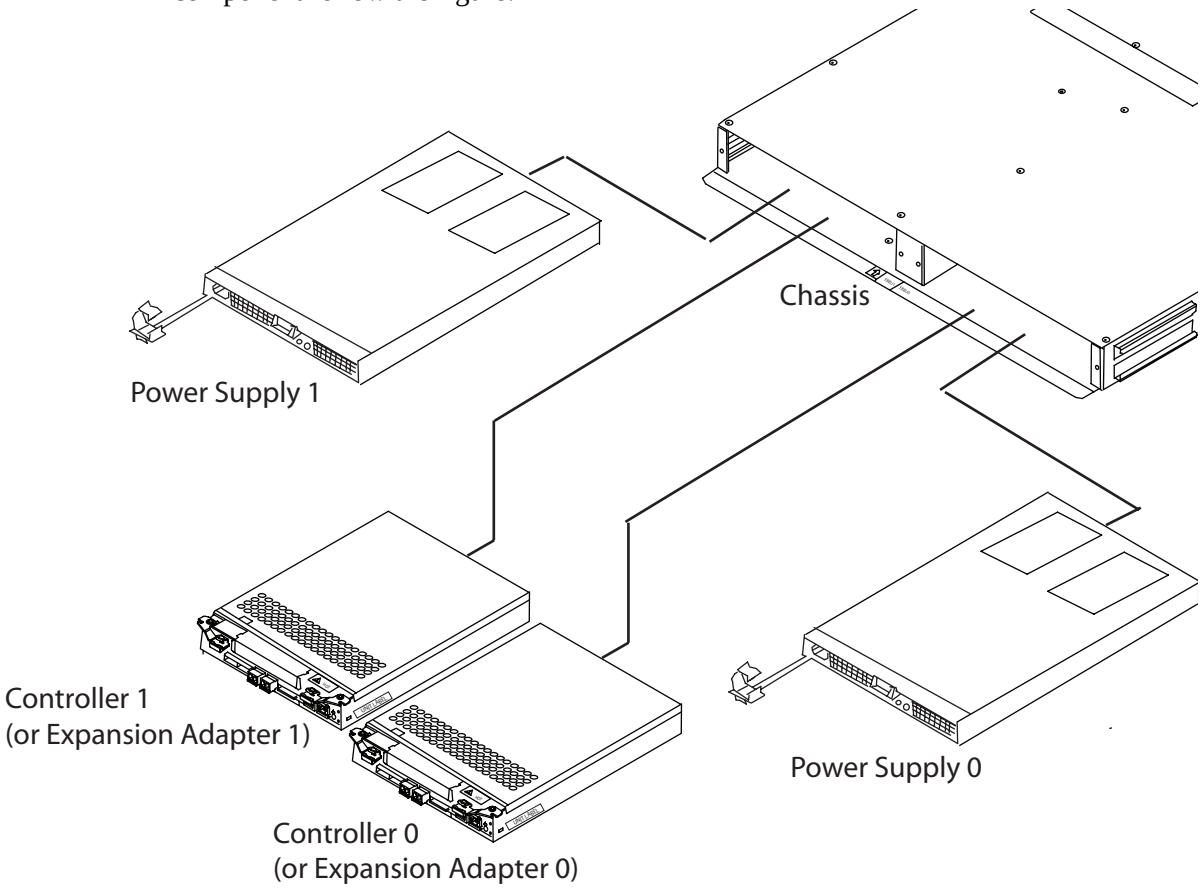
- One 2U high rack-mountable chassis
- One or two (K2 Lx0 RAID redundant) RAID controllers or two expansion adapters (Expansion chassis)
- As many as twelve SAS 73GB or 300GB (15,000 rpm) or SATA 500 GB or 750 GB (7,200 rpm) disk drives per chassis
- Two RAID chassis power supplies

All configurations have SNMP ports, slots for primary and secondary controllers, and chassis with redundant power. Any unoccupied slot (RAID controller or disk module) has a filler module to maintain air flow and compliance with electromagnetic interference (EMI) standards.

The RAID controllers, expansion adapters, disk drives and power supplies are hot-swappable field replaceable units (FRUs), which means you can add or replace them while the K2 Lx0 RAID is powered up.

An optional second RAID controller module in the K2 Lx0 RAID allows for continued access to the K2 Lx0 RAID if the primary RAID controller fails. Refer to the *K2 Storage System Instruction Manual* for detailed connection and configuration instructions.

The following figure shows the RAID Storage Chassis components. Details on each component follow the figure.



NOTE: Every K2 Lx0 RAID chassis controller includes a backup battery so that if electrical power is lost, data stored in cache memory will be saved.

Chassis

The chassis is a sheet-metal housing that contains chassis slots for the RAID controllers or expansion adapters, disk drives, power supplies, and the LAN card.

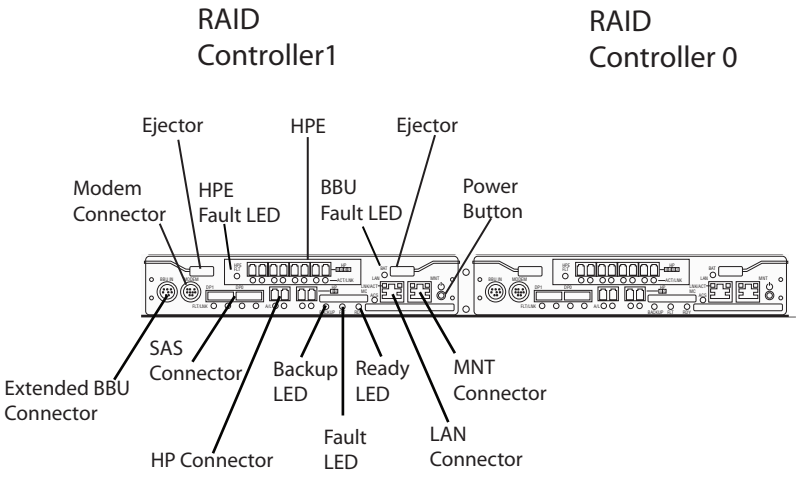
K2 Lx0 RAID Circuit board modules

There are two circuit board modules used: the RAID controller module and the expansion adapter. The RAID controller module is in the primary RAID chassis. It manages the disk drives and provides an interface to the K2 Media Server system or switch. The expansion adapter is in an Expansion chassis. It manages the disk drives, in conjunction with the connected RAID controller and provides an SAS interface to the primary chassis.

K2 Lx0 RAID Storage Chassis circuit board modules

The K2 Lx0 RAID includes one or two RAID controller modules. This provides redundant host interface ports.

The following figure shows a K2 Lx0 RAID with the two RAID controller modules.

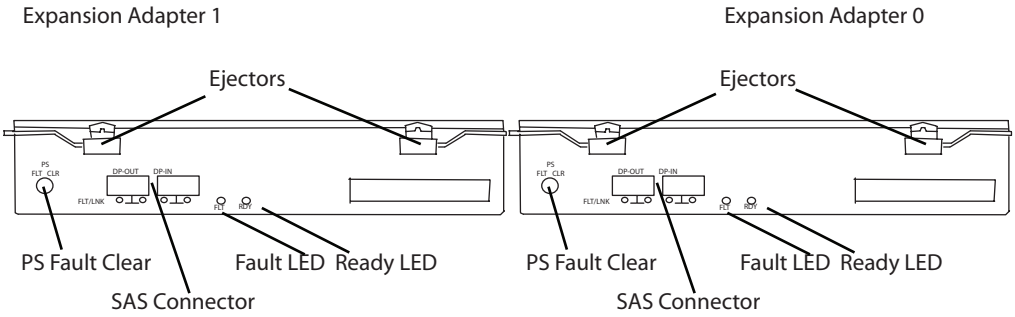


The RAID controller module has two host ports (HP0/HP1) and two Expansion Chassis SAS ports (DL1/DL0). The Host ports require LCC cables (optical) for the Fibre Channel connection to a K2 Media Server or to a Fibre Channel switch. The Expansion Chassis Ports require SAS cables for the SAS connections with a K2 Lx0 Expansion Chassis. There are two port status LEDs for each Host port and each SAS port. Refer to "Interpreting controller status LEDs" on page 35.

When the redundant controller option is not installed in the K2 Lx0 RAID Storage Chassis, a blank fills the other RAID controller slot.

K2 Lx0 Expansion RAID Expansion Chassis circuit board modules

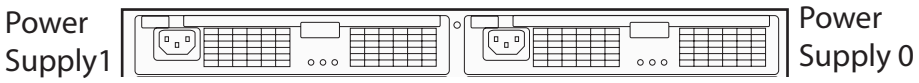
The K2 Lx0 Expansion RAID Expansion Chassis has two expansion adapters as shown in the following figure.



The expansion adapter in the K2 Lx0 Expansion has two SAS ports: DP-IN and DP-OUT. SAS cabling connects the DP-IN port to a K2 Lx0. There are two port status LEDs for each SAS port. Refer to "Interpreting expansion adapter status LEDs" on page 38.

Power supplies

There are two auto-ranging power supplies, each with a power cord. Each supply supports a fully configured K2 Lx0 External RAID and shares load currents with the other supply, if it is present. The power supplies are designed so as to protect the disk drives if you install them while the K2 Lx0 External RAID is powered up. A disk with power-related faults will not adversely affect the operation of any other disk.



Each power supply has status LEDs visible from the rear panel. The status LEDs are described in the "Interpreting power supply status LEDs" on page 39. You can add or remove one power supply in the RAID Storage Chassis while the RAID Storage Chassis is powered up, but the operation must be completed within two minutes. Even if a power supply is disabled, the fan in the non-functioning power supply can run off the second power supply to cool the RAID for a couple of minutes.

Disk modules

Each disk module consists of a SAS or SATA disk drive in a carrier assembly. If a disk drive fails, and needs replacing, you can do so while the RAID Storage Chassis is powered up. Replacement disk drives begin rebuilding immediately after being installed. (See "Removing and installing disk modules" on page 40.)

The following table shows how disk modules are identified based on the chassis address and physical location. The chassis with an address set to 0 contains drives from 00 to 0B; the expansion chassis are numbered X0 through XB, where X indicates the chassis number.

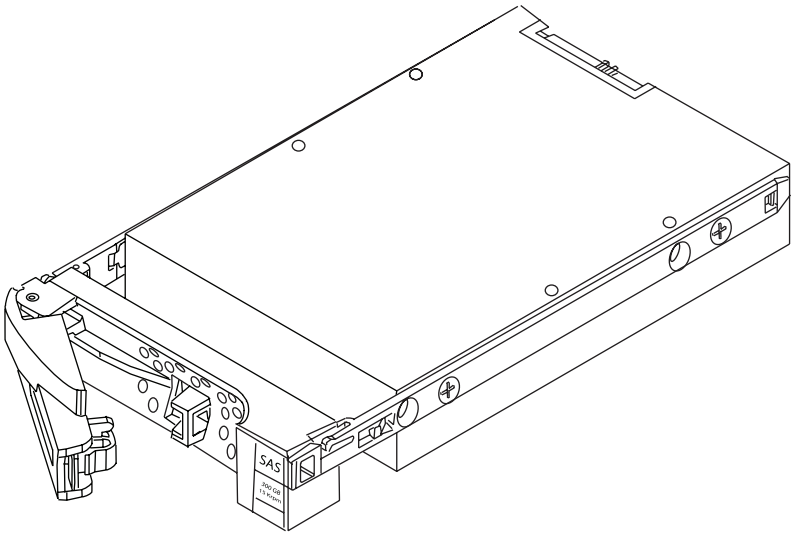
00	01	02	03
04	05	06	07
08	09	0A	0B

For information on cabling expansion chassis, see the *K2 Storage System Instruction Manual*

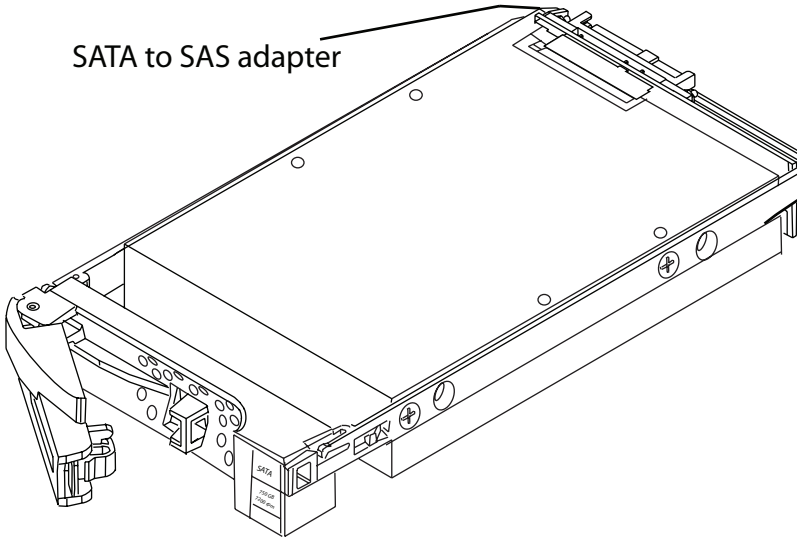
An operating primary RAID chassis must have, at a minimum, the first three physical drives (00 - 02) installed, as the RAID configuration information is written to these drives. Microcode is also written to these disks when RAID controller microcode is loaded.

The SAS and SATA disk drives are shown in the following illustrations. The SATA drive has an adapter to fit it to the K2 Lx0 RAID Chassis.

SAS disk drive



SATA disk drive



Chapter 2

K2 Lx0 RAID Installation Information

This chapter describes information you'll need to install the K2 Lx0 RAID Storage (K2 Lx0 Expansion Chassis). Major topics are:

- "Installation requirements"
- "Installing a K2 Lx0 RAID in an equipment rack"
- "K2 Lx0 RAID power-up and initialization"
- "K2 Lx0 RAID power-down"

Installation requirements

This section describes the following requirements:

Site requirements

For proper K2 Lx0 Expansion Chassis operation, the installation site must conform to certain environmental specifications. These are detailed below and in Chapter 4, *K2 Lx0 RAID Technical Specifications and Operating Limits*.

Power

Refer to "Data handling specifications" on page 49 for AC power requirements. If one of the two power supplies fails, the remaining power supply and cord can support the full load. You must use a rack mount cabinet with AC power distribution, and have main branch AC distribution that can handle these values for the number of K2 Lx0s and K2 Lx0 Expansion Chassis units that you will interconnect.

Cooling

Make sure your site has air conditioning of the correct size and placement to maintain the specified ambient temperature range. The air conditioning must be able to handle the requirements of the K2 Lx0s and any connected K2 Lx0 Expansions as indicated under "Environmental limits" on page 50.

Cabling requirements

It is recommended that you use the cables shipped with your K2 Lx0 RAID when making connections. For cable specifications, refer to "Cable lengths" on page 50. Host cables must meet the appropriate 4-Gbit HPA compliance standards.

NOTE: Also refer to the** K2 Storage System Instruction Manual **for cabling diagrams and step-by-step instructions.

Binding disk modules into groups

After cabling a K2 Lx0 RAID and any K2 Lx0 Expansion Chassis, you must bind disk modules using the Storage Utility provided by Grass Valley. Once bound, the order of the drives is important. Do not rearrange drives once they have been bound. Refer to the *K2 Storage System Instruction Manual* for information on using the Storage Utility to bind drives.

Installing a K2 Lx0 RAID in an equipment rack

Use the information in this section to unpack the K2 Lx0 RAID chassis and mount in an equipment rack.

Procedures include:

- "Unpacking the chassis"
- "Installing the rack mounts"
- "Inserting the K2 Lx0 RAID chassis in the rack"

Unpacking the chassis

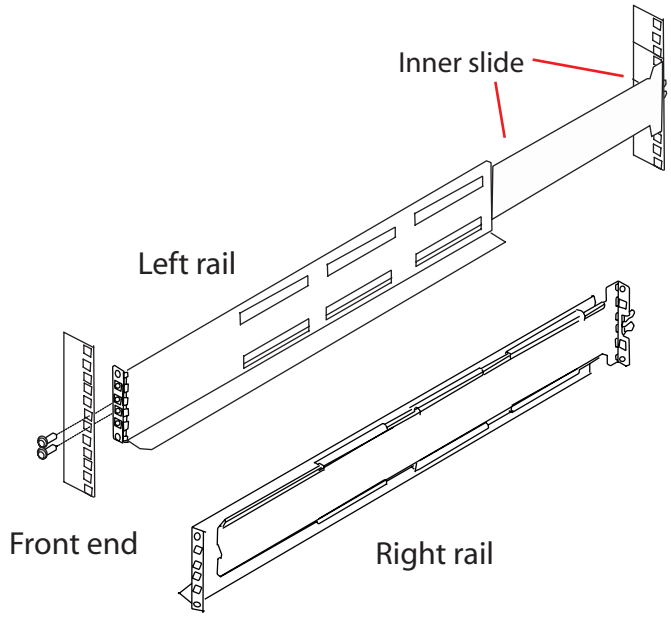
Unpack the K2 Lx0 RAID chassis, cables, and installation kit, as illustrated by the diagram on the outside of the packing box.

⚠ ***CAUTION: A K2 Lx0 RAID chassis is heavy. Three people should lift and move it.***

NOTE: Save the chassis packaging. Use only K2 approved packaging to ship.

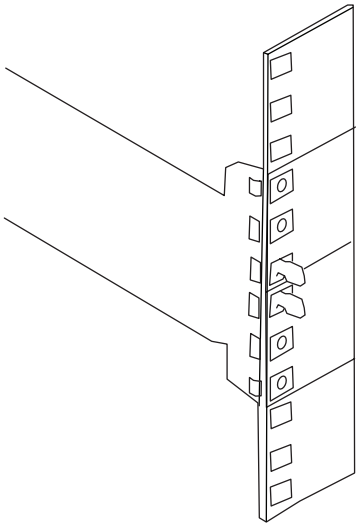
Installing the rack mounts

The following diagram and procedure describe installing the left-side rail when viewed from the front. Installation is similar for the right-side rail. The distinction between the left and right-side rails is shown in the following diagram.

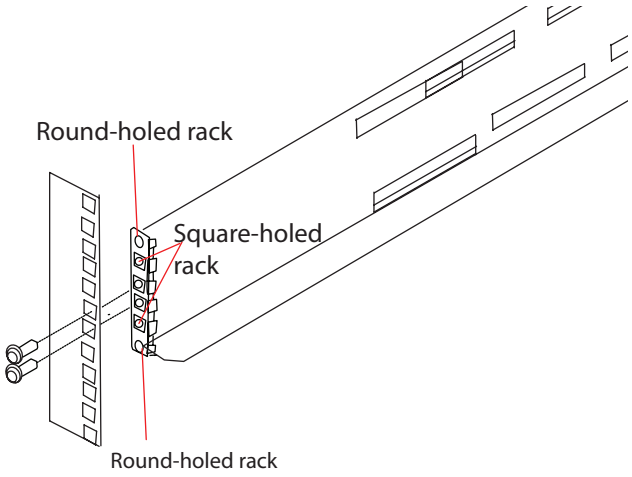


To install the K2 Lx0 RAID rack mounts:

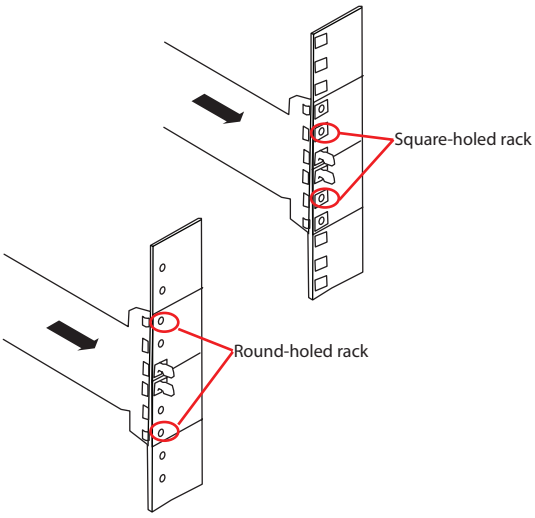
1. Align the bottom of the rail with a 1U delimiting mark on the rear support of the rack, and fit the inner rail tabs.



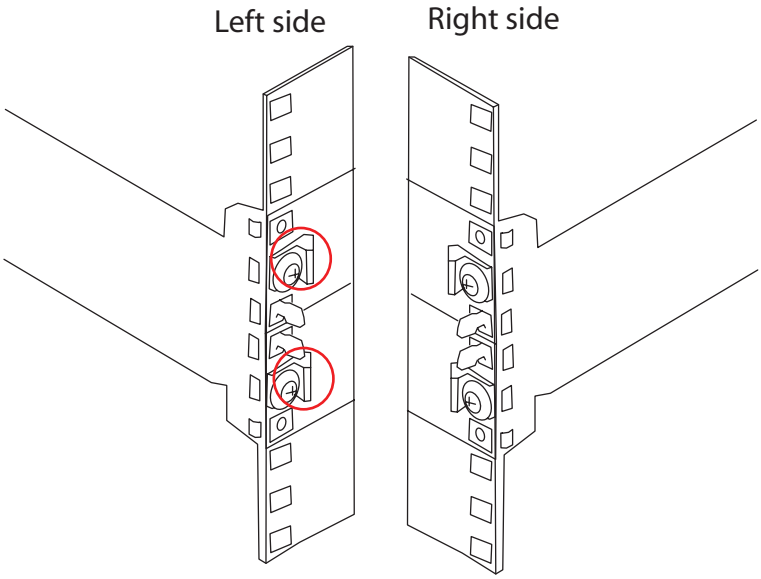
2. Align the bottom of the rail to a 1U delimiting mark on the front support of the rack, and insert the two rail projections. The following diagram shows the different insertions for the round and square-hole racks.



3. Secure the rail by inserting M5 screws in the two center screw holes in the front support of the rack.
4. Draw the inner rail to the rear support of the rack and insert the two projections. The following diagram shows the different insertions for the round and square-hole racks.



5. Secure the inner rail by inserting M5 screws in the cable clamps in the two center screw holes in the rear support of the rack. Make the cable clamp installation direction as shown in the following diagram. Note the different direction for the right-hand side cable clamps.

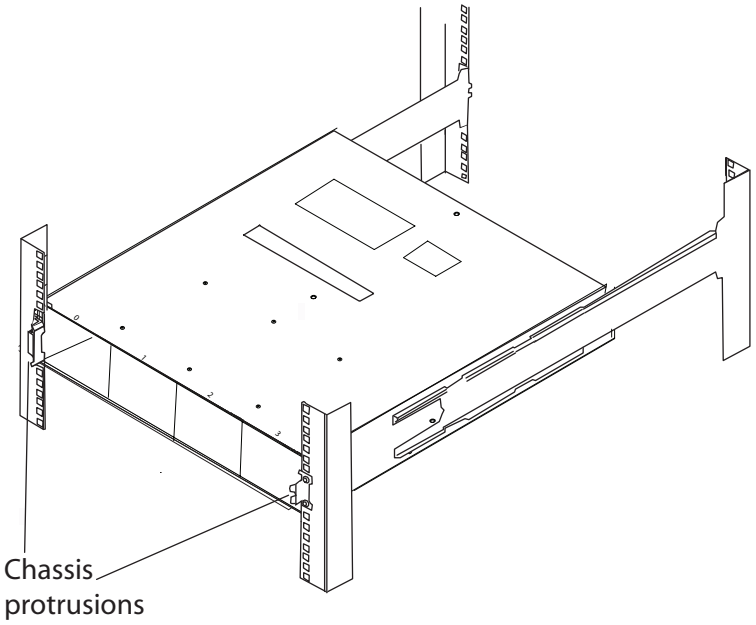


6. Install the right-hand side of the rack by the same procedure.

Inserting the K2 Lx0 RAID chassis in the rack

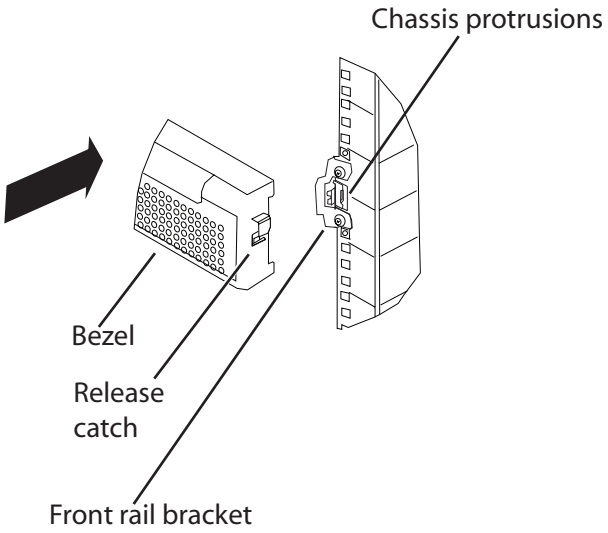
CAUTION: At least three people should perform the tasks of mounting a chassis in a rack.

1. Mount the RAID chassis from the front of the rack.
2. Place the rear of the chassis on the rail. Slide the chassis back and into place.
3. Secure the chassis with four M5 screws into the protrusions on either side of the chassis, two on the left-hand side, two on the right, as shown in the following diagram.



The chassis is now mounted in the rack.

4. Secure the two front rail brackets to the front rails with four M5 screws, two on either side. Place the screws above and below the chassis protrusions as shown in the following diagram.



5. To install the Grass Valley bezel to the front of the chassis, slide the bezel directly on to the front rail brackets. To remove the bezel, press the release catches on either side of the bezel and pull it straight back.

K2 Lx0 RAID power-up and initialization

This section gives information about connecting power and powering-on the K2 Lx0 RAID system.

Connecting electrical cables

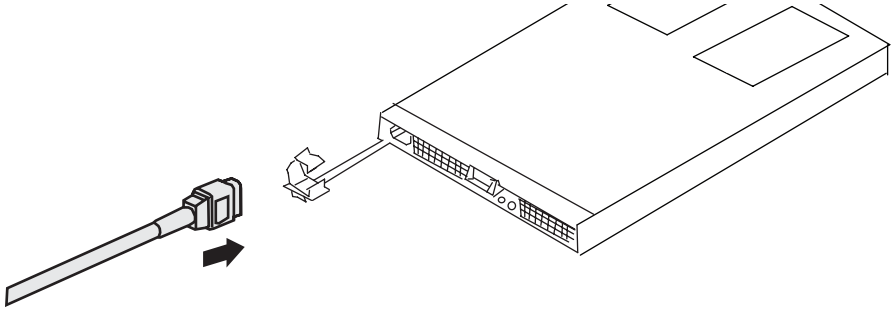
For each chassis, there are two electrical cables (one for each power supply) that should be connected to separate outside power sources.

⚠ ***WARNING: Make sure the power cords meet local safety and electrical standards.***

⚠ ***CAUTION: The K2 Lx0 RAID system must be electrically grounded. Operating the system without proper grounding can damage disk drives. If the outlet you use is not grounded, make sure that a licensed electrician replaces it and installs a grounding conductor.***

To prevent the plug from being inadvertently disconnected, secure the electrical cable into the outlet by doing the following:

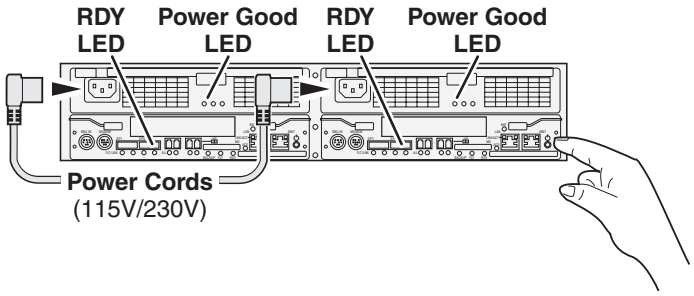
1. Check that the power switch on the RAID chassis and those on the host system are all set to OFF.
2. Insert the power cord into the power supply.



3. Secure the power cord with the power cable clamp.
4. Insert the plug of the power cord into an AC outlet. Use a grounded AC outlet.

Powering-up the K2 Lx0 RAID system

1. Verify power and cabling.
2. Press and hold down the power button on the controller, as shown.



If the RAID chassis has two controllers, you can press the power button on either controller. You do not need to press both power buttons.

Pressing the power button on a controller also powers on any connected Expansion chassis. There are no power buttons on Expansion chassis.

3. Release the power button when the Power Good LED on the power supply is illuminated. This takes 1-3 seconds.
4. Wait while the primary RAID chassis performs self-test and initialization. This takes about four minutes. While this is taking place, the RDY LED is illuminated with a steady on light.
5. Watch for the RDY LED to begin blinking at one second intervals. The LED might turn off and back on two times before starting the one second blink pattern. When the RDY LED is blinking at one second intervals, the self-test and initialization is complete and the chassis is ready for use.

   Refer to sections in Chapter 3, "Servicing the K2 Lx0 RAID" for information on interpreting status LED behavior.

NOTE: Refer to the K2 Storage System Instruction Manual for complete system power-up procedures.

K2 Lx0 RAID power-down

NOTE: If your K2 Lx0 RAID system is part of a shared storage system, refer to the *K2 Storage System Instruction Manual* ***for instructions on shutting down the shared storage before powering down a K2 Lx0 RAID.***

To power-down the K2 Lx0 RAID correctly:

1. Stop all read/write activity to the K2 Lx0 RAID storage system.
2. On the primary RAID controller chassis, press and hold down the power button.
3. Release the power button in about 5 seconds, when the RDY LED blinks more quickly, at a rate of about 2 blinks per second.

NOTE: Do not hold down the power button for longer than 15 seconds.

The power is turned off for the primary and expansion RAIDs. Power-off normally occurs within 20 seconds. It is indicated when LEDs other than those on the power supplies go off and the fans stop rotating.

To turn on power, refer to "K2 Lx0 RAID power-up and initialization" on page 27.

Battery Backup

Every K2 Lx0 RAID chassis power supply includes a backup battery so that if electrical power is lost, data stored in cache memory will be saved.

Chapter 3

Servicing the K2 Lx0 RAID

This chapter describes how to monitor K2 Lx0 External RAID status and replace Field Replaceable Units (FRU).

Topics include:

Maintenance procedures using Grass Valley Storage Utility

Several maintenance procedures can be performed using the Grass Valley Storage Utility.

To perform the following tasks, refer to the *K2 Storage System Instruction Manual*:

- Checking RAID controller microcode version
- Loading RAID controller microcode
- Identifying disk modules prior to removal
- Downloading K2 Lx0 Expansion disk drive firmware
- Disabling a K2 Lx0 Expansion RAID controller for removal
- Disabling a K2 Lx0 Expansion disk module for removal
- Configuring K2 Lx0 Expansion network and SNMP settings

Monitoring K2 Lx0 External RAID status using NetCentral

You can monitor K2 Lx0 External RAID Storage systems using Grass Valley's NetCentral monitoring software. Enabled by SNMP, NetCentral can continuously monitor the storage system and send notifications if there is a problem. The SNMP agent software required for NetCentral monitoring resides on the RAID storage device itself. As a result, the K2 Lx0 External RAID appears in NetCentral as a standalone device rather than as a subsystem of the K2 Media Client.

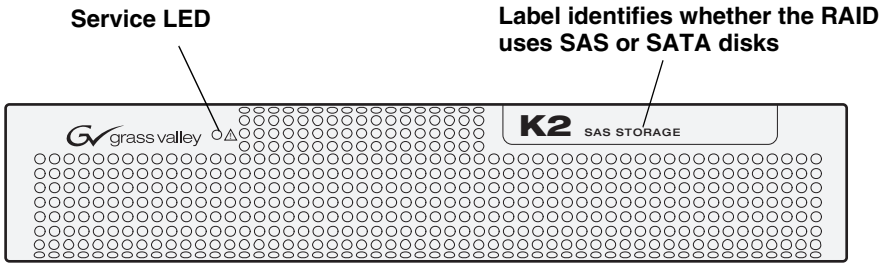
Communication with NetCentral takes place over the Ethernet connection on each RAID controller. To monitor the K2 Lx0 External RAID, you must connect network cabling, power on the system, then configure network and SNMP settings as described in the *K2 Storage System Instruction Manual*.

Refer to the *NetCentral On-line Help* for information on monitoring the K2 Lx0 RAID with NetCentral.

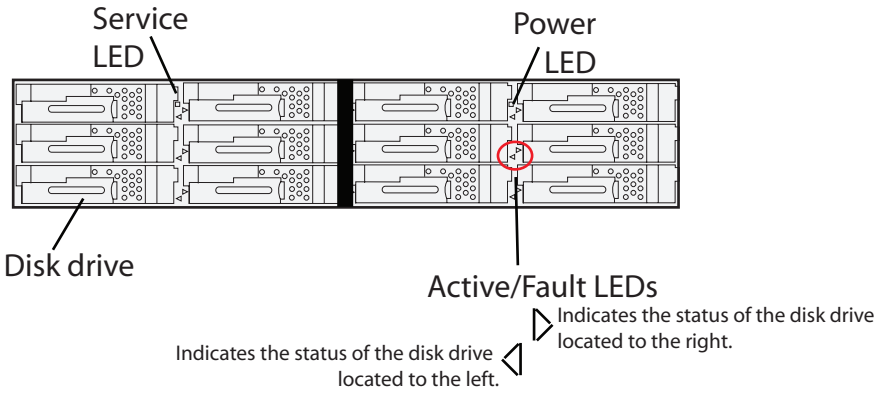
Interpreting front panel LEDs

Use the following illustrations (with and without the bezel) and table to identify and interpret front panel LEDs.

With the bezel on, only the Service LED is visible on the front panel.



With the bezel off, the Power LED and Active Fault LEDs are visible.

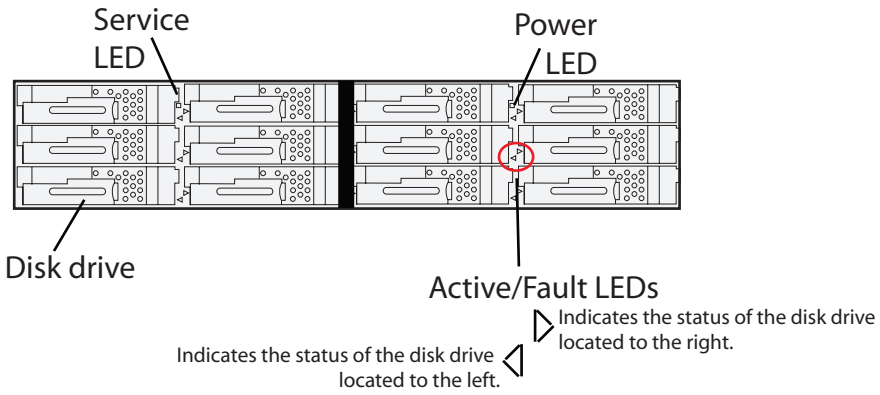


Primary and Expansion RAID chassis

Operating Condition	Power LED	Service LED	Meaning
Running	On	Off	Normal operation
	On	On	Requesting maintenance or processing a maintenance task, such as system recovery.
	On	On	Requesting maintenance or processing a maintenance task (such as system recovery). Further information provided via NetCentral.
Starting up	On	Flash	(Primary RAID only) One of the following sequences are in progress: Power-on Online download Automatic download To identify the sequence, use the controller's Ready and Fault LEDs. Do not turn off the power supply while a sequence is in progress. For more information, see "K2 Lx0 RAID power-up and initialization" on page 27.
	On	Flash (5 sec.) and Off (7 sec.)	(Primary RAID only) Requesting maintenance. (Battery backup failure, cache write data may have been lost)
Shutting down	Flash (.2 sec) and Off (.7 sec)	Off	(Primary RAID only) Shutdown sequence is in progress.
	Off	Off	Shutdown sequence is complete.

Interpreting disk module LEDs

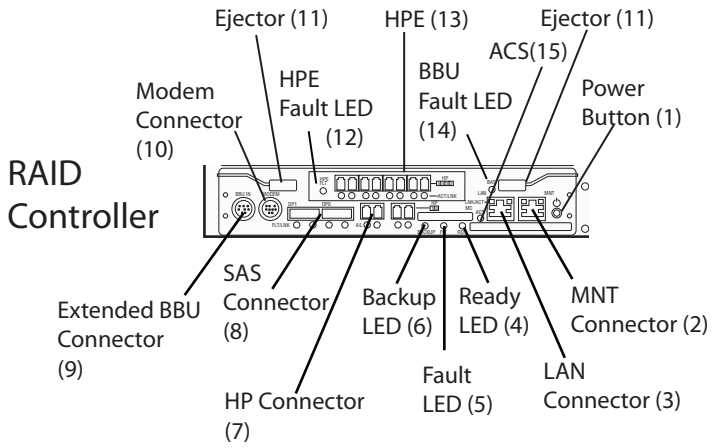
Use the following illustration and table to identify and interpret disk module LEDs. For each disk drive or dummy carrier, a single Active/Fault LED indicates the states of the disk drive.



Active/Fault LED		Meaning
Green	On	Normal state (ready)
Green	Blinking	Normal status (accessing)
Green/ Orange	Blinking in turn	Rebuilding
Orange only	Blinking	HDD low power state
Orange	On	Abnormal status

Interpreting controller status LEDs

Use the following illustration and table to identify and interpret controller LEDs.



Indicator	Description	
Power button (1)	Turns power on and off	
MNT connector (2)	Connects the controller to a maintenance PC	
LAN connector(3)	Connects the controller to a Storage Manager or a LAN for SNMP.	
	On the left is the LINK LED (green), which indicates that a LAN is physically connected.	On the right is the Active LED (orange), which illuminates during a TCP protocol connection from a host.

Ready LED (4) (green)	Fault LED (5) (orange)	Meaning
Blinking	Off	Normal operation
On	Off	Starting
Blinking (5 times/ second)	Off	Shutdown sequence in progress
Blinking asynchronously		Online/automatic download sequence in progress
Blinking synchronously		In download mode
Blinking	On	Disk interface is unavailable
On	On	Occurrence of fault

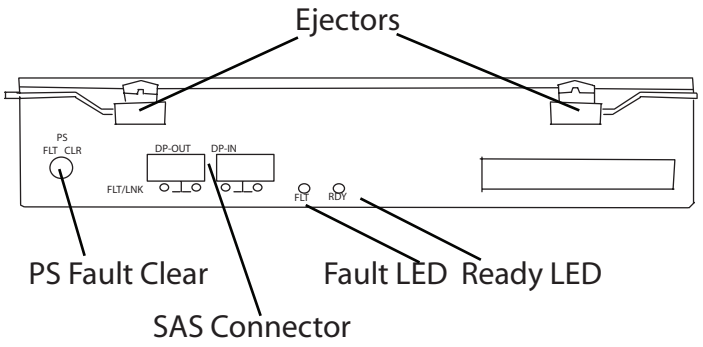
Ready LED (4) (green)	Fault LED (5) (orange)	Meaning
On	Blinking	Waiting for disk enclosure power-on
Off	Off	Powered off

Indicator	Description	
Backup LED (6)	Blinks orange light to indicate the battery backup state	Blinks if the controller has lost power, was improperly shut down, or faulted, with data in its cache that has not been written to disk. These conditions need to be rectified before the backup battery discharges (about 24 hours).
HP connector (7)	Connects the disk array unit to a host. Without an expansion port, there are two ports per controller. With an expansion port, there are six ports per controller. On the left is the Access LED, which shows the state of I/O processing. On the right is the Link LED, which shows the state of the FC link. Locations and port numbers HP5 HP4 HP3 HP2 HP1 HP0	Both LEDs blinking in a one-second cycle shows the port if offline Both LEDs blinking quickly (500ms cycle) shows the shutdown sequence is in progress. Any other simultaneous blinking shows that the port setting is not correct.
SAS connector (8)	Connects the K2 Lx0 RAID to expansion chassis. Two connectors per controller. Locations and port numbers DP1 DP0 (Optional) DP1 — only used with the Level 30 and Level 30R RAID	
	Link LED (green)	Illuminates to indicate that the link-up is being executed on the Expansion chassis. Off state indicates that the link-down is being executed on the Expansion chassis
	Fault LED (orange)	Illuminates to indicate an error.
Extended BBU connector (9)	Not used.	
Modem connector (10)	Not used.	
Ejector (11)	Used to install or remove the controller.	

Indicator	Description	
HPE Fault LED (12) (Orange)	(Optional) Illuminates to indicate an abnormality in the host port extension. Only used with the Level 30 and Level 30R RAID	
HPE (13)	(Optional) Expands the HP connector. Only used with the Level 30 and Level 30R RAID	
BBU Fault LED(14) (Orange)	BBU Fault LED	Illuminates to indicate that an error has occurred in the battery backup unit (BBU). Blinks to indicate that the BBU must be replaced (due to its life). For more information, see "Replacing a battery" on page 45
ACS (15)	Not used	

Interpreting expansion adapter status LEDs

Use the following illustration and table to identify and interpret expansion adapter LEDs

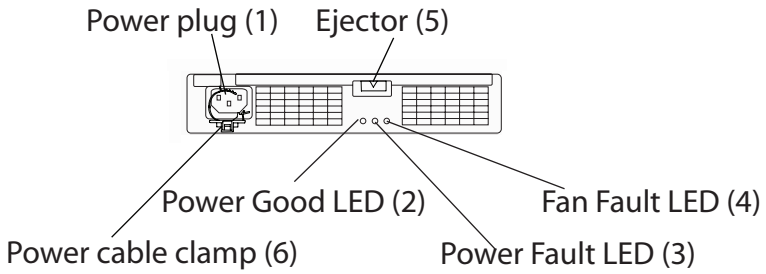


Ready LED	Fault LED	Meaning
Off	Off	No connection or powered off. (The K2 Lx0 Expansion Chassis is powered on when the connected K2 Lx0 RAID is turned on.)
On	Off	Normal operation
Blinking	Off	Starting
On	On	Fault inside the adapter, must be replaced.

Connector	Description
SAS	Connects the adapter to a K2 Lx0 RAID or K2 Lx0 Expansion Chassis. A Fault LED and Link LED are located below each connector.
	Fault LED (green) Illuminated - indicates link-up Off - indicates link-down
	Link LED (orange) Illuminated or blinking indicates that an abnormality was detected. Off - normal operation
	Locations and names of SAS connectors DP-IN - connects to controller or adapter on the side near the controller DP-OUT - connects to adapter of next disk enclosure
Ejectors	Used to install or remove the adapter.
PS Fault Clear	Used to clear the fault status of the corresponding power supply.

Interpreting power supply status LEDs

Use the following illustration and table to identify and interpret power supply LEDs



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LED	Action	Meaning
Power Good (green)	On	AC power is supplied to the chassis.
Power Fault (orange)	On	Fault in power supply (excluding the fan) or battery backup unit. This LED works when AC power of either PS0 or PS1 is supplied.
Fan Fault (orange)	On	Fault in the fan. This LED works when AC power of either PS0 or PS1 is supplied.

Moving disk modules

⚠ ***CAUTION: Once bound and added to file system, don't re-arrange the disk modules and change the discovery order. You can destroy the media file system beyond recovery if you move a disk module to a different slot. The service person can move a disk module when you don't care about losing the media in the media file system and under the following cautions:***

- The disk module must be unbound.
- Moving a drive module that is part of a LUN to another slot makes all information on the LUN inaccessible.
- You must remove and install the disk module while the storage system is powered up.
- In a location that does not mount a disk drive, mount a dummy carrier. It is necessary for the cooling of the unit.

A disk module must be inserted all the way or removed entirely. Do not leave a disk module partially removed except for periods when you are allowing it to spin down. When replacing multiple disks, observe the following:

- The RAID chassis configuration information is written to the first three disk modules. If all of these disk modules are replaced with new devices with the power supplies turned off, the information is lost. This condition is indicated by the SERVICE LED blinking at a high rate at chassis power up. Therefore, do not replace the first three disk modules with the power supplies turned off. Do not take out more than one of the disk drives inserted in locations 00, 01, and 02 at one time.
- When multiple disk modules are subject to replacement, they must be replaced with new disk modules one by one. Do not replace multiple disk modules simultaneously. After checking that the Ready LED on the front panel of the current disk module is lit, commence replacing the next disk module.
- Stick on the physical label indicating the installation position on each newly installed disk module.

⚠ ***CAUTION: Handle a disk module gently and use an ESD wristband. Do not remove a faulty disk module until you have a replacement module (with the same part number) or a filler module available.***

Removing and installing disk modules

Use the following instructions to replace a faulty disk module. It should be replaced while the RAID chassis is running (hot-swapped).

Removing a disk module

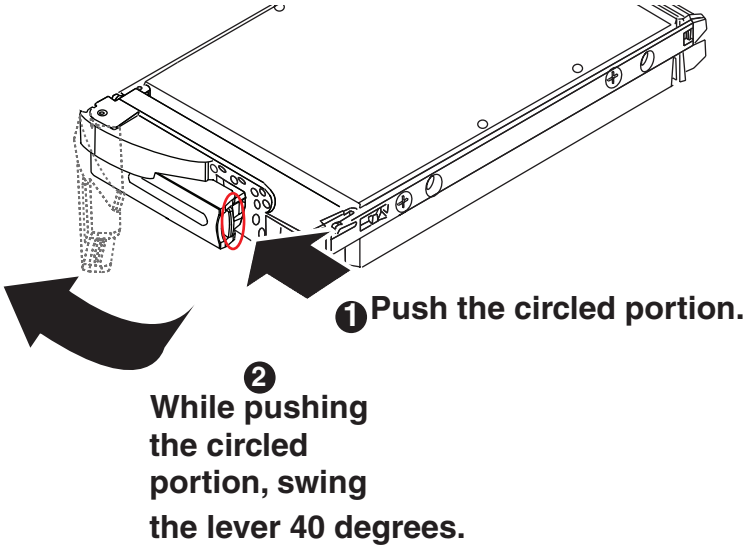
NOTE: If a disk module has been bound, do not move it to another slot unless you do not care about the data on the disk module . Each module has identifying information written when it is bound. Moving it to another slot can make this information inaccessible.

Generally, you should not remove a disk module unless it is faulty. Refer to "Interpreting front panel LEDs" on page 32 and "Monitoring K2 Lx0 External RAID status using NetCentral" on page 31.

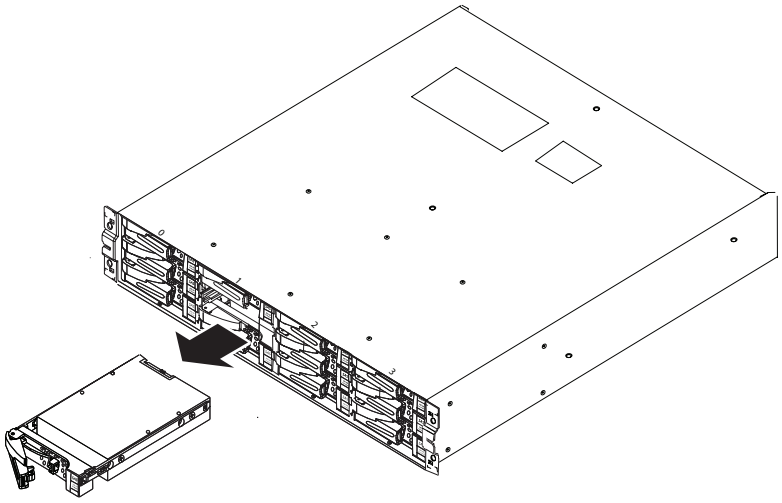
NOTE: If you wish to remove an operational disk module, use the Grass Valley Storage Utility to disable the disk before removing it.

To remove the disk module:

1. Look in Storage utility and verify that the disk is reported as disabled or offline. If it is not, disable the disk before proceeding.
2. Confirm the location of the faulty disk module by checking its Fault LED. Also check NetCentral messages. NetCentral messages can report disk faults by disk module number.
3. Open the disk module as illustrated in the following diagram.



4. With both hands, hold the sides and underside of the disk module. Remove the disk module as illustrated in the following diagram.



Installing disk module

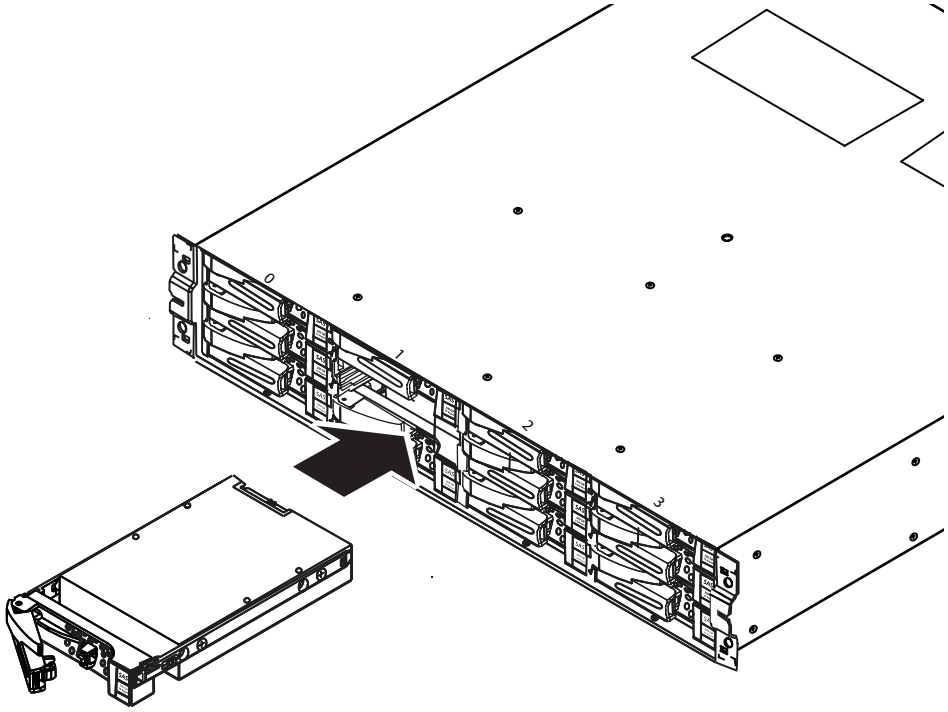
⚠ ***CAUTION: If the RAID chassis does not have the redundant controller option, when a replacement disk module is inserted there can be a 1.5 second disruption. Video record/play is not affected.***

Before installing the disk module, make sure that you:

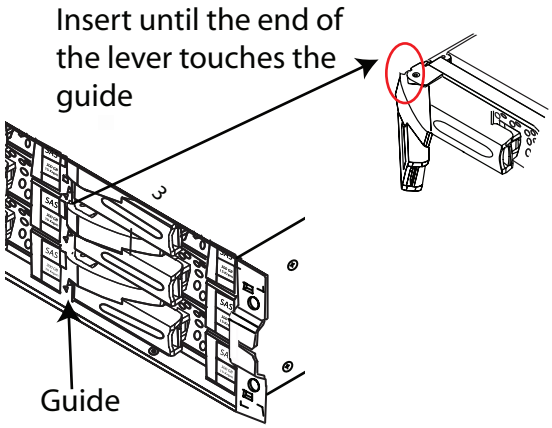
- Wait at least three minutes after removing the previous disk module.
- Put a location label on the replacement disk drive, as appropriate for the slot into which it is installed.

To install a disk module:

1. Open the lever of the disk module, as demonstrated in "Removing a disk module" on page 40.
2. Insert the drive in the unit.



3. Insert the drive as shown in the following diagram.



4. Close the lever all the way.

   The disk spins up automatically upon installation and, if the inserted disk is a replacement for a failed drive in a bound LUN, data recovery begins.

   Refer to "Interpreting controller status LEDs" on page 35 for disk module LED status during rebuild. Afterward, check disk module status using NetCentral or the Grass Valley Storage Utility.

Replacing a RAID controller or expansion adapter

Use the following instructions to replace a RAID controller or expansion adapter. On a chassis with two controllers, the controller or expansion adapter should be replaced while the chassis is powered up (hot-swapped).

On a chassis with two controllers, if the controller microcode on the replacement controller is not the same as that on the other currently installed controller, the microcode on the replacement controller is automatically upgraded or downgraded to match that on the currently installed controller.

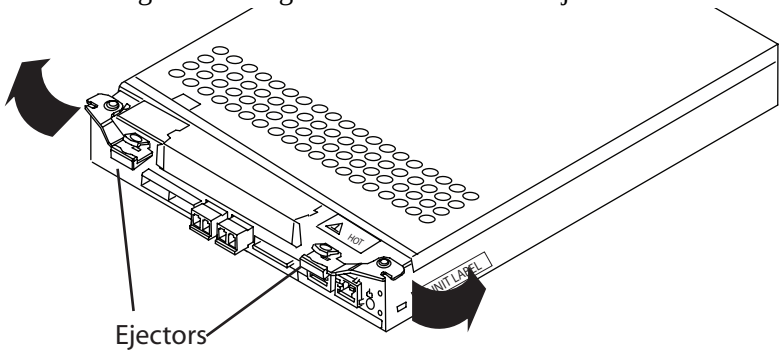
Removing a RAID controller or expansion adapter

To remove a RAID controller or expansion adapter:

1. If you are removing a redundant controller or an expansion adapter, identify the module to be replaced using NetCentral or verify that the module's Fault LED is on. If you are removing an operational RAID controller, use the Grass Valley Storage Utility to disable the RAID controller. If there is no redundant controller, power down the system.
2. Disconnect all the cables.

NOTE: The cable to the SAS connectors has a blue tab labeled "Press." Be sure to press* forward *on the blue tab, rather than down.

3. Remove the power cable and the controller cable connected to the module. Note where the cables connect to the module. The SAS cables for the K2 Lx0 Expansion Chassis are keyed so that one end can only be used with the DP-IN connector and the other end can only be used with the DP-OUT connector.
4. Take an ejector of the module in each hand. Open them to the left and the right. (The ejectors are locked at the bottom.) The module comes out by freeing it on the left and right. The diagram below shows the ejectors on a controller.



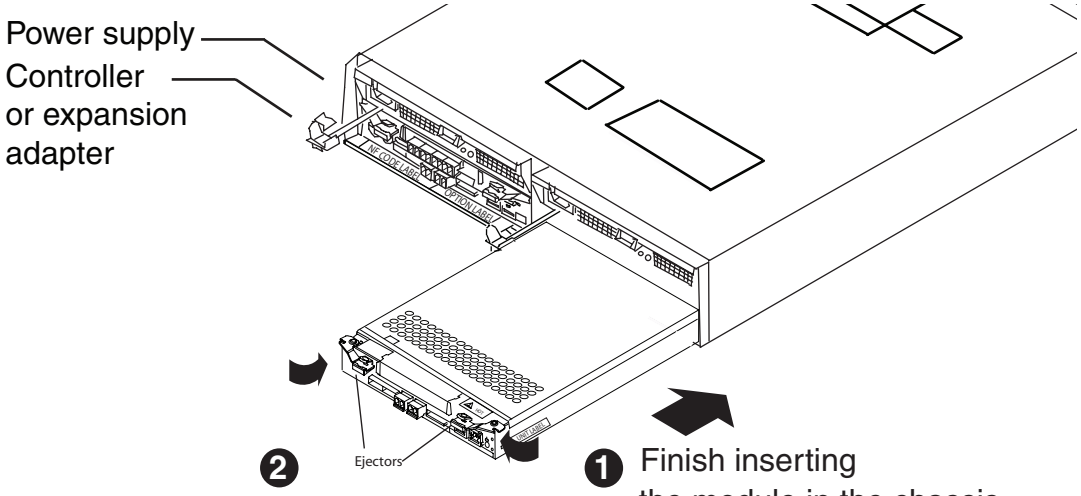
5. Holding the ejectors in both hands, pull horizontally approximately 4 inches.
6. Hold the module firmly in both hands and pull it all the way out.

⚠ ***CAUTION: The module might be hot.***

Installing a RAID controller or expansion adapter

To install a RAID controller or expansion adapter:

1. Install the module part way into the chassis, far enough in so that it is supported physically by the housing.
2. Connect the cables.
3. Continuing installing the module in the chassis, as shown in the following diagram.



Close the ejectors, firmly pressing the protruding portions of the ejectors. Confirm that both ejectors are locked.

4. If inserting an expansion adapter on a system that has a redundant controller, remove and reinsert the controller to start initialization. If inserting a controller or expansion adapter on a system that does not have a redundant controller, power up the system.
5. Verify RAID controller initialization as displayed by the module's Ready LED. This process takes approximately three to eight minutes. Refer to "Interpreting controller status LEDs" on page 35.
6. Check RAID controller status using NetCentral or the Grass Valley Storage Utility.

Replacing a power supply

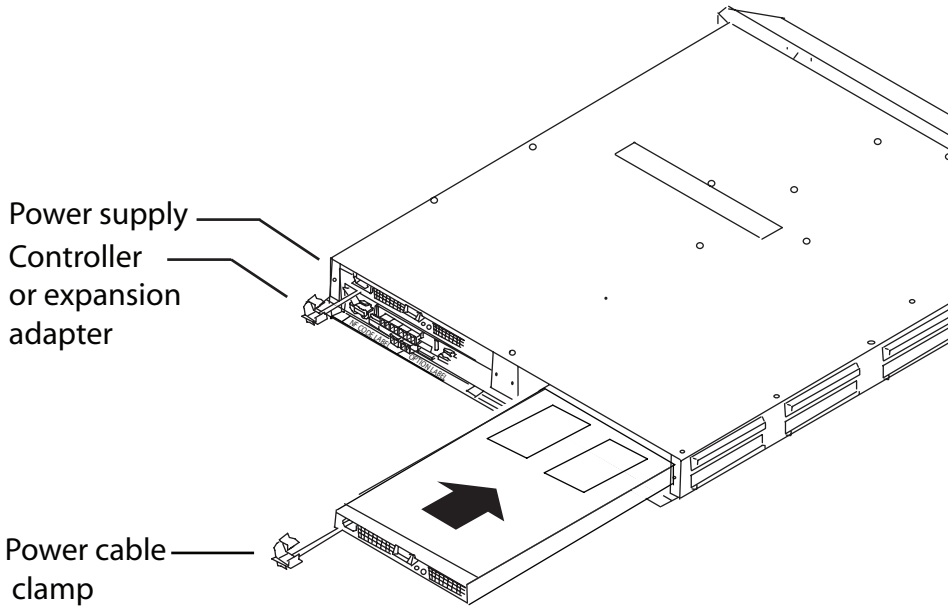
- Use power cables that are shipped with the RAID unit.
- The K2 Lx0 RAID and K2 Lx0 Expansion Chassis have dual power supply configurations so that they do not halt if one power supply breaks down. Even if a power supply is not functioning, the fan inside can draw power from the other

power supply, preventing overheating for a couple of minutes.

CAUTION: Make sure the correct type of replacement power supply is on hand and you are otherwise prepared to complete the procedure within two minutes. If the time exceeds two minutes, the protective feature of the RAID chassis triggers a shutdown sequence.

To replace the power supply:

1. Identify the faulty power supply by verifying that its Fault LED is on.
2. Unplug the power cable from the power supply.
3. Use the ejector to pull out the old power supply. Remove the power supply.
4. Push in the new power supply.



5. Reattach the power cable.
6. Secure the power cord by firmly fitting the power cable clamp.
7. Check that the Good LED of the new power supply is on.
8. Monitor the status of the power supply using NetCentral.

Replacing a battery

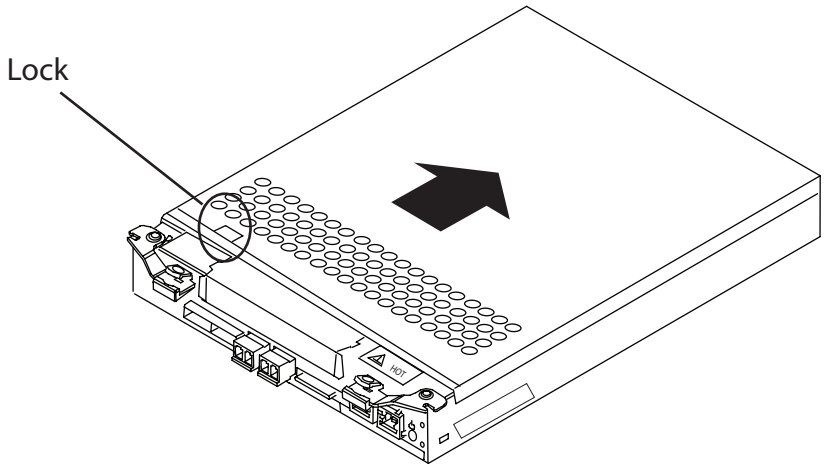
Do not replace the internal battery unless the BBU Fault LED is blinking. (For more information on controller LEDs, see “Interpreting controller status LEDs” on page 35.)

To replace the battery, follow these steps:

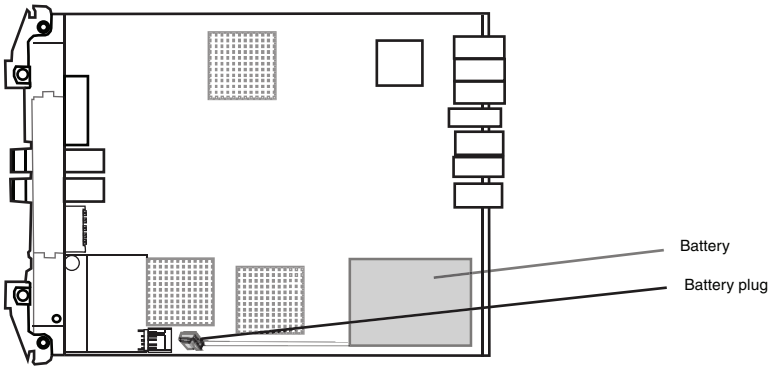
1. Remove the controller from the chassis. For information on how to remove the

controller, see “Replacing a RAID controller or expansion adapter” on page 43.

2. Remove the cover by sliding it while pressing the lock, as indicated in following diagram.



3. Holding the battery plug, unplug it from the controller. Do not pull while holding on the cable.



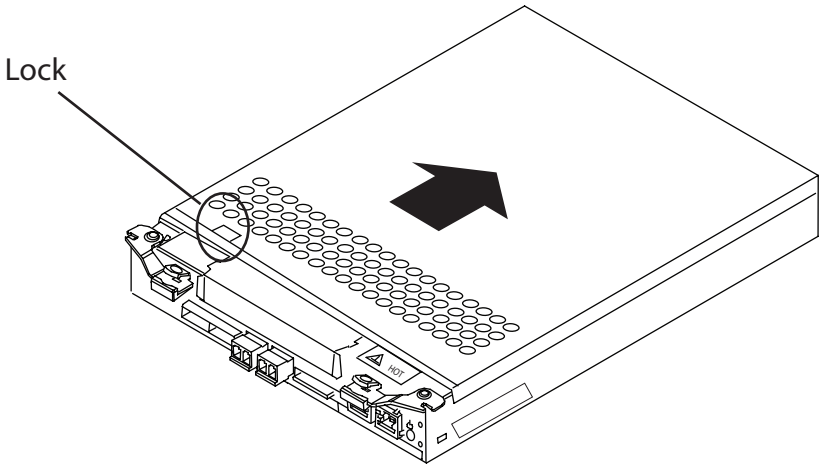
4. Remove the battery from the controller.
5. Place the new battery in the controller, and firmly insert the plug into the battery connector.
6. Replace the controller cover.
7. Return the controller to the chassis as described in “Installing a RAID controller or expansion adapter” on page 44.

Adding expansion ports

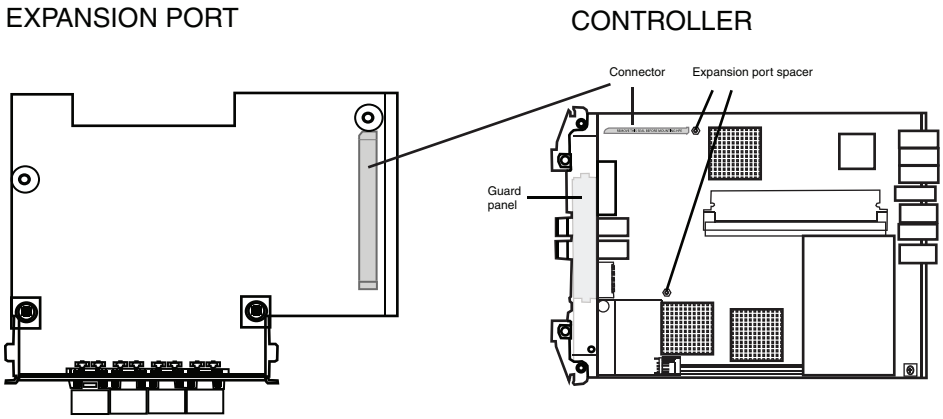
If using an L30 or L30R K2 Lx0 RAID, additional expansion ports can be added to the controller or controllers.

To install additional expansion ports, follow these steps:

1. Remove the controller from the chassis. For information on how to remove the controller, see "Replacing a RAID controller or expansion adapter" on page 43.
2. Remove the cover by sliding it while pressing the lock, as indicated in following diagram.



3. Remove the guard panel from the controller, as indicated in the following diagram.



4. Insert the expansion port by matching the connector locations. Confirm that it is firmly inserted and there is no play in the expansion port.
5. Secure with screws at the expansion port spacers.
6. Replace the controller cover.
7. Return the controller to the chassis as described in "Installing a RAID controller or expansion adapter" on page 44.

Chapter 4

K2 Lx0 RAID Technical Specifications and Operating Limits

Data handling specifications

Characteristic	Specification
Host interface	Fibre Channel
Data transfer rate	400 MB/s max
Number of host ports	2 ports per controller (L10, L20) 6 ports (Optional, an additional 4 ports, L30)
Cache memory	1 GB (L10) 2 GB (20), 4 GB (L30)

AC power requirements

Item		Measurement
Input voltage	100 to 240 VAC ±10% (x2), 50/60 Hz	
Power consumption[a] Power supply	Power supply: Basic cabinet: 2118 BTU/W Expansion cabinet: 1470 BTU/W	
Maximum power consumption[a.] Basic Chassis L10, L10R, L20, L20R configurations	SAS AC: 610VA/590W DC: 580W	SATA AC: 550VA/530W DC: 520W
Maximum power consumption[a.] Basic Chassis L30, L30R configurations	SAS AC: 640VA/620W DC: 610W	SATA AC: 570VA/550W DC: 540W
Maximum power consumption[a.] Expansion Chassis All configurations	SAS AC: 610VA/590W DC: 580W	SATA AC: 550VA/530W DC: 520W
Labeling according to the energy saving act	Category: i Energy consumption efficiency: 0.10	

a. For UPS choice, a safety allowance of 30% of the power consumption is necessary.

If one of the two power supplies fails, the remaining supply and cord must support the full load. Your rackmount cabinet must include AC power distribution that can handle these values.

Size and weight

Item	Measurement
Cabinet dimensions (excluding bezel)	Basic cabinet: 445mm W x 540mm D x 86.5mm H (same for primary chassis and expansion chassis)
Weight	Basic cabinet: 31 kg or lighter Expansion cabinet: 29 kg or lighter

Cable lengths

It is recommended that you use the cables shipped with your K2 Lx0 RAID when making connections. Host cables must meet the appropriate standards for 4-Gb/s HBA compliance (maximum cable length 150m). SAS cables are used to connect the RAID chassis with the expansion chassis.

Environmental limits

The system includes two temperature level sensors used to issue auto-warning and auto-shutdown in case the over temperature limit is reached.

Characteristic	Specification
Ambient temperature	Operating: 5°C to 40°C Halting: -10°C to 60°C
Relative humidity (without condensation)	Operating: 10% to 80% Halting: 5% to 80%
Allowable vibration level	Operating: 0.25 G or less Halting: 0.5 G or less

Life expectancies of components

Item	Measurement
Battery backup unit	5 years
Fan (power supply)	5.7 years

Glossary

The terms and definitions listed below are related to the storage system described in this manual. Understanding them will aid your understanding of the storage system.

bind

In the context of a disk-array storage system, the procedure by which you hardware-format one or more disk modules into one logical unit. Grass Valley Storage Utility lets you bind disks into a logical unit recognized by the Windows operating system, the media file system, and other software. Storage Utility labels this group of disks a *rank*.

BTU (British Thermal Unit)

A standard measure of a device's heat output.

cache

See storage-system caching.

direct-connect storage

K2 Media Client models access their own external media storage drives that are contained in a Lx0 RAID chassis. Referred to as stand-alone systems. *See* internal storage, shared storage.

disk-drive module

Another name for disk module.

disk unit

A short name for physical disk unit.

disk module

A self-contained disk drive that slides into one of the slots in the front of the storage system. It consists of the carrier assembly, which holds the disk drive and the regulator board. Also called disk-drive module.

EMI (electromagnetic interference)

Electronic radiation emitted by an electrical device. The levels of EMI are strictly controlled for data processing equipment. The EMI standards are explained after the Notice page near the beginning of the manual.

ESD (electrostatic discharge)

The discharge of an accumulated electrical charge (static). This can severely damage delicate electronic circuits.

field-replaceable unit

See FRU (field-replaceable unit).

FRU (field-replaceable unit)

A hardware assembly that can be replaced on site, instead of at the point of manufacture.

hot repair

See replace under power.

internal storage

K2 Media Client models with internal storage access their own internal media storage drives. Referred to as a stand-alone system. *See* also direct-connect storage, shared storage.

K2 Lx0 RAID Storage

A storage system that includes a chassis, up to 12 disk modules, one or two RAID controllers, and two power supplies. A K2 Lx0 can support up to eleven K2 Lx0 Expansion Chassis (with up to 12 disk modules each) in addition to its own 12 disk modules.

K2 Lx0 Expansion Chassis

A storage system that includes a chassis, up to 12 disk modules, two expansion adapters, and two power supplies.

K2 Media Client

A Broadcast Enterprise Server that incorporates IT server platform and storage technologies. The K2 Media Client can be used with internal, direct-connect, or shared storage.

power supply

An essential element of the storage-system power supply. A storage system can have two power supplies. With two, it can survive failure of one supply. You can replace a power supply under power without interrupting applications.

rank

See bind.

replace under power

The storage system provides replace under power capability, allowing you to replace, for example, a disk module or a power supply module without powering down the storage system. Applications continue while you replace the failed module.

SCSI (small computer system interface)

A well-known protocol and standard for connecting computers and peripheral devices.

SES (SCSI enclosure services)

A functional subset of SCSI III commands that allow a server to communicate with storage enclosures using their disk modules.

server

In the context of storage systems, a processor that runs an operating system and uses a disk-array storage system for data storage and retrieval.

SFF

Small Form Factor Committee

shared storage

K2 Media Client models with shared storage access RAID protected media storage drives that are part of a K2 Storage System (SAN). The K2 Storage System incorporates one or more RAID chassis, such as K2 Lx0 RAID. *See* also direct-connect storage, internal storage.

storage chassis

A storage device that includes a chassis, up to 12 disk modules, one or two RAID controllers, one LAN card, and two power supplies.

Index