



Hitachi Data Systems

19-inch Rack Reference Guide

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- Moved Appendix B to Chapter 5 and Appendix C to Chapter 6
- Merged former Appendix D, Moving and Receiving the Rack, into sections 3.1 and 3.7

Referenced Documents

- *Hitachi Thunder 9500™ V Series User and Reference Guide*, MK-92DF601
- *Hitachi Thunder 9200™ User and Reference Guide*, MK-90DF504

Preface

The *Hitachi Data Systems 19-inch Rack Reference Guide* describes the features, setup, and technical reference information for the Hitachi Data Systems 19-inch rack enclosure, which is especially designed for use with the distributed Hitachi Freedom Storage™ disk arrays. This document also provides instructions for installing the Hitachi Thunder 9500 V Series (9500V) and Hitachi Thunder 9200™ disk array subsystems into the 19-inch rack.

This document is intended for use by Hitachi Data Systems personnel, distributors, and Value-Added Resellers. This document assumes that the user is familiar with the Hitachi Thunder 9500™ V Series and Thunder 9200™ array subsystems.

For further information on the Hitachi storage arrays, please refer to the user's guide for the array (e.g., *Hitachi Thunder 9500™ V Series User and Reference Guide*, MK-92DF601). For further information on Hitachi Data Systems products and services, please contact your Hitachi Data Systems account team, or visit Hitachi Data Systems online at <http://www.hds.com>.

Note: The term "9500V" refers to the entire Thunder 9500V subsystem family (e.g., 9570V, 9580V), unless otherwise noted.

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Thank you!

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Chapter 1 Safety Information

This chapter contains safety information regarding installing the 19-inch rack and installing equipment into it. Read the following safety guidelines carefully and follow them when performing maintenance on the rack or on components within the rack.

- General safety (see section 1.1)
- Emergency precautions (see section 1.2)
- Precautions for using the equipment (see section 1.3)
- Precautions regarding power (see section 1.4)
- Electrostatic discharge (see section 1.5)
- Environmental specifications (see section 1.6)

1.1 General Safety

Before starting maintenance:

- Read and follow the safety guidelines and procedures in this manual as well as in the manuals for any products you install in the rack.
- Hazard warnings are provided in this manual and on rack-mounted products to prevent or reduce the risk of personal injury and product damage. Table 1.1 lists and describes these hazard warnings.

Important: The user is responsible for reading and complying fully with these hazard warnings.

Table 1.1 Hazard Warnings

Warning	Description
DANGER	Indicates an imminently hazardous situation which, if not avoided, may result in death or serious injury.
WARNING	Indicates a potentially hazardous situation which, if not avoided, may result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in injury or damage to product.

1.1.1 Be Aware of All Potential Hazards

It is not possible to describe every hazard that may exist with this equipment. Be aware of all possible hazards, and work safely.

1.1.2 Repair, Modification, and Disassembly of the Rack and Components

Users must not repair, remodel, or disassemble the rack and the related components. Such actions may harm the user and/or the equipment.

1.2 Emergency Precautions

This section covers emergency precautions for electric shock and fire.

1.2.1 Electric Shock

WARNING: In case of electric shock, remain calm, and take immediate and appropriate action according to your company's first-aid and safety procedures.

1.2.2 Fire

- First shut off all the power from the machine using the emergency power-off switch.
- If the fire continues burning after the power is shut off, take suitable actions immediately such as using a fire extinguisher and/or calling the fire department.

1.3 Precautions for Using the Equipment

This section explains safety precautions for:

- Equipment
- Cables
- Casters
- Air vents and airflow
- Filler panels
- Inspection and cleaning
- Rack stability
- Working with the rack or with components in the rack
- Working around rotating or moving parts

1.3.1 Equipment

- If you notice unusual heat generation, odors, or smoke emission, shut off the power feed to the equipment and contact a maintenance engineer. Leaving such conditions unattended may result in hazardous physical conditions and equipment failure.
- Avoid physical disruption to the equipment. This may result in hazardous physical conditions and equipment failure.
- Avoid using the equipment for any use other than its original purpose; otherwise, an injury or equipment failure may result.
- If using a lift, do not move it away from the rack frame or lower the platform until the component you are mounting is fully inserted into the rack. Otherwise, the component may fall.
- When warning labels become dirty or start peeling off, replace them.

WARNING: The rack allows many components to be mounted vertically. The weight and location of the components in the rack needs to be planned in order to place the center of mass as much as possible below the mid-point of the rack. To reduce the risk of danger to persons or equipment, please follow the safety guidelines and stabilize the rack as described in this manual.

WARNING: If installing a single (standalone) rack, make sure the rack is level and has been stabilized before installing the components. If an unstable rack is loaded with components, it may become unbalanced and tip over.

1.3.2 Cables

- Make sure all cables are correctly and fully connected.
- Do not obstruct walkways when routing cables.
- Do not allow heavy material to be placed on cables. Do not place cables near any apparatus that generates heat. Do not step on or subject cables or connectors to shearing or pulling forces; the cable jacket can be damaged and can break, resulting in an electric shock, fire, or loss of data.
- Make sure that electrical and signal cables are clean before connecting them. Any dirt on a connector should be removed before inserting the connector into a socket.
- When connecting devices to the power distribution units (PDUs), do not exceed 15 amps in total to a single PDU. Follow the guidelines for PDU load as listed in Table 5.3 for 9500V and Table 6.4 for 9200. The rack has more than one power supply cord. Disconnect all the power supply cords before servicing to avoid electric shock.

1.3.3 Casters

The casters facilitate movement of the rack across short distances to position it for final installation. Although the casters can support the weight of the rack with installed components, they are not designed for supporting the full weight of the rack on a long-term basis. As soon as the rack is in its final position for installation, make sure that the full weight of the rack is supported by the stabilizing feet; if not, the casters may be damaged.

1.3.4 Air Vents and Airflow

- Make sure that the air vents are free of obstruction. They should be inspected periodically.
- Do not place metallic material such as paper clips or any combustible material such as paper into or near the air vents. This may result in electric shock or fire.
- The air flows through the rack from the outside in, up, and out the top. The rack comes installed with fans at the top that assist in maintaining airflow; the fans pull air up from the inside of the rack and out through the top.
- The airflow of the Hitachi Data Systems Thunder 9500™ V Series subsystem, which can be mounted in this rack, is from front to back. The rack has no door in the front and a ventilated door in the back, which allows the subsystem to draw air through the front and exhaust air through the back. Do not block the front of mounted components, the top fans, or the rear-ventilated door.

1.3.5 Filler Panels

If all the vertical mounting space is not occupied by rack mounted products, the empty space should be covered with filler panels. Otherwise, the empty gaps between the components can cause airflow changes that may adversely affect cooling within the rack.

1.3.6 Precautions for Inspection and Cleaning

- If the unit must be powered off, make sure that the power-off sequence described in this manual is performed before proceeding with maintenance.
- Do not work on the unit in a damp or flooded environment.
- Do not obstruct access to the unit with parts or tools.
- When performing the work with the door open, take off metal watches or jewelry to prevent electric shock. If you wear metal-frame glasses, do not touch the equipment.
- Ensure that loose clothing, jewelry, or hair does not become tangled in moving components.
- There are high-voltage parts in the equipment. Observe the cautionary statements in the manual to make sure that high-voltage components are not touched during maintenance. Another person should be on alert in case the power feed to the equipment needs to be quickly turned off.
- After the power feed to the equipment is shut off, electricity remains in the equipment for a period of time. Do not touch any components other than those indicated in this manual.
- The equipment can become extremely hot. Do not touch any parts other than those indicated in this manual.
- When working with the door open, wear cotton gloves to prevent your hands from touching sharp objects.

1.3.7 Rack Stability

To reduce the risk of injury to persons or equipment, follow these guidelines:

- Stabilize the rack frame on-site by adjusting the stabilizing feet, as specified in the installation section.
- The full weight of the rack should be resting on the levelers, not on the casters.
- Pull the anti-tip stabilizing bar out fully before extending any equipment to the front (see section 4.4).
- When extending equipment out of the rack, extend only one piece at a time. Extending two or more at a time may cause the rack to be unstable and pose unnecessary risk or danger.
- Always follow common sense and safety precautions.

1.3.8 Working with the Rack or Components in the Rack

- For all procedures, follow the given methods and sequence of steps.
- Use tools and parts for maintenance specified in the manual; otherwise, personal injury or damage of the rack, as well as deterioration of the product's quality, may result.
- Use only the special tools and instruments specified in this manual or use appropriate commercially available tools and instruments.
- Keep the maintenance area clean.
- Put away parts, materials, or tools when not in use.
- Wear eye protection where liquid may splash or objects may fly about.
- When lifting anything heavy, lift it using your legs with your back kept erect to prevent injury to your back or spine. When lifting, use a proper lifting tool, or ask somebody to assist you.
- Before finishing your work, make sure that the rack and any products mounted in it are returned to their original state. Make sure that all parts removed during maintenance have been installed back in their original positions in the rack or products mounted in it. Make sure that no tool or foreign material is left in the rack.

1.3.9 Working Around Rotating or Moving Parts

- Tuck in your tie, scarf, shirt, or any other loose clothing so that it will not be caught by a rotating or moving part.
- Tie up long hair.
- Unless otherwise specifically instructed, do not supply power to any device with rotating or moving parts that are not properly covered.
- When instructed to supply power to any device with rotating or moving parts whose covers have been removed, work with another person who can immediately turn off the power in an emergency.

1.4 Precautions Regarding Power

For grounding requirements, see section 1.4.1.

For information on preventing electric shock, see section 1.4.2.

- The 19-inch rack is available wired for 220V or 110V.
 - The PDU is the same in either rack: each is rated for 100-240V, 50/60 Hz, 16 amp.
 - The preferred option for the Thunder 9500V is 220V to best utilize the 16-amp PDUs.
- The differences between a 220V and a 110V rack are:
 - The fan installed runs on the voltage of the selected rack.
 - The power cable that connects the PDU to the power source will be either an L6-20P (for 220V) or a NEMA 5-15P (for 110V).

- Two (2) 16-amp PDUs come pre-installed in the rack.

- To support redundancy, always connect PDUs on one side of the rack to one power source and all PDUs on the other side of the rack to a separate power source on a different circuit.

Connect dual-power supply components with one power cable to a PDU on the left side, and the other power cable to a PDU on the right side.

- Additional PDUs can be ordered and should be ordered when more than five modules will be installed in the rack [where a module is a 9500V rack (RK) or rack additional (RKA)], assuming a connection to 220V. If 110V is used, more PDUs are needed to handle a fully configured Thunder 9500V.
- When installing third-party components in the rack, identify the component's amp load, and check the current amperage load on the PDUs to determine if the component can be plugged into the PDU or if another PDU will be needed.

WARNING: To reduce the risk of injury, fire, or damage to persons or equipment, do not overload the AC supply branch circuit that provides power to the rack. Consult the electrical authority having jurisdiction over your facility wiring and installation requirements. When planning for power distribution and requirements for your rack configuration, note the following:

- Balance the power load between available AC supply branch circuits.
- The overall system AC current load must not exceed 80% of the branch circuit AC current rating.
- If an uninterruptible power supply (UPS) is used, the load should not exceed 80 % of the UPS's marked electrical current rating.

Caution: To reduce the risk of damage to the equipment, verify that all AC voltage selector switches are set correctly to match your local AC line voltage (115V or 230V). If the AC voltage selector switch is not properly set, your components may be damaged when power is applied. The installation of rack and mounted components must comply with local and regional electrical regulations governing the installation of Information Technology Equipment by licensed electricians. For electrical power ratings on components, refer to their product rating label or user documentation supplied.

1.4.1 Grounding Requirements

All powered equipment should be properly grounded for proper operation and safety. Power distribution units (PDUs), wiring, equipment cabling, and receptacles must be listed grounding-type devices. Ground integrity should be maintained for each connection made in a reliably grounded outlet, such as with the included PDUs. The rack comes with a Grounding Lug Mounted in the base of the cabinet and a 77-inch grounded aluminum bus bar.

WARNING: To reduce the risk of electric shock or damage to equipment, follow proper grounding procedures and do not tamper with the pre-existing installed power distribution units. The rack connects to a grounded (earth) power outlet.

1.4.2 Prevention of Electric Shock

- Before starting work, make sure that there are no potential electric hazards in the maintenance area such as insufficient grounding or a wet floor.
- Before starting work, note where the emergency power-off switches are located, and make sure you know how to operate them.
- Unless otherwise specifically instructed, cut off all power sources to the rack or the rack mounted components before starting maintenance. Just switching off the rack-mounted components is usually not enough. When power is fed from a wall or floor outlet, unplug the power supply cord, or turn off the switch on the power distribution panel or board. Attach a notice on the panel or board prohibiting the use of the switch. If the rack-mounted components have already had their power turned off, make sure that these conditions are satisfied.
- Do not touch any uninsulated conductor or surface which may remain charged for a limited time after the external power supply to a rack-mounted component is disconnected.
- When working on a rack-mounted component which has a grounding terminal, make sure that the terminal is properly connected to the facility's ground.
- When working near a hazardously energized part, do not work alone. Work with another person who can immediately turn off the power in an emergency.
- Do not wear any metallic item such as a wristwatch with a metallic surface or metallic accessories. If you wear eyeglasses with a metallic frame, do not allow the frame to touch an uninsulated surface.
- Make sure that your hands and arms are dry.
- Unless otherwise specifically instructed, use only one hand when it is necessary to work near an exposed live electric circuit. This prevents the completion of the circuit through both hands even if you accidentally touch the circuit.
- Do not use a dental mirror near an exposed live electric circuit. The mirror surface is conductive and can become hazardous even if it is made of plastic.
- Unless otherwise specifically instructed, do not supply power to any subassembly such as a power supply unit or a motor while it is removed from its main product.

1.5 Prevention of Electrostatic Discharge

To prevent damage to equipment mounted in the rack, take necessary precautions during maintenance activities (storage, switches, PDU, etc.). A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. Follow the recommended handling procedures that accompany the equipment you are mounting or handling.

Use one of the following methods for grounding when handling or installing electrostatic-sensitive parts in the rack:

- Use a wrist strap connected by a ground cord to the grounded aluminum bar or to the chassis of mounted equipment that is grounded. For proper grounding, wear the strap snug against the skin.
- If you do not have any of the suggested equipment for proper grounding, have Hitachi Data Systems technical support install the part.

1.6 Environmental Specifications

The Hitachi Data Systems 19-inch rack was designed specifically for mounting the Hitachi Data Systems Thunder 9500™ V Series and Thunder 9200™ disk array subsystems.

Table 1.2 lists the environmental specifications for the 19-inch rack with 9500V subsystem installed. These environmental specifications must be observed to ensure the proper operating and storage environment for the Thunder 9500V array in the rack. The following environmental conditions may damage or decrease the life of the 9500V subsystem.

- Exposure to direct sunlight.
- Rapid change in temperature and/or humidity (such as near an air-conditioner).
- Proximity (near) to a device which generates electrical noise, such as the ungrounded motor of an air conditioner or washing machine.
- Proximity (near) to a device that generates a strong magnetic field. (Do not bring any magnet close to the rack or the Thunder 9500V subsystem.)
- Exposure to dust or dirt.
- Vibration.

Caution: To reduce the risk of damage to equipment when installing third-party products (such as switches, hubs, etc.):

- Do not impede airflow to the products already mounted in the rack.
- Do not to exceed internal rack specifications in Table 1.2.
- Make sure that the third-party product's recommended environmental specifications are not exceeded when the product is installed in the Hitachi Data Systems rack.

Table 1.2 Environmental Specifications for the 9500V in the 19-inch Rack

Item		Specification	Remarks
Temperature	In operation (°C)	10 to 40	—
	In non-operation (°C)	-10 to 50	
	In transport/storage (°C)	-30 to 60	
	Temperature change rate (°C/h)	10	
Humidity	In operation (%)	8 to 80	No dew condensation is allowed.
	In non-operation (%)	8 to 90	
	Maximum wet bulb temp. (°C)	29	
Vibration	In operation (m/s ²)	2.5 or less	—
	In non-operation (m/s ²)	5.0 or less	
	In transport (packed) (m/s ²)	5.0 or less	
Impact	In operation (m/s ²)	20 or less	10 ms, half sine wave impact.
	In non-operation (m/s ²)	50 or less	
	In transport (packed) (m/s ²)	80 or less	
Angle at which the subsystem will fall over		15° or more	To be measured when installed on stabilizing feet.
Atmosphere		—	Isolated from corrosive gas or salty air.
Acoustic noise (dBA)		60 or less	Measured in the A scale one meter away from the front end of the rack and one meter above.

Chapter 2 Description of the Hitachi Data Systems 19-inch Rack

This chapter covers the following topics:

- Features and characteristics of the Hitachi Data Systems 19-inch rack (section 2.1), including a description of the EIA (U)nit measurement (section 2.1.1), and
- Installation and maintenance clearance areas (section 2.2).

2.1 Features and Characteristics

Figure 2.1 shows the front and rear views of the rack. Table 2.1 lists and explains rack features and characteristics. The rack shown contains:

- Three (3) pre-installed railkits
- Removable side panels
- Levelers at the bottom
- Ventilated rear door
- Hitachi Data Systems logo



Figure 2.1 Front and Rear Views of the 19-inch Rack

Table 2.1 Features and Characteristics of the 19-inch Rack

Features	Characteristics
Mounting Space	40U (70.00") usable vertical rack space (1U = 1.75 inches, see section 2.1.1) 19" horizontal mounting
Overall Dimensions	Height: 79.50" with caster leveler base Depth: 36.00" Width: 23.09"
Vertical Rails	2 pairs of 12 GA (1 in front, 1 in back) clear zinc-plated vertical mounting angles 0.375" square holes for accepting cage nuts. Bag of 50 each 10-32 cage nuts (12GA)
Chassis Supports or Rail Kits	3 pairs installed for a starting configuration of 1 RK + 2 RKAs
40U Vertical Rack Label Tape Strips	2 each in the front, 1 each on the inside of the left and right corner posts, used for measuring out EIA units 1-40
Doors	No front door for maximum front-to-back air flow Fully vented rear door with locking push button latch and key lock
Removable Side Panels	Top and bottom on the left and the right of the rack, with key lock
Top	Removable fan top panel 2 each 6.75" 220V 220-cfm fans with finger guards, single wired cord, and IEC C-14 plug. Removable 3U formed panel with 2 each 2.5" cable cutouts with Doug Mocket cap #EDP3-90 to allow cable access through top
Bottom	4 each Darnel swivel casters rated at 400 lbs. each (1600 lbs. total) 4 each heavy duty levelers rated at 1200 lbs. each (4800 lbs. total) Slide out anti-tip stabilizer.
Power	2 each 16-amp power distribution units EN60324-C13 receptacles for connecting the 9500V/9200 J2F power cables to the PDU Installed 1 per side left/right rear 18" from the bottom. Total 16 amps per PDU Used for connecting fan assembly and the Thunder 9500V/9200 (2 each) power cords with L6-20P plug
Grounding	1 each ground stud, mounted in the bottom right rear (facing the rear) 1 each 70.00" grounded aluminum bus bar, mounted on the right rear side (facing the rear)
Filler Panels	7.0U filler panel 3.5U filler panel 1.0U filler panel 0.5U filler panel
Finish	Black powder coat Hitachi Data Systems Logo on the top molding, left hand side facing the front
Safety Approvals	CSA for U.S. and Canada, CE for Europe

2.1.1 EIA (U)nit Measurement Mark

Figure 2.2 shows the EIA (U)nit measurement mark visible on the front of the rack.

1U = 1.75 inches

Note: One EIA (U)nit has 3 holes (square or round).

Note: The spacing above and below the middle hole is larger than the spacing below the bottom hole or the spacing above the top hole. This allows you to measure "U"s when there is no reference label for comparison.



Figure 2.2 EIA (U)nit Measurement on Rack

2.2 Installation and Maintenance Clearance Areas

Figure 2.3 illustrates the installation and maintenance clearance areas for the rack. Table 2.2 lists clearance measurements.

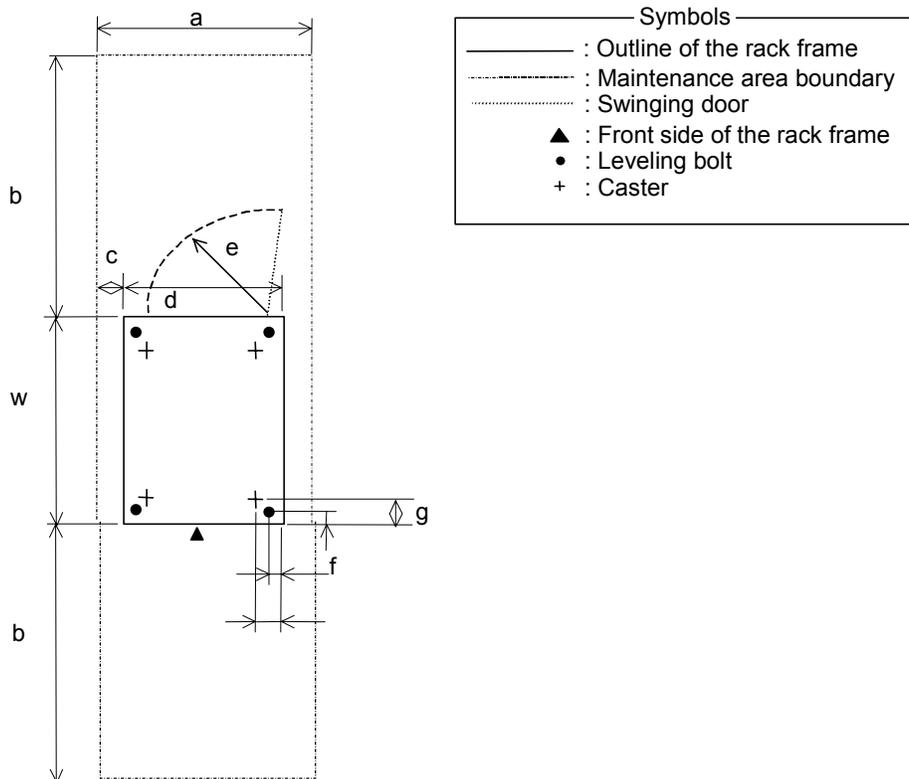


Figure 2.3 Installation and Maintenance Areas

Table 2.2 Clearance Measurements

Dimension	Millimeters	Inches
a	1064.4	41.9
b	1000.0	39.4
c	150.0	5.9
d	914.4	36.0
e	479.6	18.9
f	33.5	1.3
g	110.7	4.4
w	586.5	23.1

Chapter 3 Preparing for Installation

This chapter covers the following topics:

- Receiving considerations for the rack (see section 3.1)
- Tools required (see section 3.2)
- Checking the hardware (see section 3.3)
- Casters (see section 3.4)
- Stabilizing feet (see section 3.5)
- Stabilizing the rack (see section 3.6)
- Moving the rack (see section 3.7)
- Removing and reinstalling the rear door (see section 3.8)
- Opening and closing the side panels (see section 3.9)

3.1 Receiving Considerations for the Rack

To receive a fully integrated/configured, palletized Hitachi Data Systems 19-inch rack, consider the following:

- The dock door at the receiving site must accommodate the height and width of the palletized rack.
- The pallet is 48 inches x 32 inches and may not fit through some doors.
- On a pallet, the Hitachi Data Systems rack is 85.38 inches in height and may not fit through some entryways or doors.
- Transport the rack as close to its final destination as possible before removing it from its pallet.
- An appropriate freight elevator must be available for deliveries to upper/lower floors.
- Do not lay the rack on its side, because the sheet metal can twist and/or distort.
- If the rack already has components mounted in it, it may be heavy (250 lbs. ~ 1000 lbs. when the Thunder 9500V is installed).

3.2 Tools Required

The following tools are required for installing railkits and for securing products to the front vertical rail mounting holes:

- Adjustable wrench
- Cage nuts
- Cage nut tool
- Phillips screwdriver
- Screws
- Washers

Each railkit includes all necessary screws, washers, cage nuts, and cage nut tool.

3.3 Checking the Hardware

If you ordered only a rack, it should come with all the components described in Chapter 2 in this manual. If you ordered additional items, please check that you have received them as ordered. If you ordered Hitachi Data Systems Distributed (Midrange) Storage and/or Hitachi Data Systems Solutions installed in a rack, the product(s) will already be installed in the rack unless otherwise specified at order time.

3.4 Casters

The casters facilitate movement of the rack across short distances in order to position it for final installation. As soon as the rack is in its final position for installation, make sure that the full weight of the rack is supported by the stabilizing feet.

WARNING: The casters can only support the weight of the rack with installed components for short periods of time. They are not designed to support the full weight of the rack on a long-term basis. If this occurs, the casters may be damaged.

3.5 Stabilizing Feet

The stabilizing feet, located beside each caster on the rack, unscrew and extend to the floor. These feet support the rack and help compensate for uneven surfaces.

Use the stabilizing feet as described in section 3.4 to stabilize the rack.

3.6 Stabilizing the Rack

WARNING: The rack allows many components to be installed vertically. Plan the weight and location of the components to place the center of mass as much as possible below the mid-point of the rack. To reduce the risk of danger to persons or equipment, follow the safety guidelines and stabilize the rack as described below.

WARNING: If you are installing a single (standalone) rack, make sure that the rack is level and that it has been stabilized before installing the components. If an unstable rack is loaded with components, it may become unbalanced and fall over.

Figure 3.1 shows how to stabilize the rack. To stabilize the rack, follow these guidelines:

- Stabilize the rack frame at its final resting location by adjusting the stabilizing feet.
- Using an adjustable wrench, turn each stabilizing foot clockwise until the clearance between the caster and the floor is 2.5 mm.
- Adjust the stabilizing feet so that the tilt of the rack, forwards, backwards, left or right, becomes 0.0 ± 2 mm.
- The full weight of the rack should be resting on the stabilizing feet, not on the casters.
- When extending equipment out of the rack, extend only one at a time. Extending two or more at a time may cause the rack to be unstable and pose unnecessary risk or danger.
- Always follow safety precautions and common sense.

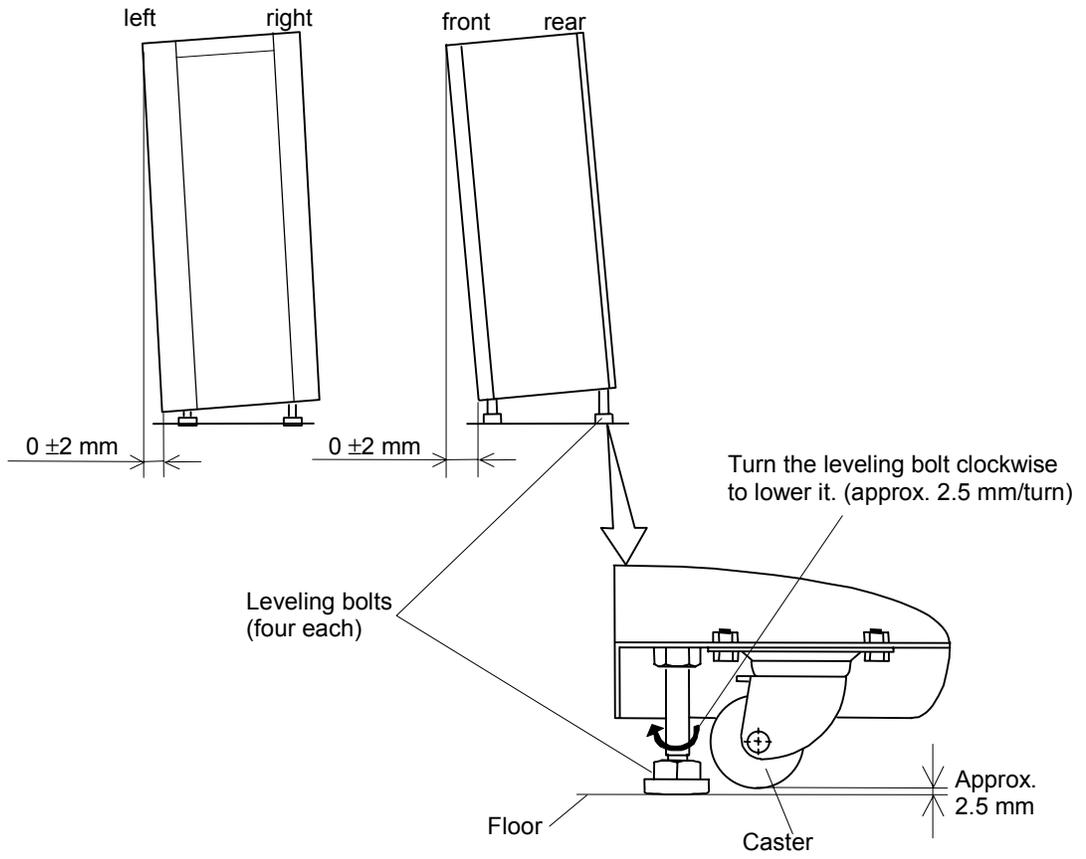


Figure 3.1 Stabilizing the Rack by Lowering the Stabilizing Feet

3.7 Moving the Rack

The maximum allowable inclination angle for the rack is eight degrees (8°). When moving the rack across steep slopes or different floor levels, use a gangway as shown in Figure 3.2 to form a slope with an inclination angle (slope) of less than eight degrees.

To reduce the risk of injury to persons or damage to equipment, it is recommended that all equipment should be removed from the rack, in order from top to bottom. Transport the rack and the components individually to the desired location.

To move the rack with the mounted components in it, it is recommended to transport on the pallet on which the rack was shipped. Take necessary precautions when loading onto the pallet. Package and secure the rack on the pallet as it was shipped and received.

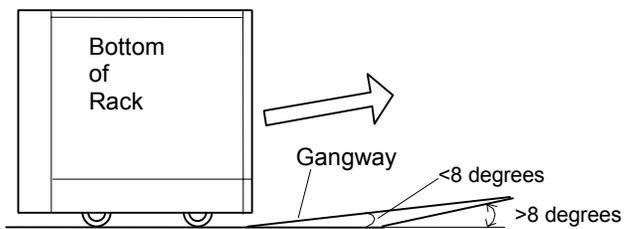


Figure 3.2 Maximum Incline (Slope) for Moving the Rack

3.8 Removing and Reinstalling the Rear Door

The rear door can be removed and reinstalled if needed. As shown in Figure 3.3, the top and bottom left corners of the door have metallic posts held by springs for this purpose. Pull the handles on the posts in order to remove or reinstall the door.

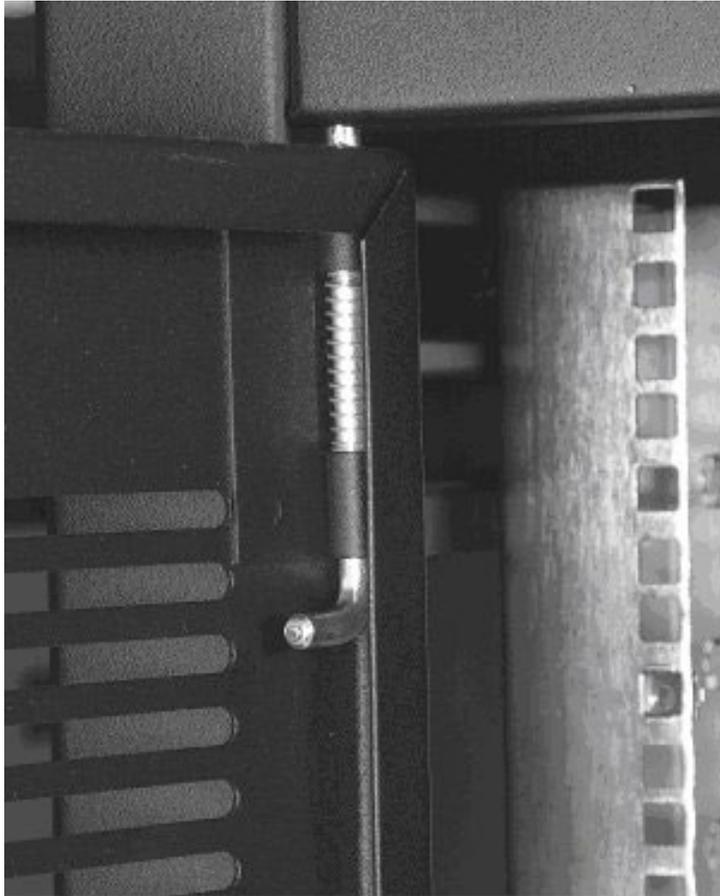


Figure 3.3 Rear Door

3.9 Opening and Closing the Side Panels

The side panels can be locked and unlocked with keys supplied with the rack. Once unlocked, press the release levers inward and pull the panel outwards towards you. Reverse these procedures when reinstalling the side panels.

Chapter 4 Installing the Railkits and Equipment

This chapter covers the following topics:

- Installation steps (see section 4.1)
- Installing cage nuts (see section 4.2)
- Installing railkits (see section 4.3)
- Extending and retracting the anti-tip stabilizing bar (see section 4.4)
- Installing filler panels (see section 4.5)

Before installing equipment, make sure to:

- Read the safety information in Chapter 1.
- Read “Stabilizing the Rack”, section 3.4 of this manual.

When installing equipment, make sure to:

- Extend the front anti-tip stabilizing bar when installing or removing equipment to provide greater stability and safety.
- Mount the heavier equipment at the bottom of the rack first, prior to installing equipment in the upper half of the rack.
- Refer to the specific instructions included with the equipment you will mount.

For instructions on mounting the Thunder 9500V subsystem(s) into the rack, see Chapter 5.

For instructions on mounting the Thunder 9200™ subsystem(s) into the rack, see Chapter 6.

4.1 Installation Steps

Most installations of equipment in the rack involve the following steps:

1. Determine location in the rack where the components will be mounted.
2. Remove side panels or rear door of rack (not necessary but may make installation easier).
3. Install railkits or mounting hardware that equipment will rest on in the rack as follows:
 - a) Prepare the mounting hardware.
 - b) Insert the applicable cage nuts in the rack to which the railkits will be secured.
 - c) Install the railkits/mounting hardware into the rack.
4. Install the equipment into the rack as follows:
 - a) Extend the front anti-tip stabilizing bar to provide greater stability and safety.
 - b) Determine what mounting holes will be used for securing the equipment to the rack.
 - c) Install cage nuts at these locations.
 - d) Insert equipment into the rack using the previously installed railkits/mounting hardware.
 - e) Secure the equipment to the rack with screws that secure to the cage nuts as determined in step 3b) above.
 - f) Retract the front anti-tip stabilizing bar when you are finished installing equipment in the rack.
5. Identify the correct power source (110V or 220V) to which the equipment will be connected to, and then connect to power.
6. Install the filler panels.
7. Reattach the side panels and/or rear door (if removed).

4.2 Installing Cage Nuts

When installing railkits or securing equipment to the rack, cage nuts are inserted into the square holes. Screws can then attach to the cage nut for securing the railkits or equipment.

To install cage nuts, insert one curved edge into the square hole, and use the cage nut tool to pull the other end through the square hole as shown in Figure 4.1.

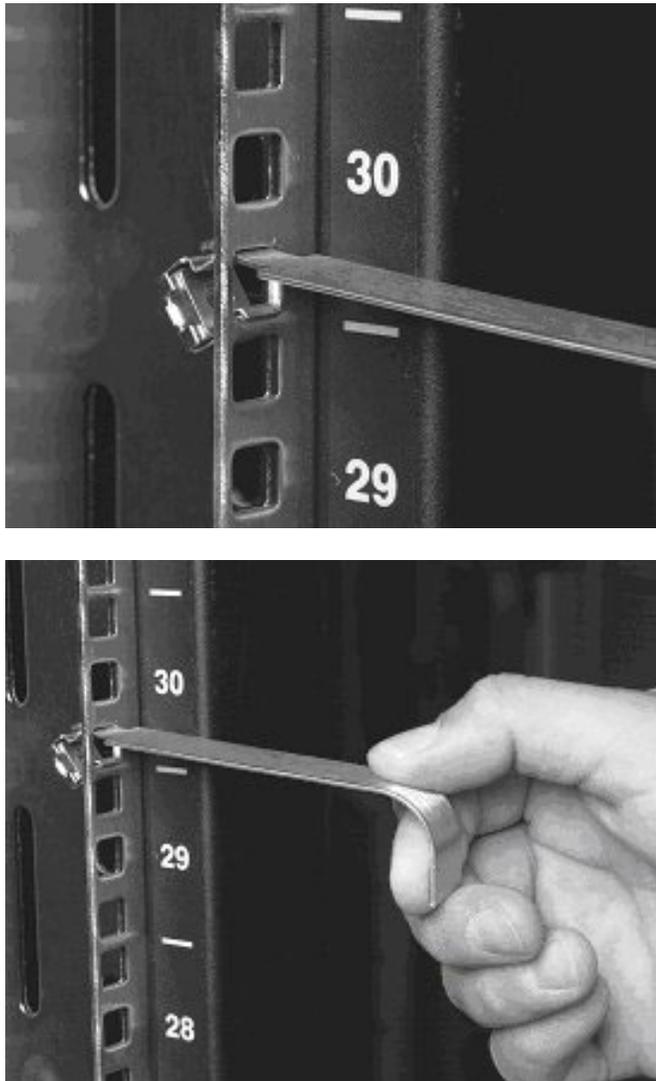


Figure 4.1 Installing the Cage Nuts

4.3 Installing Railkits

Prior to installing equipment, mount the railkits or appropriate hardware that the equipment will rest on in the rack.

The railkits available for the rack allow you to mount equipment at the bottom of an EIA (U)nit or at the middle of an EIA (U)nit. (Middle of a U may be used for some Thunder 9500V arrays that are 3.5U in height.)

Figure 4.2 and Table 4.1 show how to install at both levels. Table 4.1 lists positioning information for installing the railkits into the rack. Figure 4.2, Figure 4.3, and Figure 4.4 illustrate mounting positioning. Figure 4.3 and Figure 4.4 show examples of correctly installed railkits at the bottom and middle U locations, respectively.

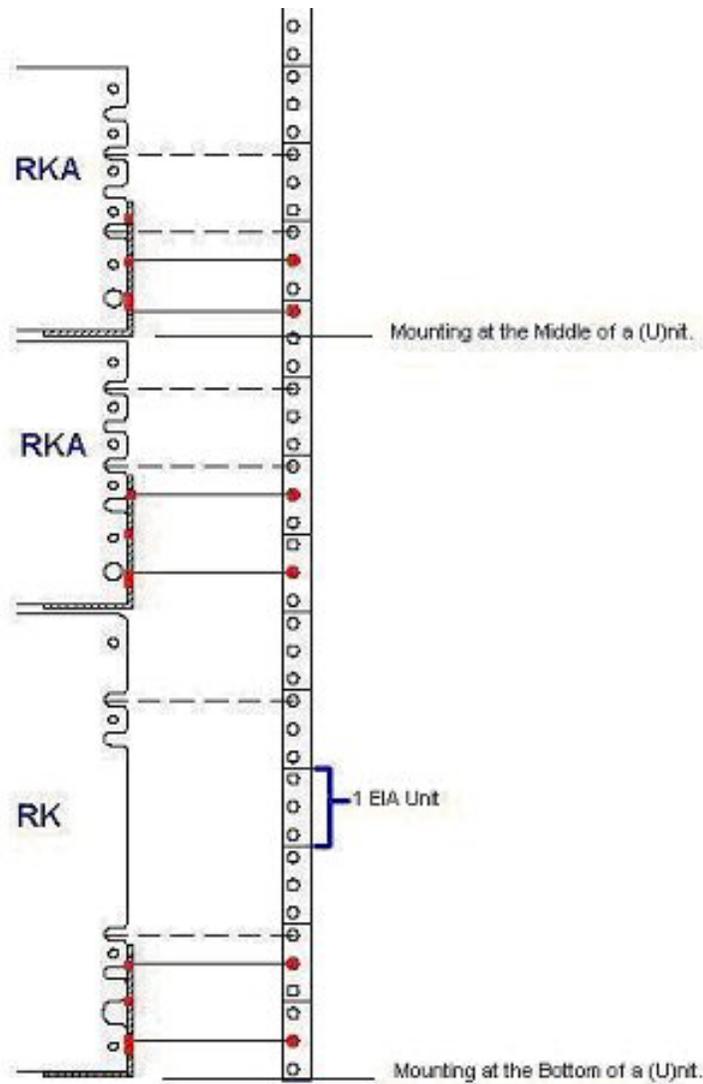


Figure 4.2 Railkit Positioning

Table 4.1 Railkit Mounting Information

Item	Location	
	Bottom of a U	Middle of a U
Cage Nut Placement	Where the solid dots (●) are located.	Where the solid dots (●) are located.
Railkit Holes Used	Top and bottom	Middle and bottom

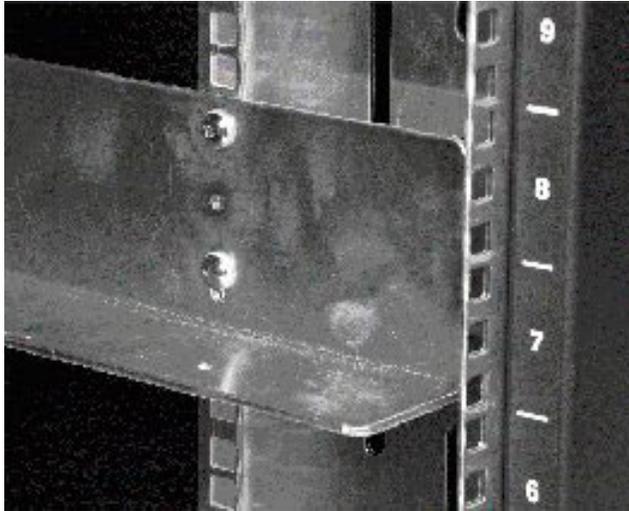


Figure 4.3 Bottom U Installation

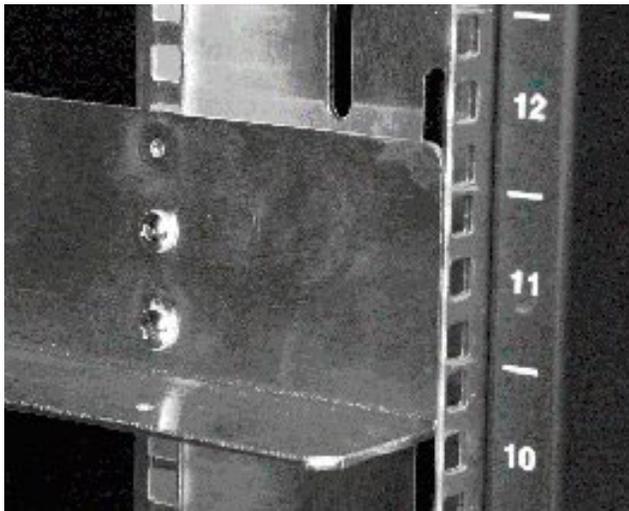


Figure 4.4 Middle U Installation

4.4 Extending and Retracting the Anti-Tip Stabilizing Bar

To extend the anti-tip stabilizing bar:

1. Press the middle of the bar, which will open up a holder.
2. Pull on the holder.

To retract the anti-stabilizing bar:

1. Push the bar in.
2. Close the middle holder.

4.5 Installing Filler Panels

Filler panels should be installed to cover any empty space at the front of the rack. This will ensure adequate airflow to the equipment in the rack, if the rack is not filled completely.

The filler panels available come in sizes of 7.0 U, 3.5 U, 1 U, and 0.5 U. When installing filler panels, follow these steps:

1. Calculate the empty space in terms of EIA (U)nits.
2. Use the larger filler panels at the top, and work your way down to using the smallest panels at the very bottom.
3. Place the filler panel on the rack as a template to determine which holes will require cage nuts.
4. Insert the cage nuts.
5. Secure the panels to the rack by screwing them onto the rack at the cage nut locations.

Note: To fill a 4.0 U space, the 3.5 U and 0.5 U filler panels have a “correct” placement method (see Figure 4.5) and an “incorrect” placement method (see Figure 4.6) in order to mount flush with each other, or flush with the filler panels above them and below them.



Figure 4.5 Correct Placement of Filler Panels



Figure 4.6 Incorrect Placement of Filler Panels

Chapter 5 Mounting the Thunder 9500V into the 19-inch Rack

This chapter provides configuration guidelines, illustrations, safety information, and specifications information for installing the Thunder 9500™ V Series disk array subsystem into the 19-inch rack. Figure 5.1 shows a rack with multiple Thunder 9500V arrays installed.



Figure 5.1 Example of a 19-inch Rack with Multiple Thunder 9500V Arrays

5.1 Configuration Guidelines

Observe the following when placing the components into the rack:

- **Weight** – Mount the heaviest equipment at the bottom of the rack and the lightest equipment at the top.
Keep the center of mass at or below the 20 U line.
- **When mounting more than one Thunder 9500V subsystem in a rack, it is important to spread the RK-to-RKA ratio evenly (for example, 1:1 for all combinations, or 1:2 for all combinations, or 1:3 for all combinations, etc.). Avoid a top-heavy installation. Figure 5.2 shows an example of a balanced RK-to-RKA ratio.**
- **Power** – Do not exceed the amperage of the PDUs. The PDUs are 16 amps, and the RK/RKA will use amperage differently based the number of Thunder 9500V power supplies that are connected (one or two per module).
 - Spread the load evenly across an even number of PDUs.
 - 220V is required for the Thunder 9500V.
 - Do not exceed 15 amps to a single PDU.
- **Height** – The vertical mounting space is measured in EIA U increments (1U = 1.75 inches).

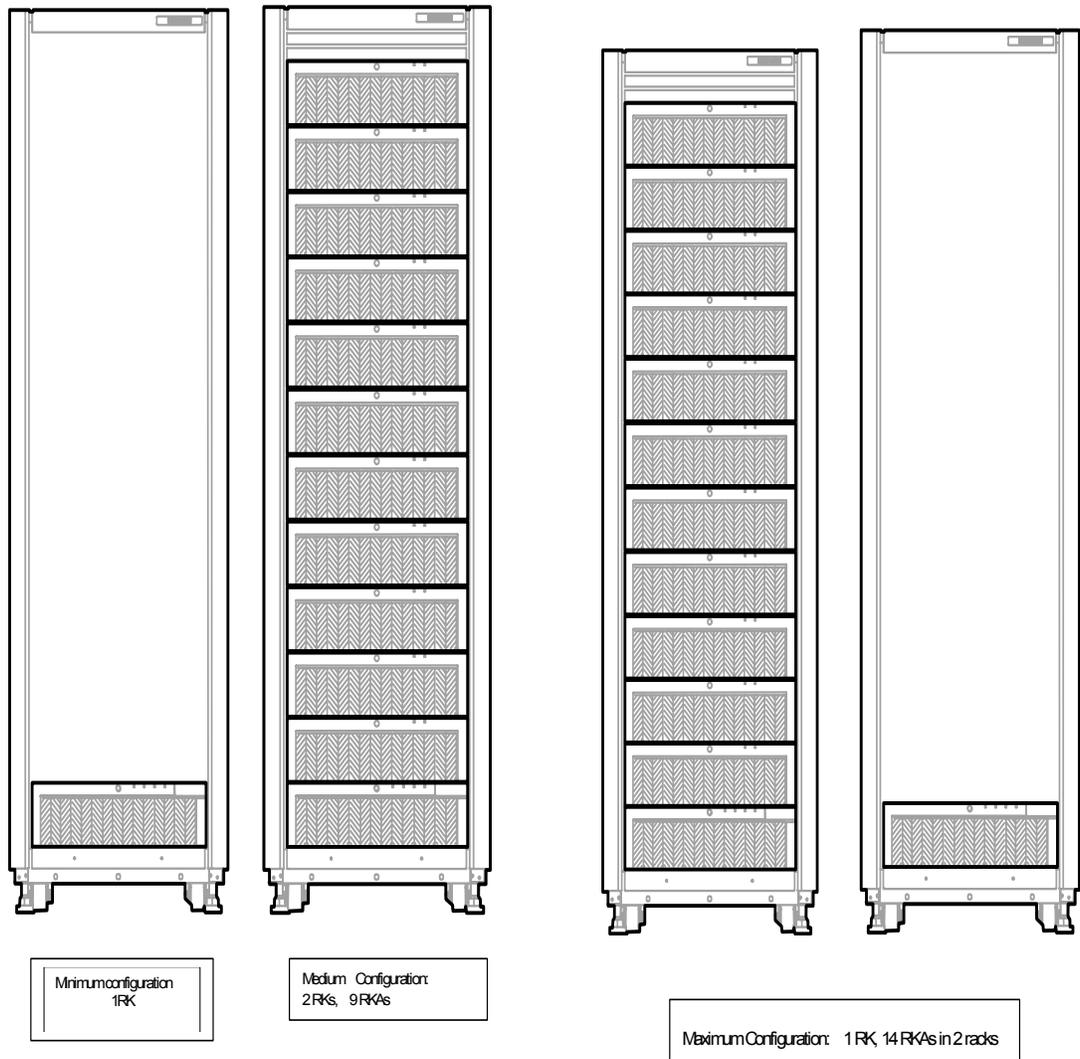


Figure 5.2 Balanced RK-to-RKA Ratio – Suggested Placement of 9500V Components

5.2 Cautions and Warnings

Prior to installing the Thunder 9500V into the rack, make sure you have read this entire rack manual. Pay careful attention to the following:

- Safety information (Chapter 1)
- Installing the Rack (Chapter 3 and Chapter 4)
- Installing Railkits and Equipment (Chapter 4)
- Configuration Rules (section 5.1 above)

The RK and RKA weigh about 44 kg and 42 kg, respectively. To reduce the risk of injury to persons or damage to equipment:

- Extend the anti-tip stabilizing bar to provide added stability during installation.
- Get help to lift and stabilize the product during installation or removal, especially when the product is not yet fastened to the rails.
- Use stable mechanical lift equipment that can handle the weight and that can lift components to the highest levels of the rack (70-80 inches).
- If using a lift, do not move it away from the rack frame nor lower the platform until the red line on the label affixed to the Thunder 9500V has crossed the front of the railkit. Otherwise, the Thunder 9500V may fall.
- Install equipment with at least one other person.
- Remove all pluggable power supplies and modules to reduce total product weight before lifting it.
- Observe local occupational health and safety requirements and guidelines for manual material handling.
- The handles may be used when raising the Thunder 9500V, but it is preferable to hold it by the front and rear portions made of sheet metal.
- Make sure that there are no scratches or flaws on the power cables. These defects may cause electric shock or a fire.
- A large leak current flows when more than one RK/RKA is installed. Make sure the units are connected to a properly grounded power source to prevent electric shock.

5.3 Installing the Thunder 9500™ V Series in the Rack

Follow these steps when installing a Thunder 9500V subsystem in the rack:

1. Read and follow all safety warnings and rules throughout this manual.
2. Make sure that the rack has been stabilized as described in section 3.4 of this manual.
3. Install cage nuts for the Thunder 9500V (see Figure 4.1). For additional information on installing cage nuts, refer to sections 4.2 and 4.3.
4. For a 9500V installation:
 - a) With the Thunder 9500V well supported, lift it up and align its chassis with the railkits mounted on the rack. Slide the 9500V all the way into the rack.
 - b) Secure the 9500V to the rack with screws that will attach to corresponding cage nuts on the rack.
 - c) Connect any applicable cables (9500V interconnect cables, power cables, etc.) according to the 9500V installation manual that was included with the 9500V RK shipment. See section 5.4 for the required number of PDUs.

Caution: Make sure to connect the 9500V to a proper power source.
5. For a 9500V upgrade:
 - a) To avoid data loss, check procedures for either an online upgrade or if downtime needs to be scheduled.
 - b) Make sure all components and equipment have been secured tightly to the rack with screws and cage nuts.
 - c) Install filler panels as described in section 4.5.

See Table 6.1 for additional installation configuration information.

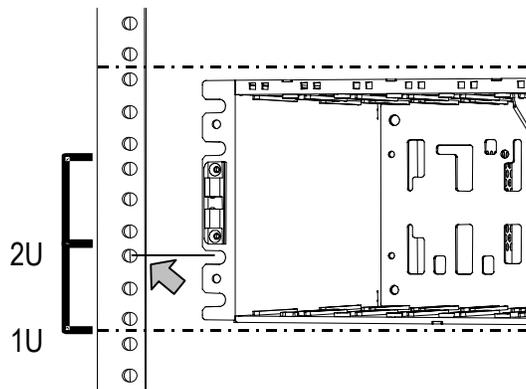


Figure 5.3 Installing the Thunder 9500™ V Series into the Rack

Table 5.1 Example of a Thunder 9500™ V Series Installation Configuration

Item		Rackmount Model 9570V	
Configuration	Configuration	RK	RKA
	Subsystem Appearance		
Physical Specifications	Chassis size (W×D×H')	430×656×129	430×656×129
	Weight [note 1]	≤ 44 kg., ≤ 97 lbs.	≤ 42 kg., ≤ 92.5 lbs.
	Required height (EIA unit)	3	3
	Input voltage (V)	AC 100/200/240 (89 to 127/178 to 254)	
	Frequency (Hz)	50/60 ± 1	
Input power specifications	Number of phases and cabling	Single-phase with protective grounding	
	Steady-state current (A) or AMPS [note 2]	When 2 power supplies are connected: 4.4x2 (2.2x2) When 1 power supply is connected: 7.2x1 (3.6x1)	When 2 power supplies are connected: 3.2x2 (1.6x2) When 1 power supply is connected: 5.2x1 (2.6x1)
	Breaking current (A)	20.0	15.0
	Required power [note 3] Steady state (VA)	When 2 power supplies are connected: 700 When 1 power supply is connected: 580	When 2 power supplies are connected: 550 When 1 power supply is connected: 450
	Required power [note 3] Starting state (VA)	When 2 power supplies are connected: 800 When 1 power supply is connected: 700	When 2 power supplies are connected: 650 When 1 power supply is connected: 550
Insulation performance	Insulation withstand voltage	AC 1,500 V (10 mA, 1 min.)	
	Insulation resistance	DC 500 V, 10 MΩ or more	
Receptacles	(2 recommended per RK or RKA module)	EN60324-C13 (178-254 VAC) or NEMA standard 5-15R (89-127 VAC)	

Notes:

1. This is the maximum value with a maximum hardware configuration.
2. For the RK and the RKA, make sure the power supplied to the subsystem meets the specifications of a single power supply. This is required because only one power supply would be operating in the event of a power failure in a dual-source power configuration.
3. The values shown represent a maximum configuration. When planning facilities, as in using a UPS, use a power factor of 100% for calculations. The values for 100V/200V are shown. (Example: 300 W = 300 VA) The actual required power may exceed the value shown in the table when the tolerance is included.

5.4 More Information about Power

Single modules (an RK or RKA are referred to as modules in this document) have two power supplies for redundancy, which is the recommended configuration. However, the modules are designed to function on only one power supply if the other power supply loses power.

You should provide two separate power sources for the rack to maximize the power redundancy of the Thunder 9500™ V Series subsystem.

A recommended power solution is similar to what is sold in the Hitachi Data Systems 19-inch rack:

- Six PDUs (three for the left power supplies of the Thunder 9500V modules, three for the right power supplies)
- Each PDU should have at least four receptacles available (for a total of 24 receptacles if six PDUs are installed).

A general rule is to connect a maximum of four modules (RK or RKA) per 16-amp PDU

- Receptacles should be EN60324-C13 type receptacles. For receptacle amperage, see specifications and requirements table above.
- Each PDU should be rated for a minimum of 16 amps (usable).
- The PDU is preferably rated for 200-240V, with an L6-20P plug type to connect to the power source.

Figure 5.4 shows the cable shipped by default with the Thunder 9500V, and Table 5.2 describes the cable. The cable fits in the previously recommended PDU.

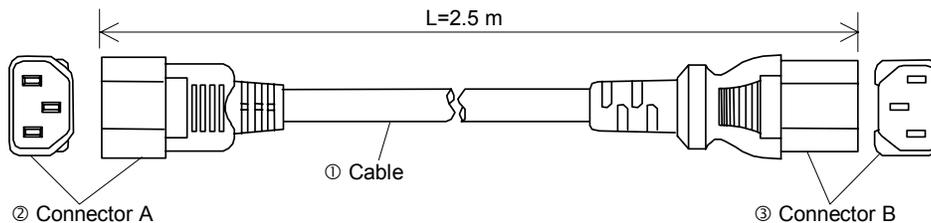


Figure 5.4 Cable

Table 5.2 Cable Description

Cable Name	Part No.	Name	Quantity	Model	Applicable Safety Standard / Rating
DF-F600-J2H Power cable	1	Cable	--	PVC code	UL and CSA
	2	Connector A	1	EN60324-C14	For 250 VAC (10 A)
	3	Connector B	1	EN60324-C13	For rack frame

Figure 5.5 shows an example of a minimum and medium 9500V installation in a rack, including PDUs and RK/RKA modules. Figure 5.6 shows an example of a fully configured 9500V installation in a rack, including PDUs and RK/RKA modules.

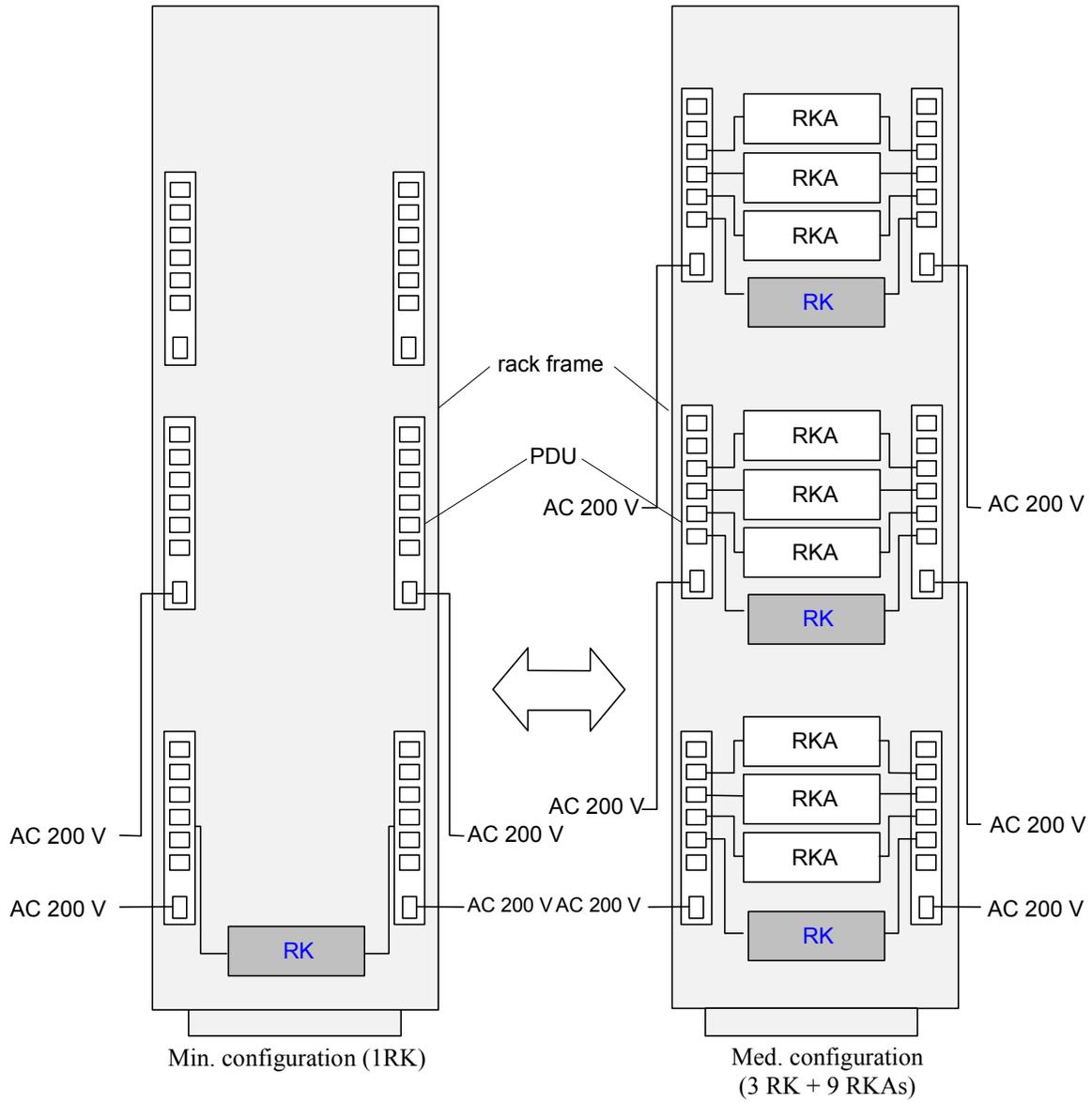


Figure 5.5 Minimum and Medium Configurations

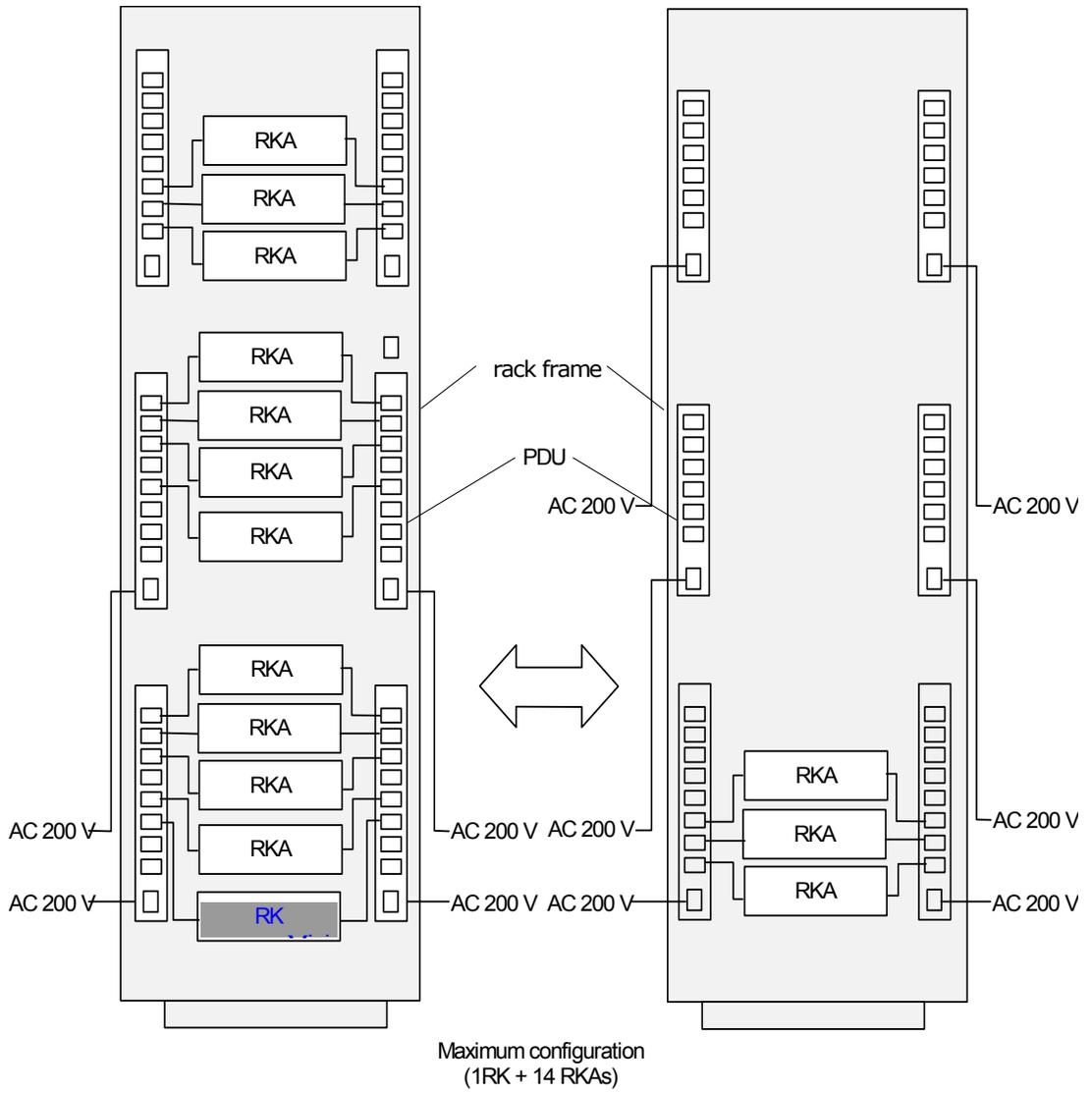


Figure 5.6 Maximum Configuration

Table 5.3 lists the PDU configuration requirements for the 9570V subsystem.

Note: For 220V use four modules per PDU or PDU pair, where a module is an RK or RKA. 110V is not an option for the Thunder 9570V in the Hitachi Data Systems 19-inch rack.

Table 5.3 PDU Configuration Requirements for the 9570V

Module	Total Amperage @ 240V	
	2 PS, amps/PS	1 PS, amps/PS
9570V RK	2.2	3.6 *
9570V RKA	1.6	2.6 *

Combinations in a Rack		Total Amperage @ 220V		Number of PDUs	
No. of RKs	No. of RKAs	2 PS, amps/PS	1 PS, amps/PS	Recommended	Minimum
1	0	2.20	3.60	2	1
1	1	3.80	6.20	2	1
1	2	5.40	8.80	2	1
1	3	7.00	11.40	2	1
1	4	8.60	14.00	2	1
1	5	10.20	16.60	4	2
1	6	11.80	19.20	4	2
1	7	13.40	21.80	4	2
1	8	15.00	24.40	4	2
1	9	16.60	27.00	4	2
1	10	18.20	29.60	4	2
1	11	19.80	32.20 *	6	3
2	1	6.00	9.80	2	1
2	2	7.60	12.40	2	1
2	3	9.20	15.00	4	2
2	4	10.80	17.60	4	2
2	5	12.40	20.20	4	2
2	6	14.00	22.80	4	2
2	7	15.60	25.40	4	2
2	8	17.20	28.00	4	2
2	9	18.80	30.60 *	6	3
2	10	20.40	33.20 *	6	3
3	0	6.60	10.80	2	1
3	1	8.20	13.40	2	1
3	2	9.80	16.00	4	2
3	3	11.40	18.60	4	2
3	4	13.00	21.20	4	2
3	5	14.60	23.80	4	2
3	6	16.20	26.40	4	2
3	7	17.80	29.00	4	2
3	8	19.40	31.60 *	6	3
3	9	21.00	34.20 *	6	3

***Caution:** Do not overload the 16-amp PDU. This can occur if you are using only one PDU, or if one of two PDUs loses its source power. Distribute the load across multiple PDUs.

5.5 Part Numbers Used for Thunder 9500V

5.5.1 Rack Configuration for the 9500V

This section will help simplify rack ordering. For the Thunder 9200, ordering and configuration are done specifically to a customer's particular order based on the different 9200 RK/RKA combinations. For the 9500V product, the goal is to streamline and ensure exact and accurate configurations.

5.5.2 Matrix Line Item Output

When a user selects the APIA/US rack, the line items shown in Table 5.4 appear in the Matrix Worksheet. Since the rack (part number 122234.P) includes some railkits, PDUs, and power cords by default, the actual configuration received by the customer includes more parts than indicated by the MATRIX line items.

Note: The 9500V product has power specifications that require very specific planning and configuration. This rack manual outlines this in detail. One rack configuration provides all equipment necessary for the 9500V.

Table 5.4 Line Items in the Matrix Worksheet

Product Code (Pcode)	Description	Quantity
122234.P This rack includes:	HDS 19-inch Rack 220V	1
122234-200.P	Rail Kits for 9500V in HDS 19	(3)
043-100082-01	PDU 110-220V (16A)	(2)
043-100083-01	Power Cord for PDU 220V L6-2	(2)
122234-200.P	Rail Kits for 9500V in HDS 19-inch	11 (14 total)
043-100082-01	PDU 110-220V (16A)	4 (6 total)
043-100083-01	Power Cord for PDU 220V L6-2	4 (6 total)
122296-1-P.P	Filler Panel 1.0U perf. for	4
122296-3-0.P	Filler Panel 3.0U For HDS 19-inch	12
MK-90DF530.P	HDS 19-inch Rack Reference G	1

5.5.3 Thunder 9500V Worksheet Configuration Screen in Matrix

Figure 5.7 shows the main Thunder 9500V Worksheet Configuration screen in Matrix. To open the Worksheet Configuration screen, select **Sales**, select **Worksheets**, and then select **Configuration** in the outline bar on the far left. Note that a rack is ordered under the **OPTIONS** section on the right of the screen.

The **19inch Rack...** button under **OPTIONS** opens the 19-inch Rack Configuration screen (see section 5.5.4).

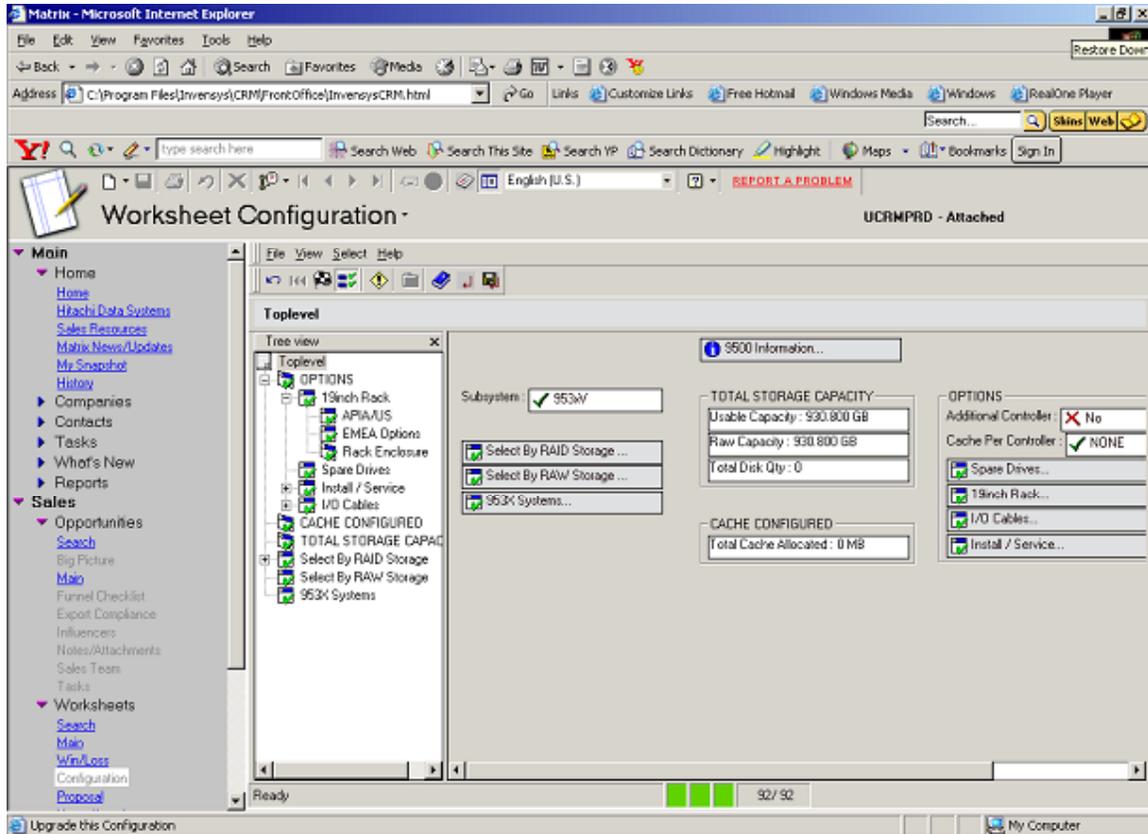


Figure 5.7 Main Thunder 9500V Worksheet Configuration Screen

5.5.4 19-inch Rack Worksheet Configuration Screen

The 19-inch Rack Worksheet Configuration screen (see Figure 5.8) is accessed by selecting the 19inch Rack... button on the main Thunder 9500V Worksheet Configuration screen.

The Rack Information... button on the 19-inch Rack Worksheet Configuration screen opens the Rack Information screen, which displays detailed information about the rack (see Figure 5.9).

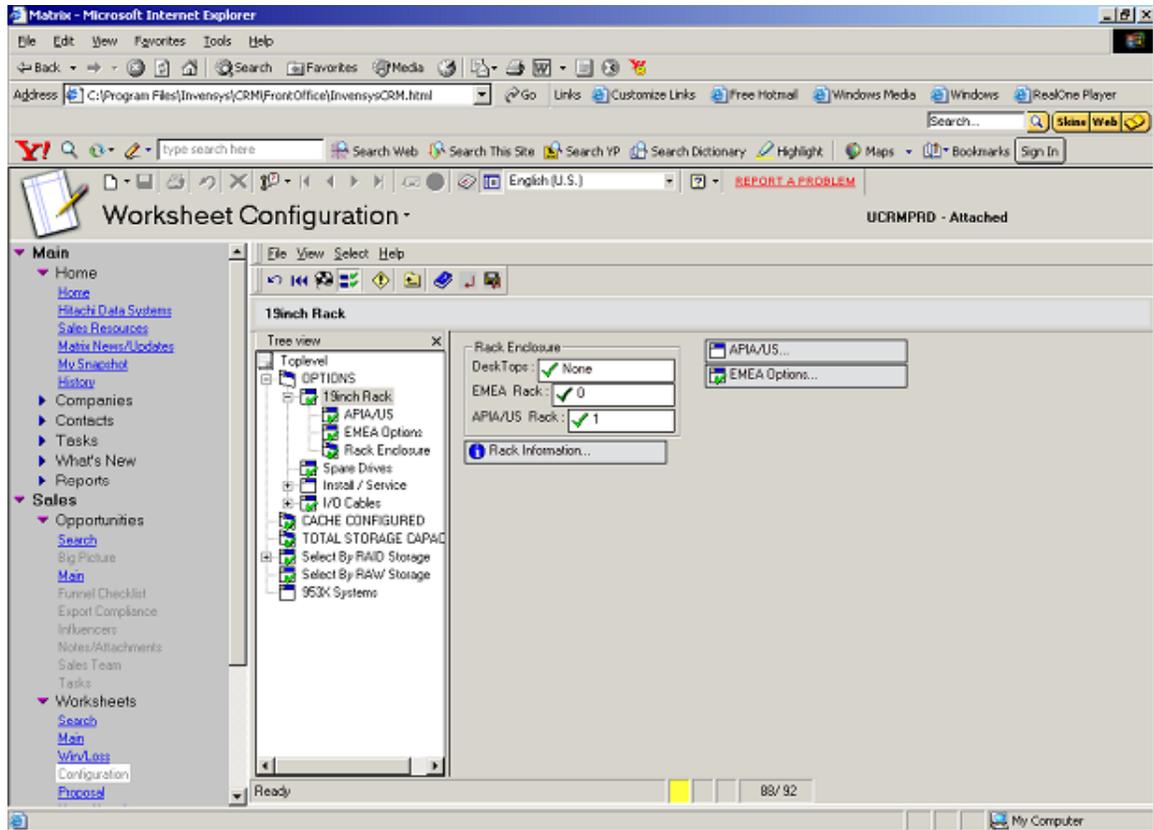


Figure 5.8 19-inch Rack Worksheet Configuration Screen

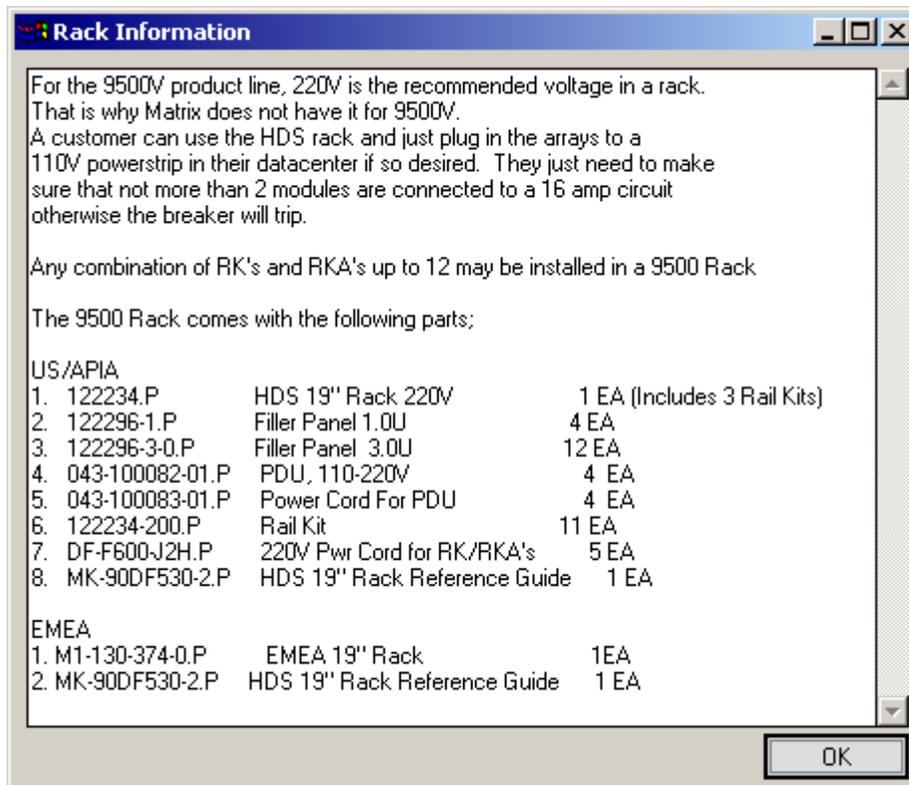


Figure 5.9 Rack Information Screen (9500V)

Chapter 6 Mounting the Thunder 9200 into the 19-inch Rack

This chapter provides configuration guidelines, illustrations, safety information, and specifications information for installing the Thunder 9200™ disk array subsystem into the 19-inch rack. Figure 6.1 shows a 19-inch rack with multiple Thunder 9200 arrays installed.



Figure 6.1 Example of a 19-inch Rack with Multiple Thunder 9200 Arrays

6.1 Configuration Guidelines

Observe the following when placing the components into the rack:

- **Weight** – Mount the heaviest equipment at the bottom of the rack and the lightest equipment at the top.
Keep the center of mass at or below the 20U line.
- When mounting more than one Thunder 9200™ subsystem in a rack, it is important to spread the RK-to-RKA ratio evenly (for example, 1:1 for all combinations, or 1:2 for all combinations, or 1:3 for all combinations, etc.). Avoid a top-heavy installation. Figure 6.2 shows an example of a balanced RK-to-RKA ratio.
- **Power** – Do not exceed the amperage of the PDUs. The PDUs are 16 amps, and the RK/RKA will use amperage differently based on the voltage selected (110V vs. 220V) and the number of Thunder 9200™ power supplies that are connected (one or two).
 - Spread the load evenly across an even number of PDUs.
 - 220V is recommended to make best use of the amperage of each PDU.
 - Do not exceed 15 amps to a single PDU.
- **Height** – The vertical mounting space is measured in EIA U increments (1U = 1.75 inches). See Table 6.1 to verify the total U height for your specific configuration.
- **Filler Panels** – See Table 6.3 to determine which filler panels are needed, and in what quantity, for your specific configuration.

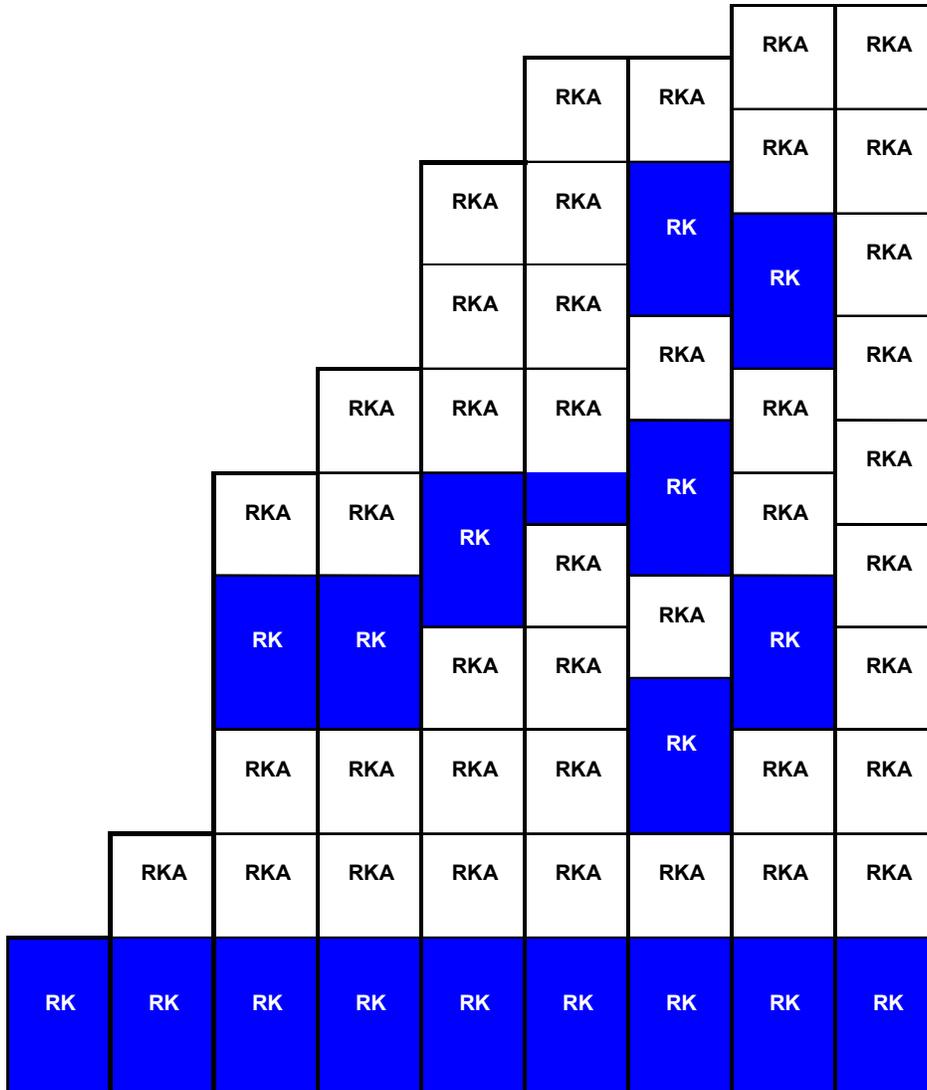


Figure 6.2 Balanced RK-to-RKA Ratio – Suggested Placement of 9200 Components

6.2 Cautions and Warnings

Prior to installing the Thunder 9200 into the rack, make sure you have read this entire rack manual. Pay careful attention to the following:

- Safety information (Chapter 1)
- Installing the Rack (Chapter 3 and Chapter 4)
- Installing Railkits and Equipment (Chapter 4)
- Configuration Rules (section 6.1 above)

The RK and RKA weigh about 40 kg and 65 kg, respectively. To reduce the risk of injury to persons or damage to equipment:

- Extend the anti-tip stabilizing bar to provide added stability during installation.
- Get help to lift and stabilize the product during installation or removal, especially when the product is not yet fastened to the rails.
- Use stable mechanical lift equipment that can handle the weight and that can lift components to the highest levels of the rack (70-80 inches).
- If using a lift, do not move it away from the rack frame nor lower the platform until the red line on the label affixed to the Thunder 9200™ has crossed the front of the railkit. Otherwise, the Thunder 9200™ may fall.
- Install equipment with at least one other person.
- Remove all pluggable power supplies and modules to reduce total product weight before lifting it.
- Observe local occupational health and safety requirements and guidelines for manual material handling.
- The handles may be used when raising the Thunder 9200™, but it is preferable to hold it by the front and rear portions made of sheet metal.
- Make sure that there are no scratches or flaws on the power cables. These defects may cause electric shock or a fire.
- A large leak current flows when more than one RK/RKA is installed. Make sure the units are connected to a properly grounded power source to prevent electric shock.

6.3 Installing the Thunder 9200™ in the Rack

Follow these steps when installing a Thunder 9200 in the rack:

1. Read and follow all safety warnings and rules throughout this manual.
2. Make sure that the rack has been stabilized as described in section 3.4 of this manual.
3. Install cage nuts for the railkits and the Thunder 9200™ (refer to Figure 4.1). For information on installing cage nuts, refer to sections 4.2 and 4.3).
4. For a 9200 installation:
 - a) With the Thunder 9200 well supported, lift it up and align its chassis with the railkits mounted on the rack. Slide the 9200 all the way into the rack.
 - b) Secure the 9200 to the rack with screws that will attach to corresponding cage nuts on the rack.
 - c) Connect any applicable cables (9200 interconnect cables, power cables, etc.) according to the 9200 installation manual that was included with the 9200 RK shipment. See section 6.4 for the required number of PDUs.
Caution: Make sure to connect the 9200 to a proper power source. Verify the PDUs installed and which power connector they have (e.g., L6-20P or NEMA 5-15P).
5. For a 9200 upgrade:
 - a) To avoid data loss, check procedures for either an online upgrade or if downtime needs to be scheduled.
 - b) Make sure all components and equipment have been secured tightly to the rack with screws and cage nuts.
 - c) Install filler panels as described in section 4.5.

See Table 6.1 for additional installation configuration information.

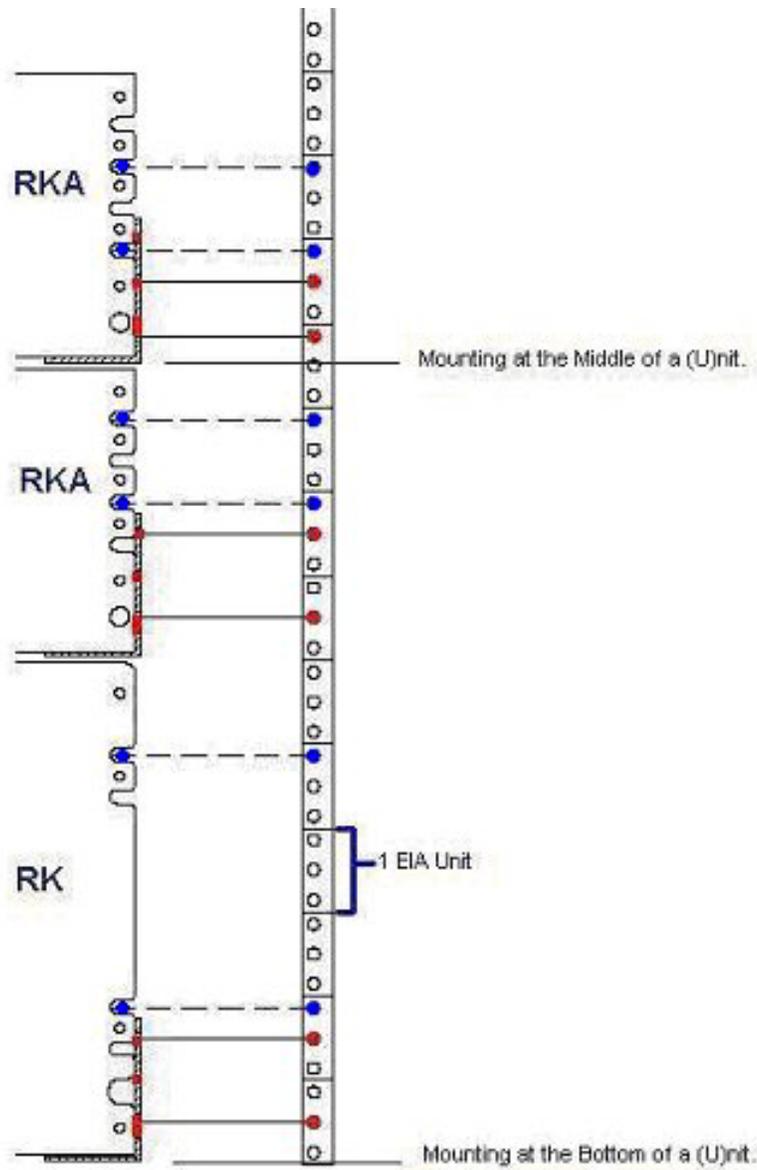


Figure 6.3 Installing the Thunder 9200™ into the Rack

Table 6.1 Example of a Thunder 9200™ Installation Configuration

Item		Rackmount Model 9200	
Configuration	Configuration	RK	RKA
	Subsystem Appearance		
Physical Specifications	Chassis size (W×D×H')	482.6 × 656 × 262 mm. 19.0 x 25.8 x 10.3 in.	482.6 × 656 × 152 mm. 19.0 x 25.8 x 5.9 in.
	Weight [note 1]	≤ 65 kg., ≤ 144 lbs.	≤ 40 kg., ≤ 88 lbs.
	Required height (EIA unit)	6	3.5
	Input voltage (V)	AC 100/200 (89 to 127/178 to 254)	
	Frequency (Hz)	50/60 ± 1	
Input power specifications	Number of phases and cabling	Single-phase with protective grounding	
	Steady-state current (A) or AMPS [note 2]	When 2 power supplies are connected: 3.5 x 2 (1.8 x 2) When 1 power supply is connected: 5.8/2.9	When 2 power supplies are connected: 2.8 × 2 (1.4x2) When 1 power supply is connected: 4.4/2.2
	Breaking current (A)	20.0	15.0
	Required power [note 3] Steady state (VA)	When 2 power supplies are connected: 700 When 1 power supply is connected: 580	When 2 power supplies are connected: 550 When 1 power supply is connected: 450
	Required power [note 3] Starting state (VA)	When 2 power supplies are connected: 800 When 1 power supply is connected: 700	When 2 power supplies are connected: 650 When 1 power supply is connected: 550
Insulation performance	Insulation withstand voltage	AC 1,500V (10 mA, 1 min.)	
	Insulation resistance	DC 500V, 10 MΩ or more	
Receptacles	(2 recommended per RK or RKA module)	EN60324-C13 (178-254 VAC) or NEMA standard 5-15R (89-127 VAC)	

Notes:

1. This is the maximum value with a maximum hardware configuration.
2. For the RK and the RKA, make sure the power supplied to the subsystem meets the specifications of a single power supply. This is required because only one power supply would be operating in the event of a power failure in a dual-source power configuration.
3. The values shown represent a maximum configuration. When planning facilities, as in using a UPS, use a power factor of 100% for calculations. The values for 100V/200V are shown. (Example: 300 W = 300 VA) The actual required power may exceed the value shown in the table when the tolerance is included.

6.4 More Information about Power

Single modules (an RK or RKA are referred to as modules in this document) have two power supplies for redundancy, which is the recommended configuration. However, the modules are designed to function on only one power supply if the other power supply loses power.

You should provide two separate power sources for the rack to maximize the power redundancy of the Thunder 9200™ subsystem.

A recommended power solution is similar to what is sold in the Hitachi Data Systems 19-inch rack:

- Six PDUs: three for the left power supplies of the Thunder 9200™ modules, and three for the right power supplies.
- Each PDU should have eight receptacles available, for a total of 48 receptacles when six PDUs are installed.
- Receptacles should be EN60324-C13 type receptacles. For receptacle amperage, see specifications and requirements table above (refer to Table 6.1).
- Each PDU should be rated for a minimum of 16 amps (usable).
- The PDU is preferably rated for 200-240V, with an L6-20P plug type to connect to the power source.

Figure 5.4 shows the cable shipped by default with the Thunder 9200, and Table 5.2 describes the cable. The cable fits in the previously recommended PDU.

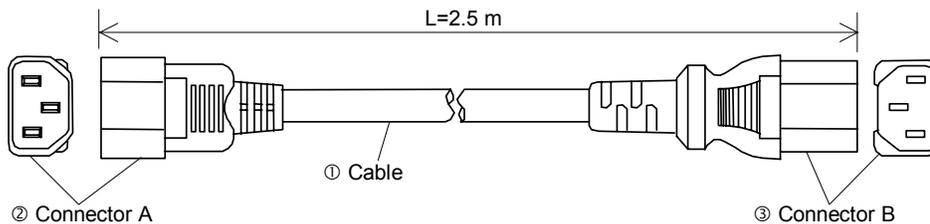


Figure 6.4 Cable

Table 6.2 Cable Description

Cable Name	Part No.	Name	Quantity	Model	Applicable Safety Standard / Rating
DF-F500-J2H Power cable	1	Cable	--	PVC code	UL and CSA For 250 VAC (10 A) For rack frame
	2	Connector A	1	EN60324-C14	
	3	Connector B	1	EN60324-C13	

Figure 5.5 shows a sample 9200 installation in a rack, including PDUs and RK/RKA modules. Table 6.3, Table 6.4, and Table 6.5 provide rack configuration information.

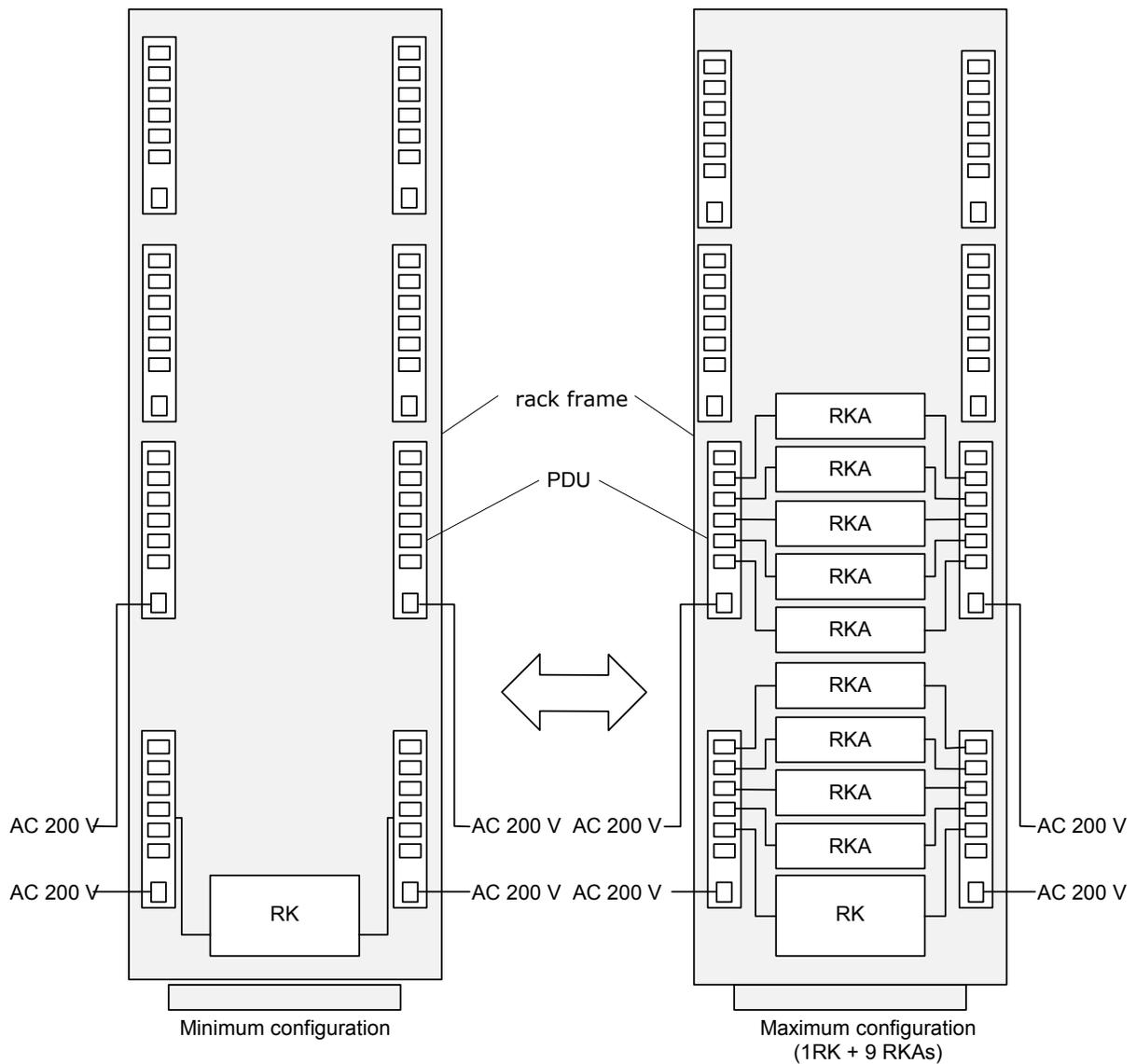


Figure 6.5 Minimum and Maximum Configurations

Table 6.3 EIA Height, Filler Panel, Weight & Rail Kit Calculations

Item	Height (U)	
	1 EIA U = 44.45 mm	
Mounting space for 9200 [note 1]	38	--
9200 RK	6	65
9200 RKA	3.5	40

Combinations in a Rack		Total EIA Height	Filler Panels Needed (in U) [note 2]				Max. Weight		Number of Railkits
No. of RKs	No. of RKAs		7	3.5	1	0.5	kg	lb	
1	0	6.0	4	1	0	1	65	143.16	1
1	1	9.5	4	0	0	1	105	231.26	2
1	2	13.0	3	1	0	1	145	319.36	3
1	3	16.5	3	0	0	1	185	407.46	4
1	4	20.0	2	1	0	1	225	495.56	5
1	5	23.5	2	0	0	1	265	583.66	6
1	6	27.0	1	1	0	1	305	671.76	7
1	7	30.5	1	0	0	1	345	759.86	8
1	8	34.0	0	1	0	1	385	847.96	9
1	9	37.5	0	0	0	1	425	936.06	10
2	0	12.0	3	1	1	1	130	286.33	2
2	1	15.5	3	0	1	1	170	374.43	3
2	2	19.0	2	1	1	1	210	462.53	4
2	3	22.5	2	0	1	1	250	550.63	5
2	4	26.0	1	1	1	1	290	638.73	6
2	5	29.5	1	0	1	1	330	726.83	7
2	6	33.0	0	1	1	1	370	814.93	8
2	7	36.5	0	0	1	1	410	903.03	9
3	0	18.0	2	1	2	1	195	429.49	3
3	1	21.5	2	0	2	1	235	517.59	4
3	2	25.0	1	1	2	1	275	605.69	5
3	3	28.5	1	0	2	1	315	693.79	6
3	4	32.0	0	1	2	1	355	781.89	7
3	5	35.5	0	0	2	1	395	869.99	8
4	0	24.0	2	0	0	0	260	572.65	4
4	1	27.5	1	1	0	0	300	660.75	5
4	2	31.0	1	0	0	0	340	748.85	6
4	3	34.5	0	1	0	0	380	836.95	7
4	4	38.0	0	0	0	0	420	925.05	8
5	0	30.0	1	0	1	0	325	715.81	5
5	1	33.5	0	1	1	0	365	803.91	6
5	2	37.0	0	0	1	0	405	892.01	7
6	0	36.0	0	0	2	0	390	858.98	6

Legend:

Yellow background indicates weight distributions which require **CAUTION**: plan installation so that the rack is not top-heavy.

Red background indicates weight distributions which can be **DANGEROUS**: plan installation very carefully to make sure that the rack is not top-heavy.

Notes:

1. The rack height is 40U. In order to remove controller 0, the bottom-most RK must be mounted up 2U.
2. In addition to the calculated filler panels above, one additional 1.0 U filler panel and one additional 0.5 U filler panel need to be included in the calculation. These two additional filler panels go at the bottom of the rack to fill up the first 1.5U of the rack. There will be a 0.5U space between these filler panels and the bottom of the first RK mounted in the rack.

Table 6.4 PDU Configuration Requirements for the 9200

Module	Total Amperage @ 240V		Total Amperage @ 110V	
	2 PS, amps/PS	1 PS, amps/PS	2 PS, amps/PS	1 PS, amps/PS
9200 RK	1.8	2.9	3.5	5.8
9200 RKA	1.4	2.2	2.8	4.4

Combinations in a Rack		Total Amperage @ 220V*		No. of PDUs		Total Amperage @ 110V*		No. of PDUs	
No. of RKs	No. of RKAs	2 PS (amps/PS)	1 PS (amps/PS)	Rec.	Min.	2 PS (amps/PS)	1 PS (amps/PS)	Rec.	Min.
1	0	1.80	2.90	2	1	3.50	5.80	2	1
1	1	3.20	5.10	2	1	6.30	10.20	2	1
1	2	4.60	7.30	2	1	9.10	14.60	2	1
1	3	6.00	9.50	2	1	11.90	19.00	4	2
1	4	7.40	11.70	2	1	14.70	23.40	4	2
1	5	8.80	13.90	2	1	17.50	27.80	4	2
1	6	10.20	16.10	4	2	20.30	32.20	6	3
1	7	11.60	18.30	4	2	23.10	36.60	6	3
1	8	13.00	20.50	4	2	25.90	41.00	6	3
1	9	14.40	22.70	4	2	28.70	45.40	8	4
2	0	3.60	5.80	2	1	7.00	11.60	2	1
2	1	5.00	8.00	2	1	9.80	16.00	4	2
2	2	6.40	10.20	2	1	12.60	20.40	4	2
2	3	7.80	12.40	2	1	15.40	24.80	4	2
2	4	9.20	14.60	2	1	18.20	29.20	4	2
2	5	10.60	16.80	4	2	21.00	33.60	6	3
2	6	12.00	19.00	4	2	23.80	38.00	6	3
2	7	13.40	21.20	4	2	26.60	42.40	6	3
2	8	14.80	23.40	4	2	29.40	46.80	8	4
3	0	5.40	8.70	2	1	10.50	17.40	4	2
3	1	6.80	10.90	2	1	13.30	21.80	4	2
3	2	8.20	13.10	2	1	16.10	26.20	4	2
3	3	9.60	15.30	4	2	18.90	30.60	6	3
3	4	11.00	17.50	4	2	21.70	35.00	6	3
3	5	12.40	19.70	4	2	24.50	39.40	6	3
3	6	13.80	21.90	4	2	27.30	43.80	6	3
4	0	7.20	11.60	2	1	14.00	23.20	4	2
4	1	8.60	13.80	2	1	16.80	27.60	4	2
4	2	10.00	16.00	4	2	19.60	32.00	6	3
4	3	11.40	18.20	4	2	22.40	36.40	6	3
4	4	12.80	20.40	4	2	25.20	40.80	6	3
5	0	9.00	14.50	2	1	17.50	29.00	4	2
5	1	10.40	16.70	4	2	20.30	33.40	6	3
5	2	11.80	18.90	4	2	23.10	37.80	6	3
6	0	10.80	17.40	4	2	21.00	34.80	6	3
6	1	12.20	19.60	4	2	23.80	39.20	6	3

***Note:** For 220V use five (5) modules per PDU or PDU pair. For 110V use three (3) modules per PDU or PDU pair.

Yellow background indicates **CAUTION:** be careful not to overload the 16-amp PDU.

Red background indicates **DANGER:** be very careful not to overload the 16-amp PDU.

This can occur if you are using only one PDU, or if one of two PDUs loses its source power. Distribute the load across multiple PDUs. The PDU is the same for 220V and 110V; the power cord used to connect to the power source is what is different.

Table 6.5 BTU Calculations

Module	Power (VA)	
	2 PS	1 PS
9200 RK	700	580
9200 RKA	550	450

Combinations in a Rack		Power (BTU/hr)	
No. of RKs	No. of RKAs	2 PS	1 PS
1	0	2389.90	1980.12
1	1	4267.50	3516.42
1	2	6145.20	5052.72
1	3	8022.90	6589.02
1	4	9900.60	8125.32
1	5	11778.30	9661.62
1	6	13656.00	11197.92
1	7	15533.70	12734.22
1	8	17411.40	14270.52
1	9	19289.10	15806.82
2	0	4779.60	3960.24
2	1	6657.30	5495.54
2	2	8535.00	7032.84
2	3	10412.70	8569.14
2	4	12290.40	10105.44
2	5	14168.10	11641.74
2	6	16045.80	13178.04
2	7	17923.50	14714.34
2	8	19801.20	16250.64
3	0	7169.40	5940.36
3	1	9047.10	7476.66
3	2	10924.80	9012.96
3	3	12802.50	10549.26
3	4	14680.20	12085.56
3	5	16557.90	13621.86
3	6	18435.60	15158.16
4	0	9559.20	7920.48
4	1	11436.90	9456.78
4	2	13314.60	10993.08
4	3	15192.30	12529.38
4	4	17070.00	14065.68
5	0	11949.00	9900.60
5	1	13826.70	11436.90
5	2	15704.40	12973.20
6	0	14338.80	11880.72
6	1	16216.50	13417.02

VA = Volt-Ampere. 1 VA = 1 W
W = Watt. 1 W = 1 VA
BTU = British thermal unit. 1 BTU/hr = 3.414 W (BTU/hr = Watts × 3.414)

6.5 Part Numbers Used for Thunder 9200™

Table 6.6 lists part numbers for the Thunder 9200™ rack components.

Table 6.6 Part Numbers for the Thunder 9200™ Rack Components

Part Number	Description	Comments
Racks		
122234-110	HDS 19-inch rack, 110 volt	Includes 3 pairs of railkits, 110V fan, and two 110V PDUs with their 110V power cords
122234	HDS 19-inch rack, 220 volt	Includes 3 pairs of railkits, 220V fan, and two 220V PDUs with their 220V power cords
Filler panels	Used for filling up empty space that remains in the front after mounting hardware in a rack.	
122296-05	Filler panel, 0.5U for HDS 19-inch rack	
122296-1	Filler panel, 1.0U for HDS 19-inch rack	
122296-3	Filler panel, 3.5U for HDS 19-inch rack	
122296-7	Filler panel, 7.0U for HDS 19-inch rack	
PDU and PDU power cords		
043-100082-01	PDU, 110-220V, (16A)	Can be used for 110V or 220V
043-100085-01	Power cord for PDU, 110V, 5-15P plug	ALWAYS order a power cord when separately ordering a PDU. This connects the PDU to the power source.
043-100083-01	Power cord for PDU, 220V, L6-20P plug	ALWAYS order a power cord when separately ordering a PDU. This connects the PDU to the power source.
Rail Kits (a.k.a. Chassis Supports)		
122234-200	Rail kit for Thunder 9200™ in HDS 19-inch rack	ALWAYS order when mounting a 9200 in an HDS 19-inch rack. Note: Includes left and right mounting brackets and necessary mounting hardware (cage nuts, screws, washers, cage-nut tool).
122411	Universal rail kit for Thunder 9200™ in non-HDS 19-inch racks	ALWAYS order when mounting a 9200 in non-HDS 19-inch rack. Note: Includes left and right mounting brackets and necessary mounting hardware (cage nuts, screws, washers, cage-nut tool).
Fans		
122234-300	Fan assembly, 110 volt, for use in HDS 19-inch rack	If a customer wants only 110V, a 220V rack can be modified by substituting its fan with this one and ordering a 110V-power cord.
122234-400	Fan assembly, 220 volt, for use in HDS 19-inch rack	If a customer wants only 220V, a 110V rack can be modified by substituting its fan with this one and ordering a 220V-power cord.

Chapter 7 Troubleshooting

If you need technical assistance, please contact your Hitachi Data Systems representative, or call the appropriate Hitachi Data Systems Support Center for assistance.

7.1 Calling the Support Center

If you need to call the Hitachi Data Systems Support Center, make sure to provide as much information about the problem as possible, including the circumstances surrounding the error or failure and the exact content of any error messages displayed on the host system(s).

The worldwide Hitachi Data Systems Support Centers are:

- Hitachi Data Systems North America/Latin America
San Diego, California, USA
1-800-348-4357
- Hitachi Data Systems Europe
Contact Hitachi Data Systems Local Support
- Hitachi Data Systems Asia Pacific
North Ryde, Australia
011-61-2-9325-3300

Acronyms and Abbreviations

A	amperes
AC	alternating current
APIA	Asia Pacific, International Americas
BTU	British thermal unit
CE	Consumer Electronics
cfm	cubic feet per minute
CSA	Canadian Standards Association
D	depth
dba	decibels (A-scale)
DC	direct current
EIA	Electronic Industry Association
EMEA	Europe, Middle East, Africa
H	height
HDS	Hitachi Data Systems
Hz	Hertz
IEC	International Electrotechnical Commission
in	inches
kg	kilograms
lb(s)	pounds (weight)
mA	milliamperes
mm	millimeters
MΩ	megaohms
NEMA	National Electrical Manufacturers Association
PDU	power distribution unit
PS	power supply
RK	rack
RKA	rack additional
U	standard EIA unit of measure in racks (one unit = 44.45 mm, 1.75 in)
UL	Underwriters Laboratories Incorporated
UPS	uninterruptible power supply
US	United States
V	volts
VA	volt-amperes
VAC	volts AC
W	width, watts

