

IBM Storage Appliance 2421 Model AP1
Version 1 Release 1

*Planning, Installation, and Maintenance
Guide*



Note

Before using this information and the product it supports, read the information in the “Notices” on page 47 section.

Edition notice

This edition replaces SC27-8520-01.

© Copyright IBM Corporation 2015, 2017.

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Contents

Safety and environmental notices	v
Safety notices and labels	v
Caution notices for IBM Storage Appliance 2421 Model AP1.	vi
About this book	ix
Who should use this book	ix
Conventions and terminology	ix
Publications and related information	ix
IBM Publications Center	x
Sending comments	xi
Summary of changes	xiii
Chapter 1. Overview	1
Feature codes	1
Product description	1
IBM Security Key Lifecycle Manager	1
Chapter 2. Planning information	3
Chapter 3. Installing	5
Preparing the rack	5
Installing IBM Storage Appliance 2421 Model AP1 tray and keyboard/monitor tray.	6
Installing an operating system	11
Installing an operating system from an installation disk	11
Installing an operating system over a network.	12
Chapter 4. Configuring	15
Chapter 5. Notifications	17
Chapter 6. Troubleshooting	19
Hardware overview	19
Identifying problems	21
General troubleshooting	21
Processor unit troubleshooting	23
KVM switch troubleshooting	24
Media drive troubleshooting.	25
Recovery procedures	26

Chapter 7. Exchange procedures	27
Exchanging a processor unit.	27
Exchanging the KVM switch.	28
Exchanging the media drive.	30
Exchanging the keyboard.	31
Exchanging the keyboard/monitor tray	34
Exchanging the power supply	35
Chapter 8. Monitor controls	39
Appendix A. Field-replaceable units	41
Appendix B. Battery removal and disposal	43
Appendix C. Warranty and licensing information	45
Notices	47
Trademarks	48
Homologation statement	49
Electronic emission notices	49
Federal Communications Commission Statement	49
Industry Canada Compliance Statement	49
Australia and New Zealand Class A Statement	49
European Union Electromagnetic Compatibility Directive	49
Germany Electromagnetic Compatibility Directive	50
People's Republic of China Class A Statement	52
Taiwan Class A Statement	52
Taiwan Contact Information	52
Japan Voluntary Control Council for Interference Class A Statement	52
Japan Electronics and Information Technology Industries Association Statement	53
Korean Communications Commission Class A Statement	53
Russia Electromagnetic Interference Class A Statement	54
Index	55

Safety and environmental notices

Review the safety notices, environmental notices, and electronic emission notices for this product before you install and use the product.

Safety notices and labels

Review the safety notices and safety information labels before using this product.

IBM Systems safety notices and information

This publication contains the safety notices for the IBM Systems products in English and other languages. It also contains the safety information labels found on the hardware in English and other languages. Anyone who plans, installs, operates, or services the system must be familiar with and understand the safety notices. Read the related safety notices before beginning work.

 *IBM Systems Safety Notices* (www.ibm.com/shop/publications/order/), G229-9054

The publication is organized into the following sections:

Safety notices

Lists the danger and caution notices without labels, organized alphabetically by language.

The following notices and statements are used in IBM documents. They are listed in order of decreasing severity of potential hazards.

Caution notice definition

A special note that calls attention to a situation that is potentially hazardous to people because of some existing condition, or to a potentially dangerous situation that might develop because of some unsafe practice.

Labels Lists the danger and caution notices that are accompanied with a label, organized by label reference number.

Text-based labels

Lists the safety information labels that might be attached to the hardware to warn of potential hazards, organized by label reference number.

Note: This product has been designed, tested, and manufactured to comply with IEC 60950-1, and where required, to relevant national standards that are based on IEC 60950-1.

Finding translated notices

Each safety notice contains an identification number. You can use this identification number to check the safety notice in each language. The list of notices that apply to the product are listed in the the “Caution notices for IBM Storage Appliance 2421 Model AP1” on page vi topics.

To find the translated text for a caution notice:

1. In the product documentation, look for the identification number at the end of each caution notice. In the following example, the number (C001) is the identification number.

CAUTION:

A caution notice indicates the presence of a hazard that has the potential of causing moderate or minor personal injury. (C001)

2. Open the *IBM Systems Safety Notices (G229-9054)* publication.
3. Under the language, find the matching identification number. Review the topics concerning the safety notices to ensure that you are in compliance.

To view a PDF file, you need Adobe Reader. You can download it at no charge from the Adobe website (get.adobe.com/reader/).

Caution notices for IBM Storage Appliance 2421 Model AP1

Ensure that you understand the caution notices for the Storage Appliance AP1.

Caution notices

Use the reference numbers in parentheses at the end of each notice, such as (C001), to find the matching translated notice in *IBM Systems Safety Notices*.

CAUTION: Only trained service personnel may replace this battery. The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.
Do not: Throw or immerse into water, heat to more than 100°C (212°F), repair or disassemble. (C002)

CAUTION: This part or unit is heavy but has a weight smaller than 18 kg (39.7 lb). Use care when lifting, removing, or installing this part or unit. (C008)

Use the following general safety information for all rack mounted devices:

DANGER: Observe the following precautions when working on or around your IT rack system:

- Heavy equipment—personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.



- Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.
(R001 part 1 of 2)

CAUTION:

- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- (For sliding drawers): Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.
- (For fixed drawers): This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.
(R001 part 2 of 2)

About this book

This book describes information about the planning, installation, and maintenance requirements of the IBM® Storage Appliance 2421 Model AP1.

Who should use this book

This book is intended for users who are involved with storage management applications, such as encryption and disaster recovery services, and for IBM Service personnel who are responsible for installing and maintaining the IBM Storage Appliance 2421 Model AP1.

Conventions and terminology

Different typefaces are used in this guide to show emphasis, and various notices are used to highlight key information.

The following typefaces are used to show emphasis:

Typeface	Description
Bold	Text in bold represents menu items.
bold monospace	Text in bold monospace represents command names.
<i>Italics</i>	Text in italics is used to emphasize a word. In command syntax, it is used for variables for which you supply actual values, such as a default directory or the name of a system.
Monospace	Text in monospace identifies the data or commands that you type, samples of command output, examples of program code or messages from the system, or names of command flags, parameters, arguments, and name-value pairs.

These notices are used to highlight key information:

Notice	Description
Note	These notices provide important tips, guidance, or advice.
Important	These notices provide information or advice that might help you avoid inconvenient or difficult situations.
Attention	These notices indicate possible damage to programs, devices, or data. An attention notice is placed before the instruction or situation in which damage can occur.

Publications and related information

Product guides, other IBM publications, and websites contain information that relates to the Storage Appliance AP1.

To view a PDF file, you need Adobe Reader. You can download it at no charge from the Adobe website (get.adobe.com/reader/).

Online documentation

The IBM Security Key Lifecycle Manager online product documentation (www.ibm.com/support/knowledgecenter/SSWPVP/) provides information about IBM Security Key Lifecycle Manager, which you can use to manage encryption keys and certificates. The online documentation is updated between product releases to provide the most current documentation.

Publications

You can download individual publications (including previous versions) that have an order number from the IBM Publications Center website (www.ibm.com/shop/publications/order/). Publications without an order number are available on the documentation CD or can be downloaded here.

Table 1. Storage Appliance AP1-related publications

Title	Description	Order number
<i>IBM Security Key Lifecycle Manager Installation and Configuration Guide</i>	This publication provides an overview of the product and information for installing and configuring Security Key Lifecycle Manager.	SC27-5335
<i>IBM Security Key Lifecycle Manager Quick Start Guide</i>	This guide describes a quick and easy way to install Security Key Lifecycle Manager.	GI13-2316

Table 2. Notices information

Title	Order number
<i>IBM Safety Notices</i>	Search for G229-9054 on the IBM Publications Center website
<i>IBM Systems Environmental Notices</i>	http://ibm.co/1fBgWFI

Related websites

View the websites in the following table to get more related information about the Storage Appliance AP1.

Table 3. Storage Appliance AP1 related websites

Title	Description
IBM website (ibm.com [®])	Find more information about IBM products and services.
IBM Support Portal website (www.ibm.com/storage/support)	Find support-related information such as downloads, documentation, troubleshooting, and service requests and PMRs.

IBM Publications Center

The IBM Publications Center is a worldwide central repository for IBM product publications and marketing material.

Procedure

The IBM Publications Center website (ibm.com/shop/publications/order) offers customized search functions to help you find the publications that you need. You can view or download publications at no charge.

Sending comments

Your feedback is important in helping to provide the most accurate and highest quality information.

Procedure

To submit any comments about this publication or any other IBM storage product documentation:

Send your comments by email to starpubs@us.ibm.com. Be sure to include the following information:

- Exact publication title and version
- Publication form number (for example, GA32-1234-00)
- Page, table, or illustration numbers that you are commenting on
- A detailed description of any information that should be changed

Summary of changes

This section describes the current changes made to the *IBM Storage Appliance 2421 Model AP1 Introduction, Planning, and Maintenance Guide*. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

Table 4. Summary of Changes.

Section	Description
Recovery procedures	Changed the description "Processor unit is unresponsive" in the Recovery procedures table to "USB, SD card, or processor unit is unresponsive." For information, see "Recovery procedures" on page 26.
Preparing the rack	The depth of the Storage Appliance AP1 was updated as well as the information in Table 6. For information, see "Preparing the rack" on page 5.

Chapter 1. Overview

IBM Storage Appliance 2421 Model AP1 is a hardware platform that supports IBM Security Key Lifecycle Manager for encryption management for DS8000, TS7700, TS4500 and TS3500 storage products. The Storage Appliance AP1 supports IBM Copy Services Manager.

Feature codes

Table 5. Feature codes for IBM Storage Appliance 2421 Model AP1

Description	Feature Codes
Security Key Lifecycle Manager indicator	0204
No OS indicator	0206
US TAA compliance indicator	0983
Single storage appliance	1761
Dual storage appliance	1762

Product description

IBM Storage Appliance 2421 Model AP1 is a stand-alone machine. It is mounted in a customer-supplied 19-inch industry standard rack.

The Storage Appliance AP1 provides platforms for software such as IBM Security Key Lifecycle Manager isolated key-manager. It is available in single processor unit (feature code 1761) and dual processor unit (feature codes 1761 and 1762 ordered together) configurations and has a one-year warranty.

The Storage Appliance AP1 includes a 2U tray for the processor unit or units, power supplies, media drive, and keyboard video monitor (KVM) switch. The Storage Appliance AP1 also includes a 1U tray for the keyboard/monitor assembly, and the required rack-mount line cords.

The KVM switch allows the dual processor unit configuration to use a shared monitor. The bezel in the tray has a label with the machine type, model, and serial number. This information is needed for hardware service.

IBM Security Key Lifecycle Manager

IBM Security Key Lifecycle Manager is an encryption key application for managing keys that are used to encrypt storage systems, such as disk or tape.

To use the Security Key Lifecycle Manager on IBM Storage Appliance 2421 Model AP1, you must acquire a Security Key Lifecycle Manager license, which is ordered separately from Storage Appliance AP1 hardware.

The licensing for Security Key Lifecycle Manager includes both an install license for the Security Key Lifecycle Manager software and licensing for the encrypting drives.

To purchase and download Security Key Lifecycle Manager, go to IBM Passport Advantage Online (www.ibm.com/software/passportadvantage/pao_customer.html).

For more information about downloading, installing, and using Security Key Lifecycle Manager, refer to the following website and publications.

- IBM Security Key Lifecycle Manager online product documentation (<http://www-01.ibm.com/support/knowledgecenter/SSWPVP/welcome>)
- *IBM Security Key Lifecycle Manager Quick Start Guide (GI13-2316)*
- *IBM Security Key Lifecycle Manager Installation and Configuration Guide (SC27-5335)*

Chapter 2. Planning information

This planning information defines pre-installation requirements for IBM Storage Appliance 2421 Model AP1. It is important to ensure that you meet all requirements to help achieve a fast and reliable installation.

Installation planning

Storage Appliance AP1 is installed by an IBM service support representative (SSR). However, you must prepare the location for installation. For information about planning the installation of a storage appliance, including equipment, site, and power requirements, see Chapter 3, “Installing,” on page 5.

After installation is complete, contact IBM Lab Services to configure the Storage Appliance AP1.

Operating system planning

SUSE Linux Enterprise Server operating system is included as the default operating system. Storage Appliance AP1 is configured by IBM Lab Services.

If you order feature code 0206 (no OS indicator) you must purchase an operating system license. For a list of supported operating systems, see IBM Security Key Lifecycle Manager online product documentation (<http://www-01.ibm.com/support/knowledgecenter/SSWPVP/welcome>). You are responsible for installing and updating the operating system. For more information, see “Installing an operating system” on page 11.

Encryption planning

Review the following encryption planning requirements and include them in the installation considerations.

- Storage appliance planning. For more information, see “Storage appliance planning” on page 4.
- Security Key Lifecycle Manager planning. Security Key Lifecycle Manager is configured by IBM Lab Services. For more information, see *IBM Security Key Lifecycle Manager Installation and Configuration Guide (SC27-5335)*.

Note: For DS8000 series, if your storage system requires dual-platform key server support, Security Key Lifecycle Manager Interim Fix 2 (Version 1.0.0.2, or later) is recommended to support displaying both key labels in the DS8000® Storage Management GUI. Additionally, if you intend to replicate keys between separate z Systems sysplexes by using ICSF with the JCECCARACFKS keystore in secure key mode and with the secure key configuration flag set in Security Key Lifecycle Manager, Security Key Lifecycle Manager Fix Pack 3 (Version 1.0.0.3, or later) is required.

- Encryption planning for your storage systems. For more information, see your storage system's online product documentation.

Storage appliance planning

Encryption-enabled storage systems require at least two storage appliances with key server software for each site. According to encryption best practices, one storage appliance must be physically isolated.

Before you configure a key label for an encryption-enabled storage system, you must replicate the key labels and their associated key material across all storage appliances that are attached to the storage system.

Chapter 3. Installing

IBM Storage Appliance 2421 Model AP1 is installed by an IBM service support representative (SSR). However, you must prepare the location for installation.

Preparing the rack

Identify the location in the 19-inch rack where IBM Storage Appliance 2421 Model AP1 will be installed.

Before you begin

Read the safety notices before you prepare the rack to hold the Storage Appliance AP1 and keyboard/monitor assembly. For more information about safety notices, see "Safety and environmental notices" on page v.

Procedure

To prepare the 19-inch external rack for Storage Appliance AP1 installation, complete the following step.

Identify the location in the rack where the Storage Appliance AP1 tray will be installed. The location must meet these requirements:

- The Storage Appliance AP1 tray and the keyboard/monitor assembly require 3U of vertical rack space (13.35 cm or 5.25 in.). See Table 6 for rack space requirements.
- The depth of the Storage Appliance AP1 tray is 71.3 cm.
- The Storage Appliance AP1 tray is designed for use in racks with front to back airflow. The Storage Appliance AP1 itself does not generate significant airflow. The internal servers use processor heat sink fans that circulate air from rack exhaust side ambient within the enclosure. The specification for these servers is a 50-degree Celsius maximum operating temperature at 8% to 85% RH within the enclosure.
- The recommended height is 1 - 1.4 m (3.28 - 4.59 ft) from the floor. If the tray is positioned lower, it is difficult to switch the media drive USB cable connection between processor units. This height is also ideal for access to the keyboard/monitor assembly.
- The rack must have three available power connections for the Storage Appliance AP1 and keyboard/monitor assembly. A Storage Appliance AP1 with two processor units must be connected to two separate power service branches. See Table 6 for power requirements.

Table 6. Storage Appliance AP1 rack space and power characteristics

Description	Rack space	Power consumption	BTU/h	Input voltage	Weight and use
Storage Appliance AP1 with one processor unit	2U	< 100 watts	< 341 BTU/h	100 - 240 V ac 50/60 Hz 2 A (x1)	< 13 kg

Table 6. Storage Appliance AP1 rack space and power characteristics (continued)

Description	Rack space	Power consumption	BTU/h	Input voltage	Weight and use
Storage Appliance AP1 with two processor units	2U	< 190 watts	< 648 BTU/h	100 - 240 V ac 50/60 Hz 2 A (x2)	< 13 kg
Keyboard/monitor assembly	1U	< 100 watts	< 341 BTU/h	100 - 240 V ac 50/60 Hz 0.93 A	< 13 kg

Note: The Storage Appliance AP1 does not support USB cables that are more than 3 m (9.85 ft) long.

Installing IBM Storage Appliance 2421 Model AP1 tray and keyboard/monitor tray

IBM Storage Appliance 2421 Model AP1 and keyboard/monitor assembly are installed by an IBM service support representative (SSR).

Before you begin

The SSR must read the safety notices before they install the Storage Appliance AP1 and keyboard/monitor trays. See "Safety and environmental notices" on page v.

CAUTION: This part or unit is heavy but has a weight smaller than 18 kg (39.7 lb). Use care when lifting, removing, or installing this part or unit. (C008)

Use the following general safety information for all rack mounted devices:

DANGER: Observe the following precautions when working on or around your IT rack system:

- Heavy equipment—personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.



- Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.
(R001 part 1 of 2)

CAUTION:

- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- (For sliding drawers): Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.
- (For fixed drawers): This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.
(R001 part 2 of 2)

DANGER: When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:

- If IBM supplied a power cord(s), connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product.
- Do not open or service any power supply assembly.
- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.
- Connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.
- Connect any equipment that will be attached to this product to properly wired outlets.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Do not attempt to switch on power to the machine until all possible unsafe conditions are corrected.
- Assume that an electrical safety hazard is present. Perform all continuity, grounding, and power checks specified during the subsystem installation procedures to ensure that the machine meets safety requirements.
- Do not continue with the inspection if any unsafe conditions are present.
- Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.
- Connect and disconnect cables as described in the following procedures when installing, moving, or opening covers on this product or attached devices.

To disconnect:

1. Turn off everything (unless instructed otherwise).
2. Remove the power cords from the outlets.
3. Remove the signal cables from the connectors.
4. Remove all cables from the devices.

To connect:

1. Turn off everything (unless instructed otherwise).
2. Attach all cables to the devices.
3. Attach the signal cables to the connectors.
4. Attach the power cords to the outlets.
5. Turn on the devices.

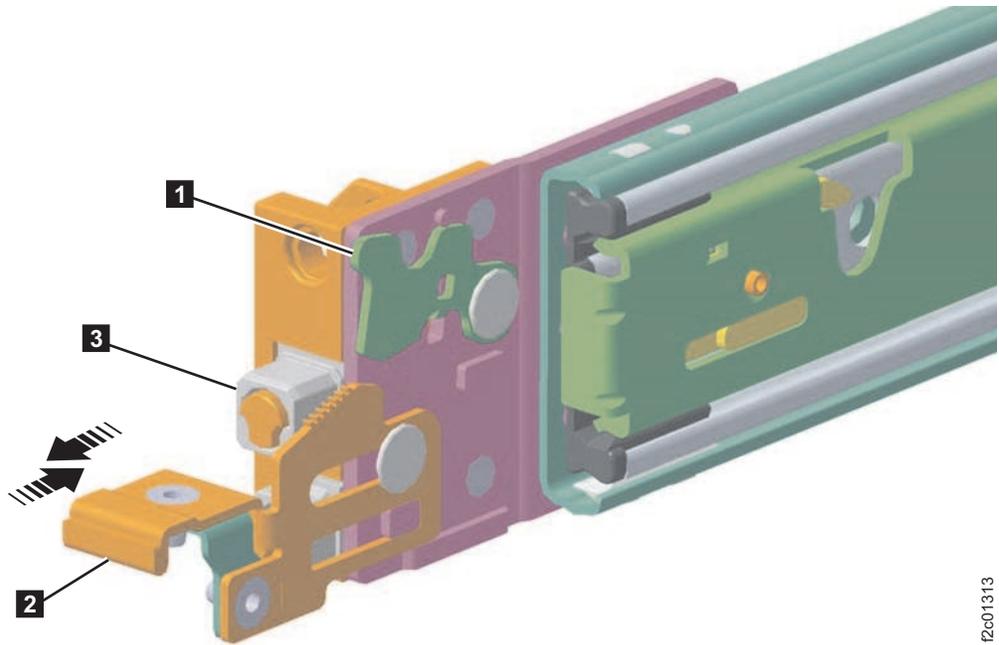
- Sharp edges, corners and joints may be present in and around the system. Use care when handling equipment to avoid cuts, scrapes and pinching. (D005)

Procedure

The SSR must complete the following steps to install a Storage Appliance AP1 and keyboard/monitor tray in a standard 19-inch rack.

1. Unpack the Storage Appliance AP1 and verify that the ship group is complete. Refer to the detailed instructions that are provided with the Storage Appliance AP1 tray. Identify the following items in the shipping carton:
 - Server rack installation kit and instructions

- Storage Appliance AP1 tray
2. Inspect the Storage Appliance AP1 hardware for any damage during shipping. If you observe shipping damage or missing items, do not install the hardware without IBM management approval. Report all observed damage immediately, following existing procedures.
 3. Prepare the rack.
 - If you have an IBM-supplied rack that needs to be installed, use the instructions that are provided with the rack to install the rack in the customer-designated location.
 - If not, then the rack must already be installed by the customer. If the rack was not installed, ask the customer to finish preparing the rack before you continue. For more information, see “Preparing the rack” on page 5.
 - a. Ask the customer to identify the location in the rack where the Storage Appliance AP1 tray will be installed. The location must meet the following requirements:
 - The Storage Appliance AP1 tray and the keyboard/monitor assembly require 3U of vertical rack space (13.35 cm or 5.25 in.). See Table 6 on page 5 for rack space requirements.
 - The depth of the Storage Appliance AP1 tray is 71.3 cm.
 - The Storage Appliance AP1 tray is designed for use in racks with front to back airflow. The Storage Appliance AP1 itself does not generate significant airflow. The internal servers use processor heat sink fans that circulate air from rack exhaust side ambient within the enclosure. The specification for these servers is a 50-degree Celsius maximum operating temperature at 8% to 85% RH within the enclosure.
 - The recommended height is 1 - 1.4 m (3.28 - 4.59 ft) from the floor. If the tray is positioned lower, it is difficult to switch the media drive USB cable connection between processor units. This height is also ideal for access to the keyboard/monitor assembly.
 - The rack must have three available power connections for the Storage Appliance AP1 and keyboard/monitor assembly. A Storage Appliance AP1 with two processor units must be connected to two separate power service branches. See Table 6 on page 5 for power requirements.
 4. Install the slide rails in the rack.
 - a. In the center area of the frame, locate a set of EIA holes in the frame to mount the slide rails.
 - b. From the front of the frame on the left side, use the slide rail marked “L ← Front..”
 - c. Place the front of the slide rail into the EIA holes by lifting **1** and pulling out **2**. The center locating pin **3** can be used in a square or round hole. Push the front of the slide against the rack and then downward until the large part of the blue pin fills the round hole or the outer square fills the square hole. Push the tab **2** back in. (Figure 1 on page 10)



12c01313

Figure 1. Slide rails for the Storage Appliance AP1 tray

- d. At the rear, push the slide adjusting bracket to the rear and align the pins with the same location as the EIA holes in the front. Install the 10-32 screw in the center location. If a blue plunger screw is installed, remove it with a flat blade screwdriver to replace it with the 10-32 screw.
- e. Repeat steps 4a on page 9 to 4d to install the right slide.
- f. Make sure that the slides are parallel; they must be directly across from each other.

Tip: If you need to move the slide, follow these steps: Remove the center screw from the rear of the slide. Push the lever that is on the back side to the front of the slide. If there is a blue button, push it in and raise the slide. To remove the slide, lift **1** and pull out **2** and then push the blue button in under tab **2** and raise the slide at the front.

5. Slide the tray into the rack from the front. Secure the tray in place by tightening the two thumbscrews at the front.
6. Install the keyboard/monitor assembly in the rack. Refer to the instructions that are provided with the keyboard/monitor assembly.
7. Use a voltage meter to validate the power source for correct wiring, grounding, and voltage.
8. Route the power cables from the Storage Appliance AP1 tray power supply to the power strip in the rack and plug them in.

Note: A Storage Appliance AP1 with two processor units must be connected to two separate power service branches.

9. Ensure that the Storage Appliance AP1 powers on.
 - a. Slide out the keyboard/monitor assembly.
 - b. Check the power status.
 - If the screen displays text then it is powered on.

- If the screen is dark, press the power control button. If the Storage Appliance AP1 doesn't power on, see Chapter 6, "Troubleshooting," on page 19 to identify the problem.

What to do next

After the SSR finishes installing your Storage Appliance AP1, do one of the following steps:

- If you ordered feature code 0206 (no OS indicator), install the operating system of your choice. For a list of supported operating systems, see the IBM Security Key Lifecycle Manager online product documentation (<http://www-01.ibm.com/support/knowledgecenter/SSWPVP/welcome>). For more information, see "Installing an operating system."
- If your storage appliance came with a SUSE Linux operating system, contact IBM Systems Lab Services to configure the storage appliance. You can contact IBM Systems Lab Services through the Storage Services website at <http://www.ibm.com/systems/services/labservices/contact.html>.

Installing an operating system

If you order feature code 0206 (no OS indicator) you must purchase an operating system license and install the operating system on the IBM Storage Appliance 2421 Model AP1.

About this task

Install the operating system after the physical installation is complete and before IBM Systems Lab Services configures IBM Security Key Lifecycle Manager on the storage appliance.

For a list of supported operating systems, see the IBM Security Key Lifecycle Manager online product documentation (<http://www-01.ibm.com/support/knowledgecenter/SSWPVP/welcome>).

You can install the operating system from an installation disk or from a website over your network.

Installing an operating system from an installation disk

If the operating system is available on an installation disk, you can use the media drive to install it on the Storage Appliance AP1.

Procedure

Complete the following steps to install an operating system from an installation disk.

1. Loosen the two captive screws on each side of the Storage Appliance AP1 tray, then slide the tray into the lock service position.
2. Verify that the processor unit where you want to install the operating system is powered on.
3. Verify that the KVM switch is turned to the correct processor unit. A yellow light indicates the left processor unit. A green light indicates the right processor unit.

4. Verify that the media drive USB cable is connected to the back panel of the selected processor unit. (Figure 7 on page 21)
5. Insert the operating system installation disk into the media drive and close the media drive tray.
6. Slide the Storage Appliance AP1 tray back into the rack.
7. Loosen the two captive screws on each side of the keyboard/monitor assembly tray, then slide the tray into the lock service position.
8. Verify that the monitor is powered on.
9. Restart the processor unit.
10. Press F12 to display boot options.
11. Select the **DVD boot** option.
12. Follow the operating system prompts to complete installation.
13. After installation is complete, turn off the monitor.
14. Slide the keyboard/monitor tray back into the rack.
15. Loosen the two captive screws on each side of the Storage Appliance AP1 tray, then slide the tray into the lock service position.
16. Remove the operating system installation disk from the media play and disconnect the USB cable from the rear panel of the processor unit.
17. Slide the Storage Appliance AP1 tray back into the rack.

Installing an operating system over a network

If the operating system is available from a website, you can use your network connection to install it on the Storage Appliance AP1.

Procedure

Complete the following steps to install an operating system from a website over your network.

1. Loosen the two captive screws on each side of the Storage Appliance AP1 tray, then slide the tray into the lock service position.
2. Verify that the processor unit where you want to install the operating system is powered on.
3. Verify that the KVM switch is turned to the correct processor unit. A yellow light indicates the left processor unit. A green light indicates the right processor unit.
4. Verify that the Storage Appliance AP1 is connected to your network.
5. Slide the Storage Appliance AP1 tray back into the rack.
6. Loosen the two captive screws on each side of the keyboard/monitor assembly tray, then slide the tray into the lock service position.
7. Verify that the monitor is powered on.
8. Restart the processor unit.
9. Press F12 to display boot options.
10. Select the network boot option.
11. Follow the operating system prompts to complete installation.
12. After installation is complete, turn off the monitor.
13. Slide the keyboard/monitor tray back into the rack.

What to do next

After the operating system is installed, contact IBM Systems Lab Services to configure IBM Security Key Lifecycle Manager on the storage appliance. You can contact IBM Systems Lab Services through the Storage Services website at <http://www.ibm.com/systems/services/labservices/contact.html>.

Chapter 4. Configuring

IBM Security Key Lifecycle Manager is configured on IBM Storage Appliance 2421 Model AP1 by IBM Systems Lab Services.

Before you begin

Storage Appliance AP1 must be installed in a 19-inch external rack by an IBM service support representative (SSR) before it is configured.

If you order feature code 0206 (no OS indicator) you must purchase an operating system license and install the operating system on the Storage Appliance AP1 before IBM Systems Lab Services configures Security Key Lifecycle Manager. For more information, see “Installing an operating system” on page 11.

About this task

To contact IBM Systems Lab Services about configuring the Storage Appliance AP1, go to the IBM Storage Services website at <http://www.ibm.com/systems/services/labservices/contact.html>.

Chapter 5. Notifications

IBM Storage Appliance 2421 Model AP1 does not generate call home notifications. Call home notifications are generated by the attached storage system and depend on the connectivity of the encryption keys that are managed by this appliance.

If the storage appliance requires service, call IBM Service at 1-800-IBM-SERV. You need to provide the machine type, model number, and serial number, which are on the front panel of the Storage Appliance AP1 tray. See Figure 2.

Machine type and model

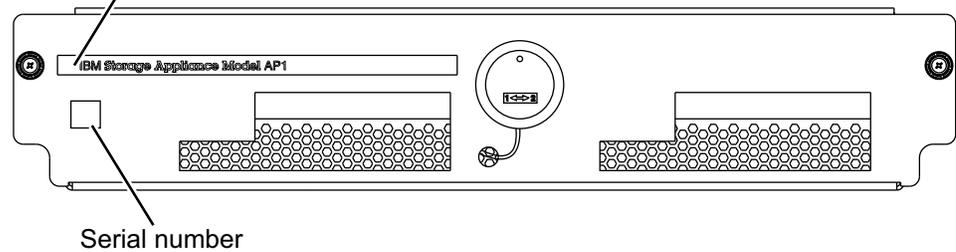


Figure 2. IBM Storage Appliance 2421 Model AP1 front panel

Chapter 6. Troubleshooting

Troubleshooting procedures help you identify hardware failures. If the hardware is in working condition, contact IBM Software Support.

Hardware overview

IBM Storage Appliance 2421 Model AP1 hardware components include a keyboard video monitor (KVM) switch and toggle button, two processor units, a media drive, and two power supplies.

Hardware components

The following figures illustrate the hardware components of Storage Appliance AP1 and are referenced in the troubleshooting procedures.

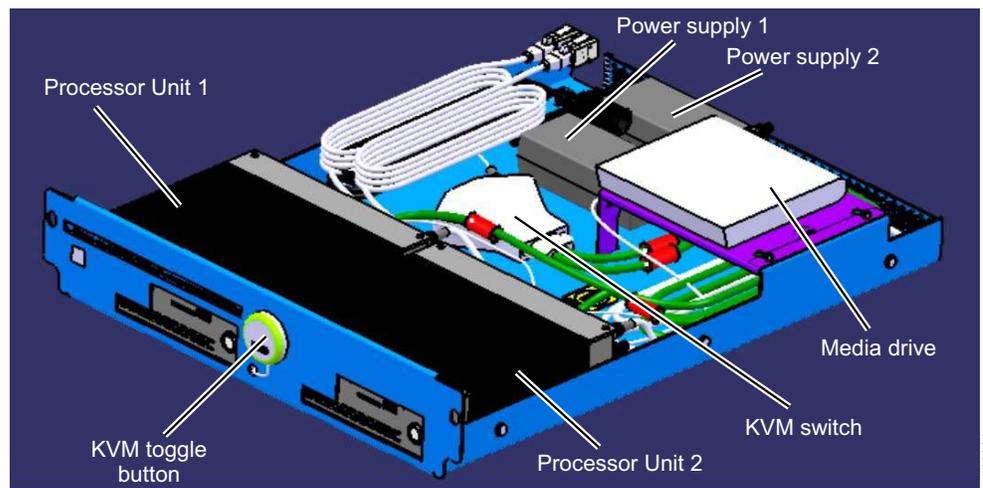


Figure 3. Storage Appliance AP1 tray components



Figure 4. Power supply

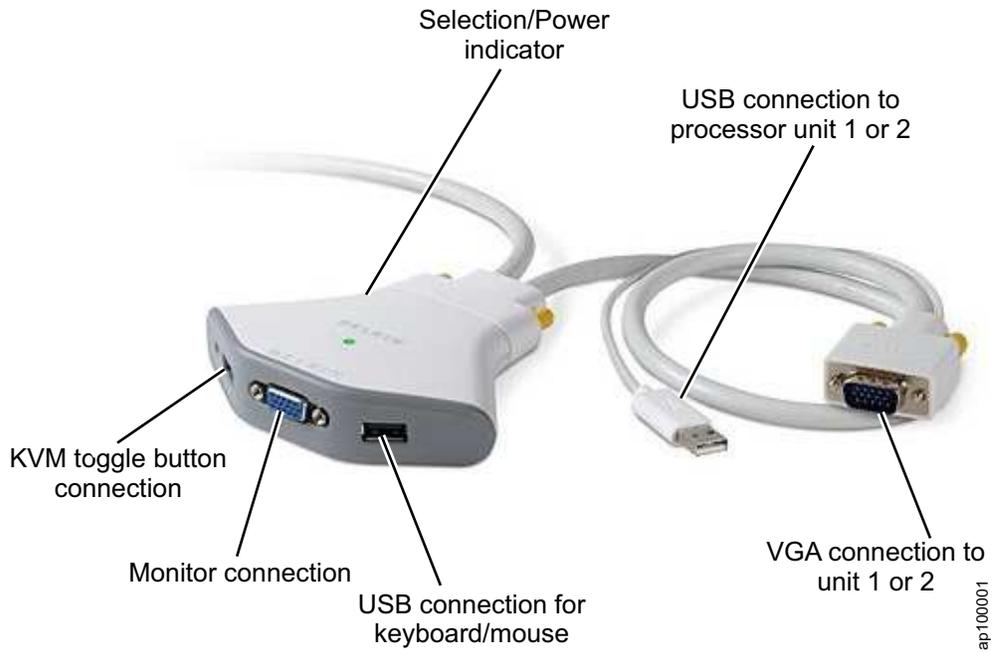


Figure 5. KVM switch



Figure 6. KVM wired toggle button

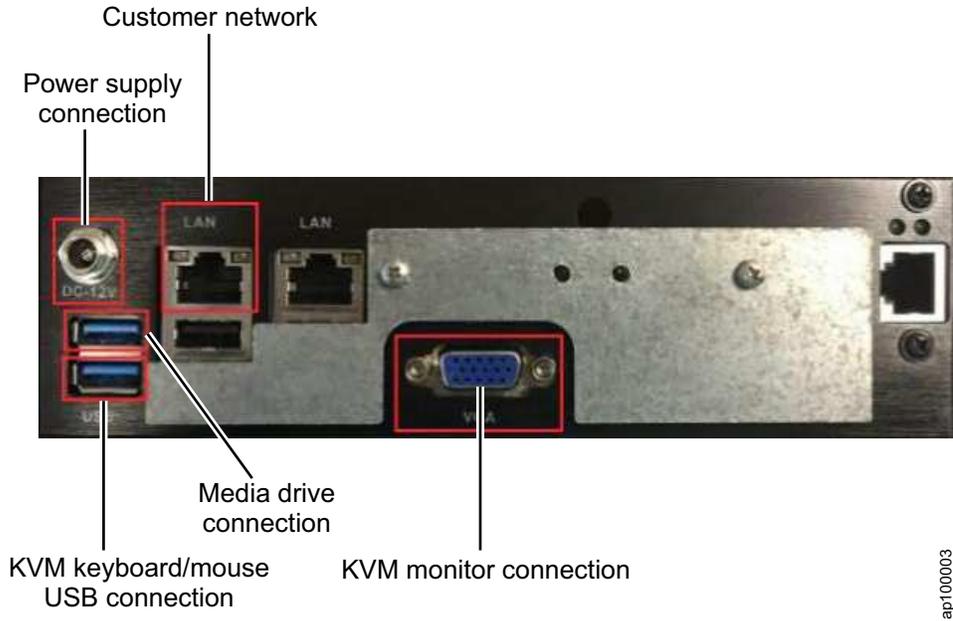


Figure 7. Processor unit back panel and connections

Identifying problems

Use troubleshooting procedures to identify problems with IBM Storage Appliance 2421 Model AP1.

General troubleshooting

Start here to identify hardware problems with your IBM Storage Appliance 2421 Model AP1.

Procedure

1. Does the rack that houses the IBM Storage Appliance 2421 Model AP1 have power?
 - Yes. Continue to step 2.
 - No. Address the rack power issue. After it is resolved, continue to step 2.
2. Is the keyboard/monitor assembly powered on?
 - Yes. Continue to step 3.
 - No. Power on the keyboard/monitor assembly.
3. How many processor units are installed in the Storage Appliance AP1? See Table 7 on page 22 for the steps to take when one or two processor units are installed.

Table 7. General troubleshooting

One processor unit	Two processor units
<p>Is the KVM indicator light (Figure 5 on page 20) on?</p> <ul style="list-style-type: none"> • No. Skip to step 4. • Yes. Is the KVM indicator light (Figure 5 on page 20) yellow? <ul style="list-style-type: none"> – Yes. Continue to step 4. – No. Press the KVM toggle button (Figure 3 on page 19) <ul style="list-style-type: none"> - If the KVM indicator light is yellow, continue to step 4. - If the KVM indicator light is not yellow, go to “KVM switch troubleshooting” on page 24. 	<p>Is the KVM indicator light (Figure 5 on page 20) on?</p> <ul style="list-style-type: none"> • No. Go to step 4 • Yes. Is the round green power indicator that surrounds the power button lit on the front side of both processor units? (Figure 3 on page 19) <ul style="list-style-type: none"> – Yes. Go to step 4. – No. Which processor unit is powered off? <ul style="list-style-type: none"> - The left processor unit is powered off. <ol style="list-style-type: none"> 1. Press the KVM toggle button to select the left processor unit. The KVM indicator light should be yellow. 2. Press the power button on the left unit. Did the left processor unit power indicator light up? <ul style="list-style-type: none"> • No. Go to “Processor unit troubleshooting” on page 23. • The green power indicator around the processor unit power button is flashing. Contact IBM Service to replace the processor unit hardware. After the processor unit is replaced, contact IBM Systems Lab Services to restore the logical configuration. • Yes. Allow five minutes for the processor unit to power on. <ul style="list-style-type: none"> – If the login prompt is displayed on the monitor, the procedure is complete. – If the login prompt is not displayed on the monitor, go to “Processor unit troubleshooting” on page 23. - The right processor unit is powered off. <ul style="list-style-type: none"> • Use the KVM toggle button to select the right processor unit. The KVM indicator light should be green. • Press the power button on the right processor unit. Did the right processor unit power indicator light up? <ul style="list-style-type: none"> – No. Go to “Processor unit troubleshooting” on page 23. – The green power indicator around the processor unit power button is flashing. Contact IBM Service to replace the processor unit hardware. After the processor unit is replaced, contact IBM Systems Lab Services to restore the logical configuration. – Yes. Allow five minutes for the processor unit to power on. Go to step 4.

4. Press the space bar on the keyboard.
 - If the login prompt is displayed, verify that the storage system can connect to the Storage Appliance AP1.

- If the storage system can connect to the Storage Appliance AP1, the procedure is complete.
- If the storage system is unable to connect to the Storage Appliance AP1, Open a terminal session so that the IBM service support representative (SSR) can complete the following steps:
 - a. The SSR should issue the **ethtool en0** command for Linux.

```
stone:~ #ethtool eth0
Settings for eth0:
  Supported ports: [ TP MII ]
  Supported link modes:   10baseT/Half 10baseT/Full
                        100baseT/Half 100baseT/Full
                        1000baseT/Half 1000baseT/Full
  Supports auto-negotiation: Yes
  Advertised link modes:  10baseT/Half 10baseT/Full
                        100baseT/Half 100baseT/Full
                        1000baseT/Half 1000baseT/Full
  Advertised pause frame use: Symmetric Receive-only
  Advertised auto-negotiation: Yes
  Link partner advertised link modes: 10baseT/Half
                                       100baseT/Half
  Link partner advertised pause frame use: No
  Link partner advertised auto-negotiation: Yes
  Speed: 100Mb/s
  Duplex: Half
  Port: MII
  PHYAD: 0
  Transceiver: internal
  Auto-negotiation: on
  Supports Wake-on: pumbg
  Wake-on: g
  Current message level: 0x00000033 (51)
                        drv probe ifdownifup
  Link detected: yes
stone:~ #
```

- If the output is Link detected: yes, the SSR should contact Security Key Lifecycle Manager Software Support.
- If the output is Link detected: no, the SSR should ask you to confirm that the network is in working order.
- If an error message is displayed that indicates that no media is detected, the processor unit is no longer operational and must be replaced. Contact IBM Service to replace the processor unit. After the processor unit is replaced, contact IBM Systems Lab Services to restore the logical configuration.
- If an error message is displayed that indicates fan failure, the processor unit is no longer operational and must be replaced. Contact IBM Service to replace the processor unit hardware. After the processor unit is replaced, contact IBM Systems Lab Services to restore the logical configuration.
- If the login prompt is not displayed, go to “Processor unit troubleshooting.”

Processor unit troubleshooting

Use this procedure if the green power indicator does not light up after you press the power button on the processor unit.

Procedure

Is the power indicator on the power supply lit? (Figure 4 on page 19)

- Yes
 1. Reseat the power cord on the processor unit. (Figure 7 on page 21)

2. Reseat the power cord at the power distribution unit and the power supply.
 3. Make sure that the power supply power indicator is lit.
 4. Press the power button on the processor unit.
 5. Is the processor unit powered on?
 - No. Contact IBM Service to replace the processor unit hardware. After the processor unit is replaced, contact IBM Systems Lab Services to restore the logical configuration.
 - Yes. Return to the procedure that brought you to this step.
- No
 1. Reseat the power cord at the power distribution unit and the power supply.
 2. Is the power supply power indicator lit?
 - Yes.
 - a. Press the power button on the processor unit.
 - b. Did the processor unit power on?
 - No. Contact IBM Service to replace the processor unit hardware. After the processor unit is replaced, contact IBM Systems Lab Services to restore the logical configuration.
 - Yes. Return to the procedure that brought you to this step.
 - No. Contact IBM Service to replace the power supply. After the processor unit is replaced, contact IBM Systems Lab Services to restore the logical configuration from a backup.

KVM switch troubleshooting

Use this procedure if you press the KVM toggle button and nothing happens.

Procedure

How many processor units are installed in the Storage Appliance AP1? See Table 8 on page 25 for the steps to take when one or two processor units are installed.

Table 8. KVM switch troubleshooting

One processor unit	Two processor units
<p>Is the KVM indicator light (Figure 5 on page 20) on?</p> <ul style="list-style-type: none"> • Yes. <ul style="list-style-type: none"> - If the KVM indicator light is yellow (Figure 5 on page 20, return to the procedure in “General troubleshooting” on page 21. - If the KVM indicator light is green, press the KVM toggle button. If the KVM indicator light does not change to yellow, remove the KVM keyboard/mouse USB connection for 10 seconds and then reinsert the USB connector. (Figure 7 on page 21) - If the KVM indicator light is not lit, contact IBM Service to replace the KVM switch. - If the KVM indicator light is yellow, return to the procedure that brought you to this step. - If the KVM indicator light is green, press the KVM toggle button. If the KVM switch indicator light does not turn yellow, contact IBM Service to replace the KVM switch. • No. Is the round green power indicator light lit on the front of the processor unit? <ul style="list-style-type: none"> - Yes. Remove the KVM keyboard/mouse USB connection from the back panel of the left processor unit for 10 seconds and then reinsert the USB connector. (Figure 7 on page 21) - If the KVM indicator light is not lit, contact IBM Service to replace the KVM switch. - If the KVM indicator light is yellow, return to the procedure that brought you to this step. - If the KVM indicator light is green, press the KVM toggle button. If the KVM switch indicator light does not turn yellow, contact IBM Service to replace the KVM switch. - No. Go to “Processor unit troubleshooting” on page 23. 	<p>Are both processor units on?</p> <ul style="list-style-type: none"> • Yes. Is the KVM indicator light (Figure 5 on page 20) on? <ul style="list-style-type: none"> - Yes. Press the KVM toggle button. <ul style="list-style-type: none"> - Did the KVM indicator light change from yellow to green or green to yellow? <ul style="list-style-type: none"> • Yes, return to the procedure that brought you to this step. • No. Contact IBM Service to replace the KVM switch. - No. Remove the KVM keyboard/mouse USB connection from both processor units for 10 seconds and then reinsert the USB connector. (Figure 7 on page 21). - Is the KVM indicator light on? <ul style="list-style-type: none"> • No. Contact IBM Service to replace the KVM switch. • Yes. Does the KVM indicator light alternate between yellow and green when you press the KVM toggle button? <ul style="list-style-type: none"> - No. Contact IBM Service to replace the KVM switch. - Yes, return to the procedure that brought you to this step. • No. Go to “Processor unit troubleshooting” on page 23.

Media drive troubleshooting

Use this procedure if the media drive does not open.

Procedure

1. Is the USB cable connected to the media drive?

- Yes. If one processor unit is installed in the Storage Appliance AP1, go to step 2; if two processor units are installed, go to step 3.
 - No, Connect the USB cable to the media drive.
2. Is the processor unit powered on?
- Yes. Is the USB cable connected to the processor unit?
 - Yes. Reseat the USB cable at both the media drive and the processor unit. If the media drive still does not open, contact IBM Service to replace the media drive.
 - No. Connect the USB cable (Figure 7 on page 21).
 - No. Go to “Processor unit troubleshooting” on page 23.
3. Are the two processor units powered on?
- Yes. Is the USB cable connected to the processor units?
 - Yes. Reseat the USB cable at both the media drive and the processor units. If the media drive still does not open, contact IBM Service to replace the media drive.
 - No. Connect the USB cable (Figure 7 on page 21).
 - No. Go to “Processor unit troubleshooting” on page 23.

Recovery procedures

Use the following procedures to recover from an unresponsive keyboard or processor unit.

Use the recovery procedures in Table 9 when the keyboard or processor unit is not responding.

Table 9. Recovery procedures

Performance loss	Recovery procedure
Keyboard / track point is unresponsive	Power cycle the KVM switch: <ol style="list-style-type: none"> 1. Unplug the white USB cables that are connected to the KVM switch from both processor units for at least five seconds. 2. Replug the USB cables.
USB, SD card, or processor unit is unresponsive	Power cycle the processor unit: <ol style="list-style-type: none"> 1. Press and hold the power button until the indicator light turns off. 2. Press the power button to power on the processor unit.
Processor unit rebooted unexpectedly	Log in again and retry the operation.

Chapter 7. Exchange procedures

If you need to replace any of the hardware components of IBM Storage Appliance 2421 Model AP1, contact IBM Service.

The following procedures are intended for IBM Service personnel.

Exchanging a processor unit

If you need to exchange a processor unit in IBM Storage Appliance 2421 Model AP1, contact IBM Service.

About this task

The following procedure is intended for IBM Service personnel.

Procedure

Complete the following steps to replace a processor unit.

1. Loosen the two captive screws on each side of the tray, then slide the tray into the lock service position.
2. Unplug the AC power cable from the rear of the processor unit.
3. Unplug the Ethernet cable from the rear of the processor unit.
4. Unplug the monitor cable and the KVM switch USB connector from the processor unit.

Note: If a media drive is connected to the processor unit, disconnect this USB connection as well.

5. Remove the processor unit from the tray by removing four M3 x 8 mm screws with lock washers.
6. Remove the processor unit connector plate cover from the rear of the processor unit by removing two 4-40 x 8 mm screws.
7. Install the connector plate cover that was removed in step 6 and fasten it to the replacement processor unit with two 4-40 x 8 mm screws
8. Install the replacement processor unit in the same location as the failed unit and fasten the processor unit to the tray with four M3 x 8 mm screws with lock washers.
9. Reconnect the AC power cable to the rear of the processor unit.
10. Reconnect the Ethernet cable to the rear of the processor unit.
11. Reconnect the monitor cable from the VGA and the USB connector from the KVM switch. If a media drive was connected to the failed processor unit, reconnect it to the replacement processor unit.
12. Verify that all of the connections match Figure 7 on page 21.
13. Contact IBM Systems Lab Services to reinstall the operating system and IBM Security Key Lifecycle Manager software, and to restore data from a backup.

Exchanging the KVM switch

If you need to exchange the KVM switch in IBM Storage Appliance 2421 Model AP1, contact IBM Service.

About this task

The following procedure is intended for IBM Service personnel.

Procedure

Complete the following steps to replace the KVM switch.

1. Loosen the two captive screws on each side of the tray, then slide the tray into the lock service position.
2. If a media drive is connected to the processor unit, unplug the USB connection from the back panel of the processor unit.
3. Loosen the two screws (00G1268, M4x7) on the right side of the tray. (Figure 8)

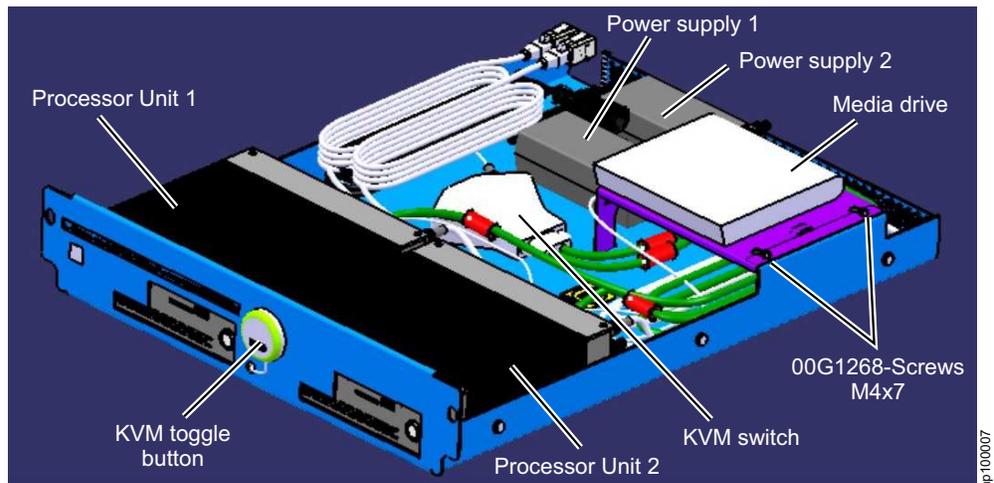


Figure 8. IBM Storage Appliance 2421 Model AP1 hardware overview

4. Slide the media drive bracket toward the right and lift.
5. Unplug the VGA from the back panel of one or both units. (Figure 7 on page 21)
6. Unplug the KVM switch USB from the back panel of one or both processor units
7. Unplug the KVM toggle button from the KVM switch and remove it from the tray. The KVM toggle button is attached to the front of the tray with a hook-and-loop fastener.
8. Undo the hook-and-loop fastener and remove the KVM cabling.
9. Remove the KVM switch from the tray. The KVM switch is attached to the bottom of the tray with a hook-and-loop fastener.
10. Place the two new loop fastener tapes on the hook fasteners in the tray (see Figure 9 on page 29) and remove the protective backing from the adhesive.
11. Place the replacement KVM switch firmly on the hook-and-loop fasteners.

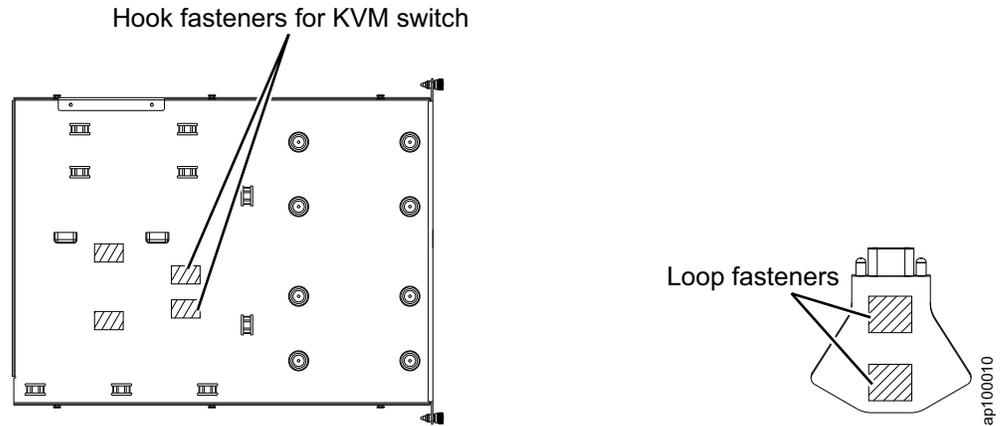


Figure 9. KVM switch (bottom view) and location in the IBM Storage Appliance 2421 Model AP1 tray

12. Reroute the KVM switch cables according to Figure 10.

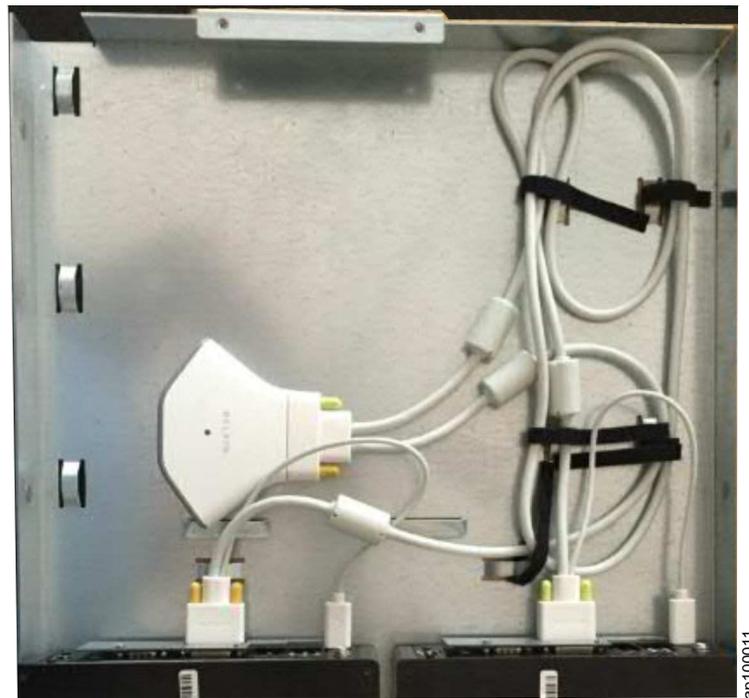


Figure 10. KVM switch cabling

13. Place the new loop fastener tape for the replacement KVM toggle button on the hook fasteners on the front of the tray and remove the protective backing from the adhesive.
14. Press the replacement KVM toggle button firmly on the hook-and-loop fastener on the front of the tray. (Figure 11 on page 30)

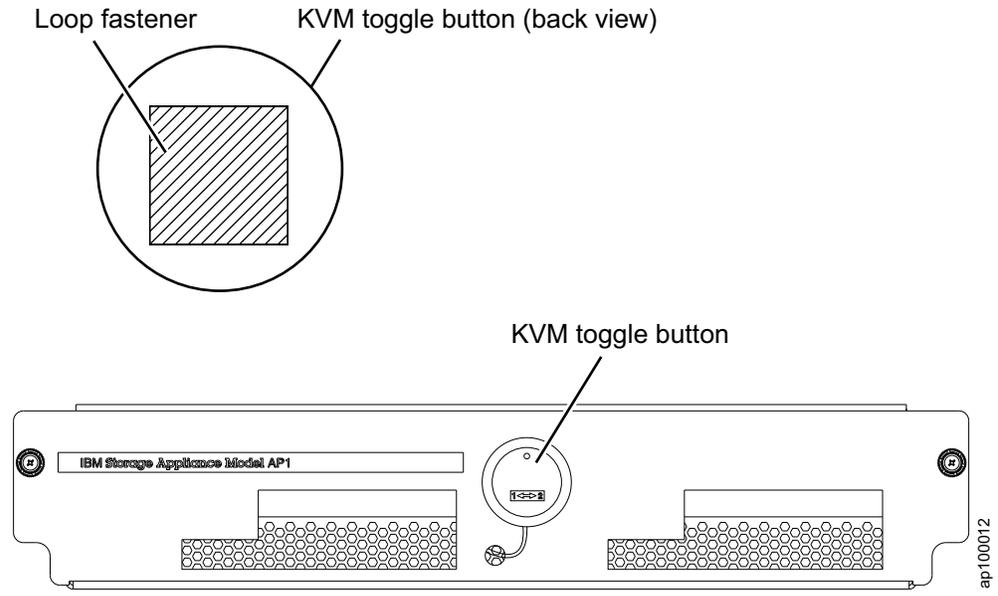


Figure 11. KVM toggle button (back view) and location on front panel of the IBM Storage Appliance 2421 Model AP1 tray

15. Attach the VGA cable with the yellow screw knobs to the processor unit on the left, along with the attached USB cable. If two units are installed, attach the VGA cable with the green screw knobs to the processor unit on the right, along with the attached USB cable.
16. Slide the media drive bracket down and toward the left.
17. Tighten the two screws (00G1268, M4x7) on the right side of the tray.

Exchanging the media drive

If you need to exchange the media drive in IBM Storage Appliance 2421 Model AP1, contact IBM Service.

About this task

The following procedure is intended for IBM Service personnel.

Procedure

Complete the following steps to replace the media drive.

1. Loosen the two captive screws on each side of the tray, then slide the tray into the lock service position.
2. Unplug the USB cable from the back of the media drive.
3. Remove the media drive from the media drive bracket.
4. Attach the four new loop fasteners to the hook fasteners on the media drive bracket (Figure 12 on page 31) and remove the protective backing from the adhesive.

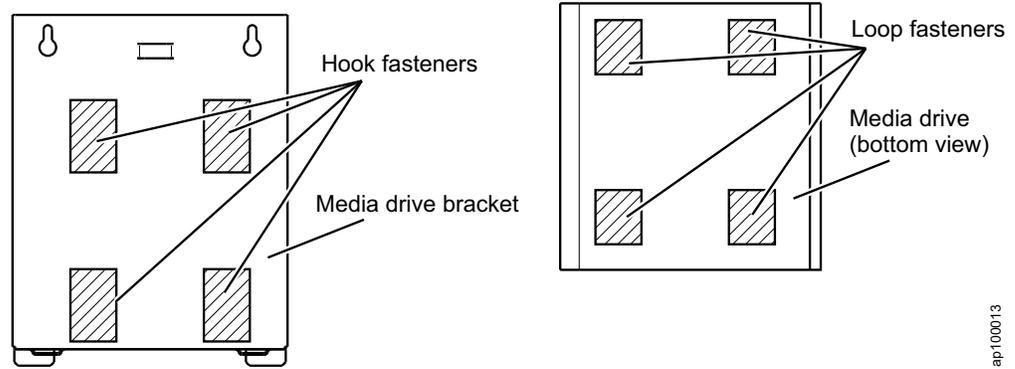


Figure 12. Media drive (bottom view) and media drive bracket

5. Press the replacement media drive firmly on the hook-and-loop fasteners on the media drive bracket.
6. Connect the USB cable to the back of the media drive.

Exchanging the keyboard

If you need to exchange the keyboard that is attached to the IBM Storage Appliance 2421 Model AP1, contact IBM Service.

About this task

The following procedure is intended for IBM Service personnel.

Procedure

Complete the following steps to replace the keyboard.

1. Disconnect the keyboard and mouse connectors from the server or console switch.
2. Unscrew the thumbscrews, and then fully extend the keyboard/monitor assembly from the rack.
3. Carefully unfasten the cable straps and then remove the keyboard-and-mouse cable from the cable-management arm.
4. On the underside of the keyboard/monitor assembly, unfasten the keyboard-and-mouse cable from the nut and clamp: (Figure 13 on page 32)

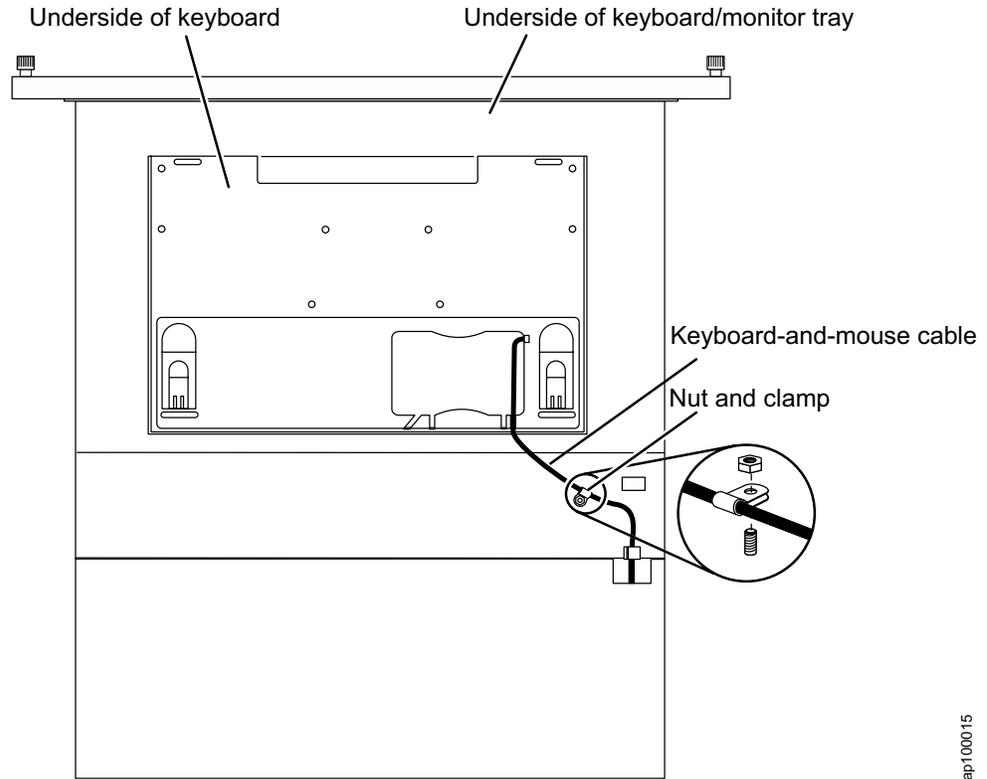


Figure 13. Underside of fully extended keyboard/monitor assembly with focus on nut and clamp

- a. Unscrew the nut and remove the clamp.
 - b. Remove the keyboard-and-mouse cable from the clamp.
 - c. Save the nut and clamp to use later in this procedure.
5. Remove the plastic split bushing from the cable-routing cutout in the keyboard/monitor assembly frame:
- a. On the underside of the keyboard/monitor assembly, gently squeeze the bushing and push it toward the rear of the keyboard/monitor assembly to remove it. (Figure 14 on page 33)

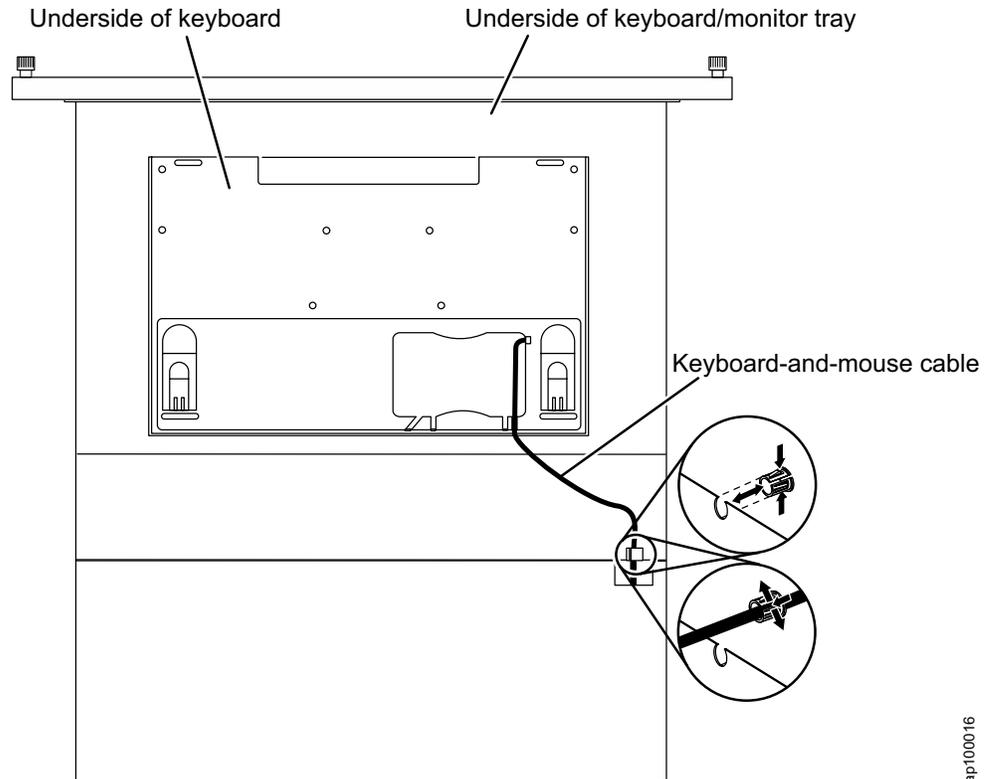


Figure 14. Underside of fully extended keyboard/monitor assembly with focus on bushing and cable routing

- b. Remove the keyboard-and-mouse cable from the bushing.
- c. Save the bushing to use later in this procedure.
6. Carefully lift the flat-panel monitor to the full upright position.
7. Remove the keyboard and cable from the keyboard/monitor assembly.
8. Unpack the replacement keyboard. If the new keyboard comes with two rubber pads on the underside of the keyboard, remove and discard them. (The rubber pads have an adhesive backing and can be peeled from the surface.) If you leave the rubber pads on the keyboard, they extend into the 1U space below.

Attention: Do not extend the keyboard feet. The flat-panel monitor might be damaged if the feet are extended when the display is closed.
9. Peel the protective strip from the hook-and-loop fastener strip and attach it near the front of the underside of the replacement keyboard.
10. Carefully route the keyboard-and-mouse cable from the replacement keyboard down through the keyboard tray opening, up through the opening on the right side of the tray, and toward the cable-management arm. Pull the full length of the cable through the opening.
11. Place the keyboard in the tray and press the hook-and-loop fasteners together.

Attention: When you route the keyboard-and-mouse cable, make sure that the cable does not hang below the underside of the keyboard where it might be damaged if it interferes with the devices in the rack space below the keyboard/monitor assembly.
12. Route the keyboard-and-mouse cable:

- a. Route the cable through the slot on the left side of the cable-routing area on the underside of the keyboard. Do not route the cable through any of the other three slots. (Figure 14 on page 33)
 - b. Push the keyboard-and-mouse cable through the slit in the plastic bushing that you removed in step 5 on page 32, and push the bushing into the cable-routing cutout in the keyboard/monitor assembly frame.
13. Fasten the keyboard-and-mouse cable to the keyboard/monitor assembly with the nut and clamp:
- a. Push the keyboard-and-mouse cable into the clamp that you removed in step 3 on page 31. (Figure 13 on page 32)
- Important:** Make sure that you place the clamp on the keyboard-and-mouse cable approximately 70 - 76 mm (2.75 - 3.0 in.) from where the cable exits the keyboard. The clamp prevents the cable from hanging below the bottom of the keyboard/monitor assembly.
- b. Place the clamp on the screw on the console unit frame and hand-tighten the nut on top of the clamp.
14. Route the keyboard-and-mouse cable and the other cables through the cable-management arm. To avoid placing strain on the cables, secure the cables by using the hook-and-loop fastener cable straps. Make sure that the cable-management arm is in the extended position when you secure the cables to it.
15. Reconnect the keyboard-and-mouse cable to the server or console switch.
16. Carefully lift the flat-panel display to the full upright position.

Exchanging the keyboard/monitor tray

If you need to exchange the keyboard/monitor tray that is attached to the IBM Storage Appliance 2421 Model AP1, contact IBM Service.

About this task

The following procedure is intended for IBM Service personnel.

Procedure

Complete the following steps to replace the keyboard/monitor tray.

1. Loosen the two captive screws on each side of the keyboard/monitor tray, then slide the tray into the lock service position.
2. Press the monitor power button to power off the monitor. Make sure that the power LED is off.
3. Push the keyboard/monitor tray back into the rack
4. Loosen the two captive screws on each side of the Storage Appliance AP1 tray, then slide the tray into the lock service position.
5. Remove the video and USB cable from the Storage Appliance AP1 cable management arm.
6. At the rear of the rack, disconnect the keyboard/monitor integrated cable from the KVM switch.
7. Push the Storage Appliance AP1 back into the rack.
8. Disconnect the power cable for the monitor from the rack PDU.
9. Pull the keyboard/monitor tray out from the rack. Leave the monitor in the down position. Press the release latches, and remove the keyboard/monitor

tray. (Figure 15)

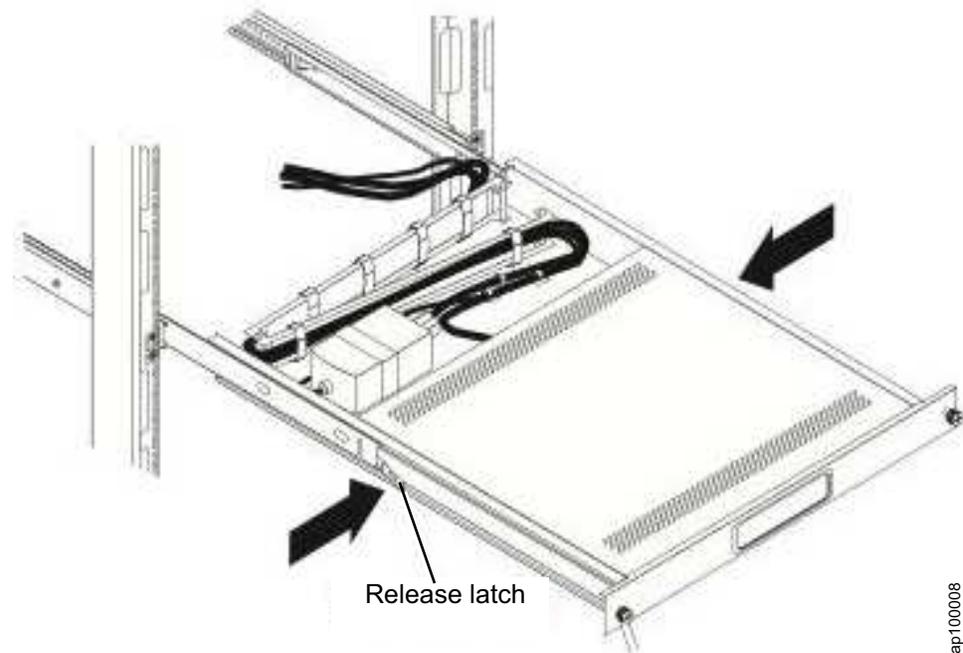


Figure 15. Keyboard/monitor tray

10. With the extended inner part of the outer rails, slide the ball-bearing assemblies forward to the front of the outer rails. Carefully slide the replacement keyboard/monitor tray into the ball-bearing assemblies in the rails.
11. Press the release latches and then push the replacement keyboard/monitor tray completely into the rack. There will be resistance initially as the ball-bearing assemblies align between the inner and outer rails. Pull the keyboard/monitor tray out halfway, and then push it back in to seat the keyboard/monitor tray in the rails. Repeat this step several times until the keyboard/monitor tray moves smoothly in the rails.
12. Connect the video and USB connectors.
13. Fully extend the keyboard/monitor tray from the front of the rack cabinet, and then neatly route the cables within the rack cabinet and secure them with cable straps along the way.
14. Press the monitor power button to turn on the monitor.

Exchanging the power supply

If you need to exchange the power supply in IBM Storage Appliance 2421 Model AP1, contact IBM Service.

About this task

The following procedure is intended for IBM Service personnel.

Procedure

Complete the following steps to replace the power supply.

1. Loosen the two captive screws on each side of the tray, then slide the tray into the lock service position.
2. If a media drive is connected to the processor unit, unplug the USB connection from rear of the processor unit.
3. Loosen the two screws (00G1268, M4x7) on the right side of the tray. (Figure 8 on page 28)
4. Slide the media drive bracket toward the right and lift.
5. Disconnect the power cable that connects the rack PDU to the Storage Appliance AP1 power supply.
6. Disconnect the power supply from the back panel of the processor unit
7. Loosen the cable ties that hold the power supply cables in place.
8. Remove the power supply from the tray.
9. Attach the two new loop fasteners to the hook fasteners in the tray (Figure 16) and remove the protective backing from the adhesive.

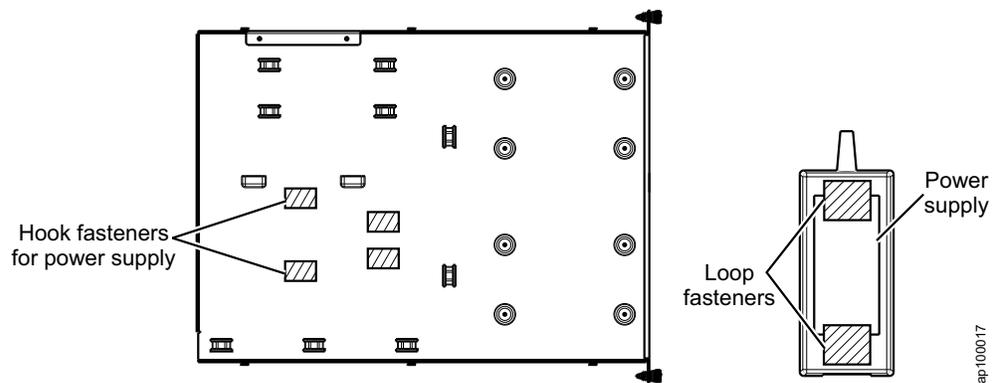


Figure 16. Power supply (bottom view) and position of power supply in the Storage Appliance AP1 tray

10. Press the replacement power supply firmly on top of the hook-and-loop fasteners in the tray. (Figure 16)
11. Route the power cable from the power supply to the back panel of the processor unit. (Figure 17 on page 37 and Figure 18 on page 37)

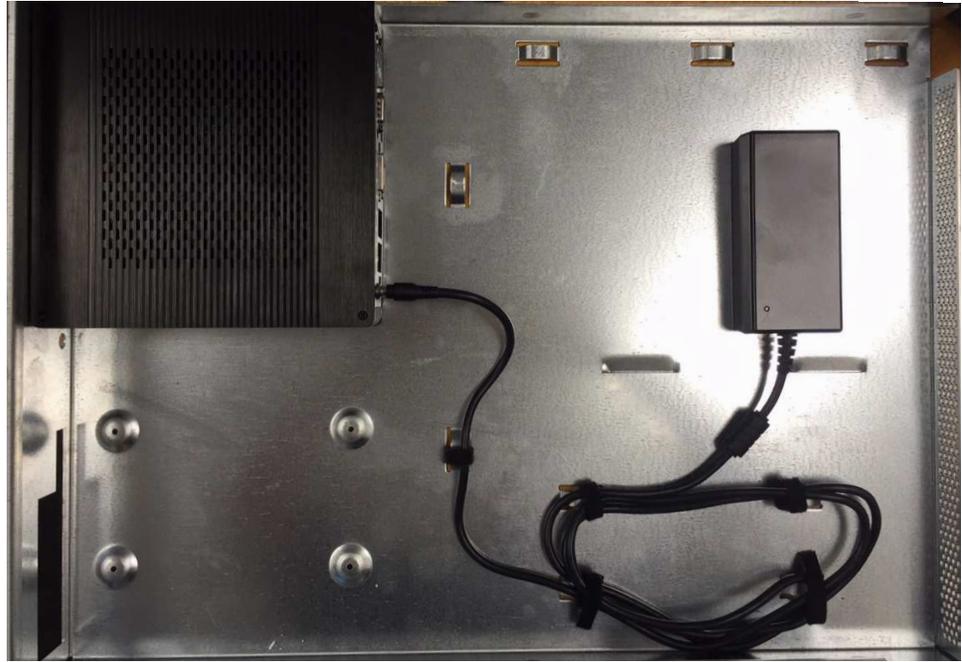


Figure 17. Power supply cable routing for processor unit 1



Figure 18. Power supply cable routing for processor unit 2

12. Tighten the cable ties to secure the cables.
13. Attach the power cable that connects the rack PDU to the Storage Appliance AP1 power supply.
14. Verify that the power supply indicator light is on.

15. Verify that the green round power indicator surrounding the power button on the front of the processor unit is lit
16. Slide the media drive bracket down and to the left.
17. Tighten the two screws (00G1268, M4x7) on the right side of the tray.

Chapter 8. Monitor controls

Use the control buttons on the front of the monitor to adjust the characteristics of the image that is displayed.

When you use these buttons to adjust the settings, an on-screen display (OSD) menu displays their numeric values as the settings change.

For most applications, the factory default screen settings do not require adjustment. To return the screen settings to the factory default, press and hold the EXIT button for three seconds.

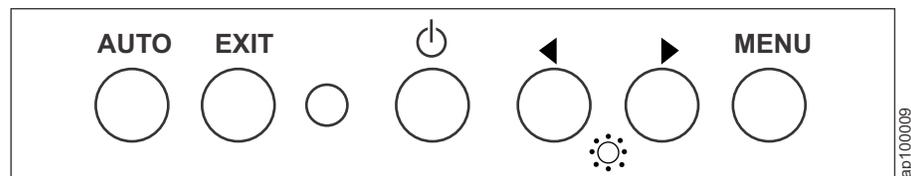


Figure 19. Monitor controls

The user controls on the front of the LCD display function as detailed in the following list.

AUTO

Press to automatically adjust the display settings.

EXIT Press to exit from the OSD function or return to the previous menu.

Power indicator

Indicates the status of the display operation.

Green Indicates normal operation.

Black Indicates that the power is off.

Power Press to turn on and turn off the monitor power.

Left arrow and right arrow

- Press the right arrow button to select the function that you want to adjust.
- Press the left arrow or right arrow button to decrease or increase the value of the selected adjustment or to select the correct setting.
- Brightness: Press the left arrow or right arrow button to adjust the brightness of the back light lamp without using the OSD menu.

MENU

Press to display the OSD menu and to move the selector on the OSD menu.

Appendix A. Field-replaceable units

IBM Storage Appliance 2421 Model AP1 includes several field-replaceable units (FRUs).

Use the following part numbers when ordering FRUs for Storage Appliance AP1.

Table 10. Field-replaceable unit (FRU) numbers for Storage Appliance AP1

Component	FRU number
Keyboard (English)	00WV000
Monitor assembly	17P8487
12 V power adapter	98Y5594
KVM switch	98Y7692
DVD external drive	98Y7693
1U processor unit (3250M4 Security Key Lifecycle Manager server)	98Y7825
2800 mm power cord	46X2536
Ethernet cable	99Y0471

Appendix B. Battery removal and disposal

At the product's end of life, measures must be taken to properly remove and recycle battery.

Only trained service personnel are authorized to remove the battery from the processor unit. The following information is intended for IBM Service personnel.

Removing the battery

Complete the following steps to safely remove the battery from a processor unit in the IBM Storage Appliance 2421 Model AP1.

1. Remove the processor unit from the Storage Appliance AP1. See “Exchanging a processor unit” on page 27.
2. Remove the bottom cover of the processor unit by removing the four screws that are located under the feet of the unit. (Figure 20)

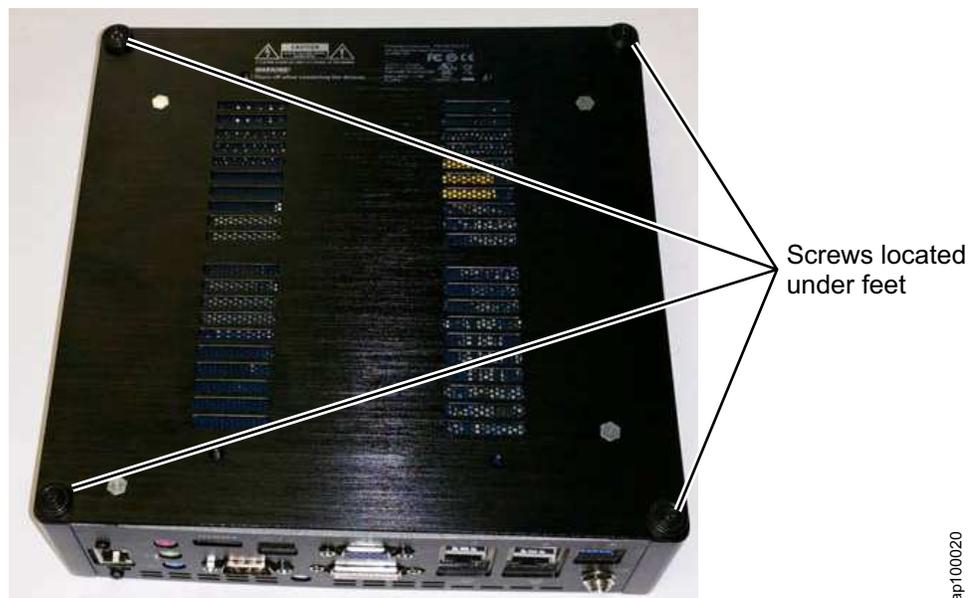
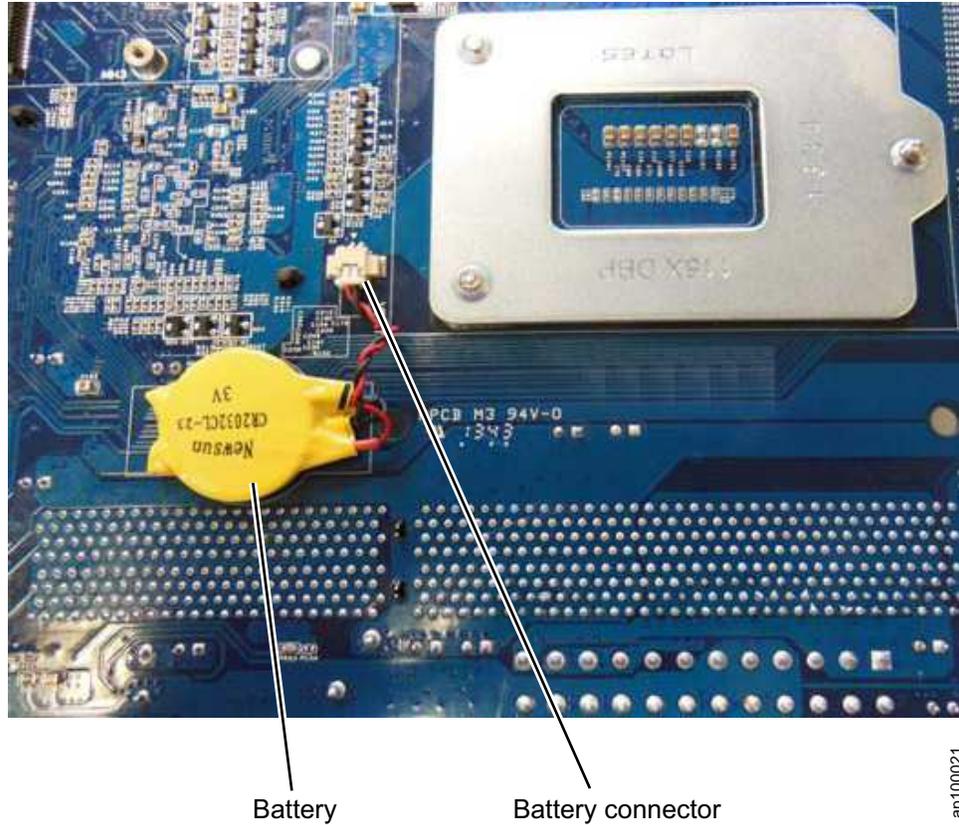


Figure 20. Underside of processor unit

3. Unplug the yellow battery from the battery connector and remove the battery. (Figure 21 on page 44)



ap100021

Figure 21. Battery location inside the processor unit

CAUTION: Only trained service personnel may replace this battery. The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.
Do not: Throw or immerse into water, heat to more than 100°C (212°F), repair or disassemble. (C002)

Appendix C. Warranty and licensing information

The Storage Appliance AP1 is available in single-unit (feature code 1761) and dual-unit (feature code 1761 and 1762 ordered together) configurations and has a one-year warranty.

Before you install the necessary software such as Security Key Lifecycle Manager and the Linux operating system (SUSE Linux Enterprise Server), review the warranty conditions and requirements for each software product. For Linux SUSE information, go to SUSE website (www.suse.com).

Notices

This information was developed for products and services offered in the USRussia. This material might be available from IBM in other languages. However, you may be required to own a copy of the product or product version in that language in order to access it.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

*IBM Director of Licensing
IBM Corporation
North Castle Drive, MD-NC119
Armonk, NY 10504-1785
US*

For license inquiries regarding double-byte character set (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

*Intellectual Property Licensing
Legal and Intellectual Property Law
IBM Japan Ltd.
19-21, Nihonbashi-Hakozakicho, Chuo-ku
Tokyo 103-8510, Japan*

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those

websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you provide in any way it believes appropriate without incurring any obligation to you.

The performance data discussed herein is presented as derived under specific operating conditions. Actual results may vary.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information is for planning purposes only. The information herein is subject to change before the products described become available.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to actual people or business enterprises is entirely coincidental.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Copyright and trademark information website (www.ibm.com/legal/copytrade.shtml).

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Homologation statement

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact an IBM representative or reseller for any questions.

Electronic emission notices

This section contains the electronic emission notices or statements for the United States and other countries.

Federal Communications Commission Statement

This explains the Federal Communications Commission's (FCC's) statement.

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, might 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.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors, or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device might not cause harmful interference, and (2) this device must accept any interference received, including interference that might cause undesired operation.

Industry Canada Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conform à la norme NMB-003 du Canada.

Australia and New Zealand Class A Statement

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

European Union Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of European Union (EU) Council Directive 2014/30/EU on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept

responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

Attention: This is an EN 55022 Class A product. In a domestic environment this product might cause radio interference in which case the user might be required to take adequate measures.

European community contact:

IBM Deutschland GmbH
Technical Regulations, Department M372
IBM-Allee 1, 71139 Ehningen, Germany
Tele: +49 (0) 800 225 5423 or +49 (0) 180 331 3233
Email: halloibm@de.ibm.com

Germany Electromagnetic Compatibility Directive

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 / EN 55032 Klasse A ein. Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung von IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung von IBM gesteckt/eingebaut werden.

EN 55022 / EN 55032 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden:

“Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen.”

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten Dieses Produkt entspricht dem “Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG).” Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC Richtlinie 2014/30/EU) für Geräte der Klasse A Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV-Vorschriften ist der Hersteller:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
Tel: 914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

IBM Deutschland GmbH
Technical Relations Europe, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 800 225 5426
e-mail: halloibm@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 / EN 55032 Klasse A.

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse B EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022/EN 55032 Klasse B ein. Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung von IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung von IBM gesteckt/eingebaut werden.

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC Richtlinie 2014/30/EU) für Geräte der Klasse B

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV-Vorschriften ist der Hersteller:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
Tel: 914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

IBM Deutschland GmbH
Technical Relations Europe, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 800 225 5426
e-mail: halloibm@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022/ EN 55032 Klasse B.

People's Republic of China Class A Statement

中华人民共和国“A类”警告声明

声明

此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

Taiwan Class A Statement

警告使用者：
這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。

taitemi

Taiwan Contact Information

This topic contains the product service contact information for Taiwan.

IBM Taiwan Product Service Contact Information:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd., Taipei Taiwan
Tel: 0800-016-888

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

f2c00790

Japan Voluntary Control Council for Interference Class A Statement

This explains the Japan Voluntary Control Council for Interference (VCCI) statement.

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用する
と電波妨害を引き起こすことがあります。この場合には使用者が適切な対策
を講ずるよう要求されることがあります。 VCCI-A

Japan Electronics and Information Technology Industries Association Statement

This statement explains the Japan JIS C 61000-3-2 product wattage compliance.

(一社) 電子情報技術産業協会 高調波電流抑制対策実施
要領に基づく定格入力電力値： Knowledge Centerの各製品の
仕様ページ参照

This statement explains the Japan Electronics and Information Technology Industries Association (JEITA) statement for products less than or equal to 20 A per phase.

高調波電流規格 JIS C 61000-3-2 適合品

This statement explains the JEITA statement for products greater than 20 A, single phase.

高調波電流規格 JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。

- 回路分類：6（単相、PFC回路付）
- 換算係数：0

This statement explains the JEITA statement for products greater than 20 A per phase, three-phase.

高調波電流規格 JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。

- 回路分類：5（3相、PFC回路付）
- 換算係数：0

Korean Communications Commission Class A Statement

This explains the Korean Communications Commission (KCC) statement.

이 기기는 업무용(A급)으로 전자파적합기기로
서 판매자 또는 사용자는 이 점을 주의하시기
바라며, 가정외의 지역에서 사용하는 것을 목
적으로 합니다.

Russia Electromagnetic Interference Class A Statement

This statement explains the Russia Electromagnetic Interference (EMI) statement.

ВНИМАНИЕ! Настоящее изделие относится к классу А.
В жилых помещениях оно может создавать
радиопомехи, для снижения которых необходимы
дополнительные меры

rusemi

Index

C

call home 17
caution notices v, vi
comments, sending xi
configuring 15
conventions
 terminology ix
 typefaces ix

D

danger notices v

E

encryption 1
exchange 27
 keyboard 31
 keyboard/monitor tray 34
 KVM switch 28
 media drive 30
 power supply 35
 processor units 27

F

feature codes 1
feedback, sending xi
field-replaceable units 41
FRUs 41

H

hardware overview 19
homologation 49

I

IEC 60950-1 v
installing 5
 keyboard/monitor assembly 6
 operating system 11
 Storage Appliance AP1 6

K

keyboard
 exchanging 31
 recovery 26
keyboard/monitor tray
 exchanging 34
 installing 6
 requirements 5
KVM switch
 exchanging 28
 troubleshooting 24

L

labels, safety information v
logical configuration 15

M

media drive
 exchanging 30
 troubleshooting 25
monitor
 controls 39
 exchanging 34

N

notices
 caution vi
 safety v
notifications 17

O

operating system
 installing 11
 planning 3
overview 1

P

planning 3
power requirements 5
power supply
 connecting 6
 exchanging 35
 safety notices 6
pre-installation requirements 5
processor units
 exchanging 27
 recovery 26
 troubleshooting 23
publications
 ordering xi
 product ix
 related ix

R

rack
 location 5
 preparing for installation 5
 requirements 5
replacing components 27
requirements
 power 5
 rack space 5

S

safety
 information labels v
 notices v
Security Key Lifecycle Manager 1
 configuring 15
 planning 3
statement of limited warranty 45
storage appliances 1
summary of changes xiii

T

terminology ix
trademarks 48
troubleshooting 19
 general 21
 KVM switch 24
 media drive 25
 processor units 23
 recovery, keyboard 26
 recovery, processor unit 26

W

warranty 45
websites ix



Printed in USA

SC27-8520-02

