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Compaq Rack 9000 and 10000 Series Installation and Best Practices

Abstract: This document discusses recommended practices when installing, transporting, and establishing a work environment for the Compaq Rack 9000 and Rack 10000.

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Compaq Rack 9000 and 10000 Series Installation and Best Practices
White paper prepared by Industry Standard Server Division
December 2001

Application

Compaq Rack 9000



Figure 1: 9000 Series Racks

Compaq sets the standard for performance and value in the Enterprise environment with the Compaq Rack 9000 Series of racks and rack options. This enterprise-class rack combines next-generation structural integrity, ease of use, and superior ventilation to deliver industry-leading performance. Compaq 9000 Series racks provide customers with the power to sensibly maximize space utility while protecting and simplifying network management.

Ideal for on-site or pre-configured assembly of rack-mounted Compaq *ProLiant*[™] and *AlphaServer*[™] servers, rack-mounted workstations, and server storage products, the Compaq Rack 9000 Series complements and protects your investment in technology. The Compaq Rack 9000 Series is available in four sizes—42U, 36U, and 22U racks are 600-mm wide; and the 9842 rack is 800-mm wide. The new Compaq Rack 9000 Series is designed to ensure outstanding performance and seamless integration to support all of your business needs.

All Compaq rack-mountable and floor-standing or “tower” products are designed to fit the industry-standard 19-inch (482.6-mm) wide Electronic Industry Association (EIA) rails. Tower-to-rack conversion kits are available to support tower units in the Rack 9000 Series.

Note: The 9842 rack is only available on a wooden pallet and has not been qualified for pre-configured rack shipment at this time.

Compaq Rack 10000



Figure 2: 10000 Series Racks

Compaq is introducing a new rack line with a similar industry award-winning design as the 9000 Series rack, but also incorporating many new features and enhancements in addition to a darker color. The 10000 series rack is 1 meter deep allowing more room for cable management and for accommodating deeper server and storage equipment. For additional cable management, large cable egresses have been cut into the roof of the rack, the removable access panel on the split rear door allows for cabling out the back and Velcro straps allow for clean bundling of cables. This new rack has a dynamic loading capacity up to 2000lbs. in the 10642. This means that when using a shock pallet, customers can ship up to 2000 lbs. of equipment installed in the rack.

Model	U Height	Width	Depth	Dynamic Load	Static Load	Shipping Options	Color
9122	22U	600mm / 23.62 in	900mm / 35.43 in	450 lbs / 204.12 kg	1800 lbs. / 816.47 kg	pallet (-B21) shock pallet (-B22) crate (-B23)	opal
9136	36U	600mm / 23.62 in	900mm / 35.43 in	1400 lbs / 635.03 kg	1800 lbs. / 816.47 kg	pallet (-B21) shock pallet (-B22) crate (-B23)	opal
9142	42U	600mm / 23.62 in	900mm / 35.43 in	1450 lbs / 657.71 kg	1800 lbs. / 816.47 kg	pallet (-B21) shock pallet (-B22) crate (-B23)	opal
9842	42U	800mm / 31.49 in	900mm / 35.43 in	CAN NOT SHIP WITH EQUIPMENT INSTALLED	1100 lbs. / 498.95 kg	pallet (-B21)	opal
10622	22U	600mm / 23.62 in	1000mm / 39.37 in	1045 lbs / 474.00 kg	1045 lbs / 474.00 kg	pallet (-B21) shock pallet (-B22) crate (-B23)	graphite metallic
10642	42U	600mm / 23.62 in	1000mm / 39.37 in	2000 lbs / 907.18 kg	2000 lbs / 907.18 kg	pallet (-B21) shock pallet (-B22) crate (-B23)	graphite metallic

Table 1: Rack 9000 and 10000 models

Rack Options

Compaq delivers innovative racks that make it easy to centralize, protect, organize, and access your hardware for servicing and upgrading. The racks are flexible, secure, and designed to industry standards.

For a complete list of Compaq rack options and accessories, refer to the main rack page at www.compaq.com/racks or to the main rack options page at www.compaq.com/rackoptions

For a list of products and services for Compaq servers, refer to www.compaq.com/servers

For a list of Compaq power products such as UPS and PDU, refer to www.compaq.com/ups

To ensure a safe and compliant and reduce the risk of damaging the equipment or voiding the warranty, the final integrator is responsible for installing all equipment in accordance with Compaq installation instructions and configuration guidelines. Failure to do so could produce a that may not meet with regulatory compliance requirements and/or may violate the 's environmental specifications. If you need a solution that is fully certified by a third party such as Underwriter's Laboratories, then contact Compaq Customs & Solutions at www.compaq.com/solutions/customs/

To facilitate compliance with industry standards, government regulations, and product specifications, Compaq offers the following rack and cabinet options for setup:

- Stabilizer kits
- Fan kits
- Extension kits (9136 and 9142 only)
- Top cable egress kits (9000 series only)
- Antistatic wrist strap kits
- Cable management kits
- Short rear doors (9000 series only)

Stabilizer Kits

Stabilizer kits are used with cabinets to keep them mechanically stable (front-to-back) when heavy, slide-mounted equipment is pulled out to its service position. Compaq offers these different stabilizers for different applications:

- Leveling feet (ship standard on the rack)
- Fixed stabilizer (600 mm and 800 mm)
- Deployable stabilizer
- Ballast

Note: The deployable stabilizer is required for any Alpha product and is only available through Compaq Customs & Solutions at

www.compaq.com/solutions/customs/

The equipment integrator will need to determine which ballast and stabilizer kits to use. If the cabinet is bolted to the floor or to adjacent cabinets with sufficient combined weight, a stabilizer kit may not be required.

For a discussion on each stabilizer kit, refer to the “Stability” section.

Fan Kits

Compaq products are designed to provide airflow from the front of the rack to the rear. Compaq recommends that rack components only be installed on the front rails for many reasons including proper airflow. Fan kits may help meet additional thermal requirements of rack-mounted equipment and are used to keep the ambient temperature inside the cabinet within the specified operational limits of the equipment. Units that are exposed to excessive heat may not operate correctly and may experience abnormally high failure rates. Roof-mounted fan kits are supported in all 9000 and 10000 racks.

Extension Kits (9136 and 9142 only)

Extension kits are used when additional room is required at the rear of the rack to satisfactorily house the computer equipment and associated cables. Cables and equipment can be damaged in use or in shipping if there is insufficient room in the cabinet.

The Rack 9000 Series extension kit, mounted at the rear of the rack, provides roughly 3.5 inches (88.9 mm) of additional space. Extension kits are only available for the 600-mm racks at this time.

A list of available extension kits can be found at the main rack options product page at www.compaq.com/rackoptions

Top Cable Egress Kits (9000 series only)

Top cable egress kits allow cables to be routed through the top of a cabinet yet prevent foreign objects from falling through the hole and damaging equipment below. Whether or not these kits are required is dependent upon how the cabinet will be qualified and used.

Antistatic Wrist Strap Kits

Using the antistatic wrist strap keeps electrostatic discharge (ESD) from damaging equipment that is temporarily exposed when covers are removed for servicing. While not usually required to meet safety and regulatory standards, use of an antistatic wrist strap is standard operating procedure in the industry and will minimize component damage due to handling.

Cable Management Kits

Cable management kits provide an easy way to organize and route cables within Compaq racks. One cable management kit, the Cable Management D Ring Kit, consists of 10 D-shaped rings that are mounted at the back of the rack to allow for organization and management of cabling.

Short Rear Doors (9000 series only)

The short rear doors can be used to replace the full-size doors that are shipped with the 9000 Series rack. These doors provide about 7 inches (177.8 mm) of space at the bottom of the rack to allow cabling to be routed out of the rack while still maintaining the security of a locking door.

Rack Builder Online

Compaq Rack Builder Online provides users with a powerful Web-based tool for configuring one or more racks with Compaq components. Using either the simple "Help Me Build It" guided interface or a "Build It Myself" mode for advanced users, you can create rack configurations using a complete and current database that includes all Compaq rack-mountable products.

The two user modes provide flexibility and ease of use. The "Help Me Build It" mode interview process enables novice users to quickly begin creating rack configurations with questions that guide the user in selection of racks and components. The application calculates the selection of power products and adds accessories necessary for a functional configuration. In the "Build It Myself" mode, users with rack configuration experience have unlimited flexibility in building configurations with new and legacy Compaq components. If components are not available in the central product database, they can be user-defined, saved, and added to configurations using the "User-Defined Devices" function.

Users can easily drag-and-drop components from one rack to another to quickly customize a configuration. Validation messages provide detailed information specific to each combination of components, suggest missing pieces, and provide general information about the configuration.

Rack Builder Online also produces useful reports, such as a graphic representation of the rack layout and a detailed report on the specific part numbers, quantities of racks, and power management products required. These reports can be used to facilitate a speedy and efficient implementation of new installations.

Key features include:

- Centralized Web repository for saving configurations
- Instant access via the World Wide Web
- Online help for the application and product database
- Ability to edit, print, and save rack configurations on either your local drive or the Compaq server
- Graphic display of configurations with drag-and-drop functionality
- Improved power sizing algorithms
- Direct access to current product data as products are announced
- Complete database of new and legacy Compaq products
- Ability to create, save, and configure third-party rack components
- Two user modes: "Help Me Build It" and "Build It Myself"

Rack Builder Online can be accessed at
www.compaq.com/rackbuilder

Precautions

To reduce the risk of electric shock or damage to the equipment when installing, maintaining, or servicing Enterprise products, observe the following precautions.

Installation and Maintenance

Some Enterprise products are capable of producing hazardous voltages and hazardous energy levels. The installation of internal options and routine maintenance and service of these products should be performed only by individuals who are knowledgeable with the procedures, precautions, and hazards associated with this type of equipment. Refer to the documentation included with each product to determine whether it belongs in this category.

Unless the equipment is installed in a restricted area, this equipment should be operated only with all enclosures in place and properly secured. Always refer to the equipment installation guide and observe all applicable warnings and precautions.

Products with Casters

Products provided with casters should be moved with care. Sudden stops, excessive force, and uneven surfaces may cause the product to overturn.

WARNING: To reduce the risk of personal injury or damage to the equipment, do not attempt to move large equipment racks by yourself. Obtain adequate assistance to stabilize the rack during movement or hire professional equipment riggers.

CAUTION: To reduce the risk of damage to the casters, make sure that the full weight of the rack rests on the leveling feet, and not on the casters. The casters are designed **only** as an aid in moving the rack into position. They are not designed to support the weight of the rack, and the casters may become damaged if relied on to support the rack.

Hot-Pluggable Power Supplies

Observe the following guidelines when connecting and disconnecting power to the power supplies:

- Unplug the power cord before removing the power supply from the server.
- Install the power supply before connecting the power cord to the power supply.
- Do not overload the AC supply branch circuit that provides power to the rack. The total rack load should not exceed 80 percent of the branch circuit rating.

Rack-Mountable Products

Because the rack allows you to stack computer components vertically, you must take precautions to provide for rack stability and safety.

- Use the configuration you prepared with the Rack Builder Online utility as a guideline for installing the components.
- For safety and rack stability, load the heavier components first, and load the rack from the bottom up. When coupling racks, be sure to balance the weight load between the racks, placing the heaviest components at the bottom. For example, if you have several UPS units and several servers, do not put all of the UPS units into one rack—distribute them evenly in the bottom positions of each rack.
- Before working on the rack or extending a component on rails, be sure that the leveling feet (jacks) extend to the floor, the full weight of the rack rests on the feet, and the rack is level and stable. Also, install stabilizing brackets or extend deployable stabilizers on a single rack or bay multiple racks together before starting work.
- Extend only one component at a time. The rack may become unstable if more than one component is extended. If there is a deployable stabilizer installed, extend this part prior to sliding any component forward for access. When work is complete, replace the deployable stabilizer.
- Allow a minimum clearance of 30 inches (762 mm) between the wall and the rear of the rack to provide adequate access for installation and service.
- Use caution when pressing the component rail release latches and sliding a component into the rack. The slide rails can pinch your fingers.
- If the rack is to be shipped, shipping hardware must be installed if provided.

Component Placement and Assembly Guidelines

Apply the following rules when physically placing components in the Compaq Rack 9000 and 10000 :

- **Weight**—Sort all components by weight, placing the heaviest components at the bottom of the rack.
- **Keyboard/Video/Mouse (KVM) Switch Box**—Mount the switch box either behind the keyboard or within a side wall cavity to provide a zero-U space solution.
- **Keyboard/Integrated Keyboard Monitor**—When using a any size rack, install the keyboard/integrated keyboard monitor at a level that is in the correct ergonomic position where your shoulders and neck are relaxed.
- **Monitor** – Ergonomic considerations should drive the placement of a monitor in the rack, whether it is a CRT or Flat-panel design. It is recommended to arrange the screen a minimum of 4U's above the keyboard tray. Most customers prefer placement of the video system high in the rack, especially in a full rack, to allow easier access to serviceability of other system components below it. If you are using a 22U rack, place the monitor on top of the rack frame.

If you are using an optional rack-mountable flat panel monitor, select a position to accommodate the desired viewing height (a minimum of 4Us above the keyboard tray).

- **Balance**—When connecting racks, be sure to balance the weight load between the racks, placing the heaviest components at the bottom. For example, if you have several UPS units and several servers, do not put all of the UPS units into one rack—distribute them evenly in the bottom positions of each rack.
- **Rack and Components**—Provide adequate ventilation space for the front and back doors to allow ambient room air to enter the rack and to allow warm air to escape the rack.

For further information regarding component placement, refer to the *Important Safety Instructions* that are shipped with the rack and the *Safety and Comfort Guide - Precautions for Server and Network Products* located at www.compaq.com/ (search for safety and comfort guide)

Stability

Rack stability is of special concern when equipment is routinely installed, removed, or accessed within the rack. Stability is addressed through the use of leveling feet, fixed stabilizers, and deployable stabilizers or ballast.

Leveling Feet (Jacks)

Leveling feet are adjustable stabilizers that secure the cabinet at the installation site. The required leveling pads are shipped in the hardware kit.

Fixed Stabilizer

This anti-tip stabilizer provides stability and support when equipment is installed, removed, or accessed within the rack. Compaq recommends that you use a stabilizer option kit, available in both a 600 and an 800 version, with a stand-alone rack.

Deployable Stabilizer (9000 Series Only)

A retractable anti-tip stabilizer provides stability and support when equipment is installed, removed, or accessed within the rack.

Note: The deployable stabilizer is required for any Alpha product and is only available through Compaq Customs & Solutions at

www.compaq.com/solutions/customsystems/

Ballast Kits

Ballast kits can be added to cabinets to increase side-to-side and/or front-to-back mechanical stability.

Lightly loaded 9000 series cabinets may require ballast to keep them from tipping over when a force is applied to the side of the cabinet. Heavily loaded systems, depending on the particular configuration involved, usually do not require ballast.

To ensure rack stability, the minimum weight of the installed equipment should be 210 pounds (95 kg). Ballast kits should be added in the event a system has less than 210 pounds minimum weight.

For example, if you have only 50 pounds (23 kg) of equipment, you would add two ballast kits. Each kit contains two 40-pound (18 kg) ballast. Two ballast kits (a total of four ballast) equal 160 pounds (72 kg), bringing the total up to 210 pounds.

In addition, if any single piece of equipment weighs more than 100 pounds (46 kg), there must be at least 200 pounds (91 kg) of additional equipment installed to maintain stability when the piece of equipment is extended on its rails. Ballast kits should be added in the event the additional equipment is less than 200 pounds.

10000 series cabinets usually do not require ballast, however, it may be added if additional stability is desired.

WARNING: To reduce the risk of personal injury or damage to the equipment, extend only one component at a time. The rack may become unstable if more than one component is extended.

Facilities

To ensure proper operation of all components, Compaq recommends you consider the following installation guidelines:

- Thermal consideration
- Temperature and humidity (etc.)
- Other considerations: Fire sprinkler heads require 18” of clearance.

Thermal Considerations

Slots and openings in the product are provided for ventilation and should never be blocked or covered, since these ensure reliable operation of the product and protect it from overheating. The product should not be placed in a built-up enclosure unless the enclosure has been specifically designed to accommodate the product, proper ventilation is provided for the product, and the manufacturer’s instructions have been followed.

Any open “U” spaces in the front of a rack must have blanking panels installed to support the front-to-back airflow design needs.

Leave a minimum clearance of 25 inches (635 mm) in the front of the rack, 30 inches (762 mm) in the rear of the rack, and 48 inches (1219 mm) from the back of the rack to the rear of another rack or row of racks.

If multiple rows of rack mounted equipment are installed, the facility may take advantage of the front-to-back airflow by arranging racks front-to-front and back-to-back. Conditioned air registers may then be oriented along the “front” aisles and the return air registers in the “back” aisles. Such an arrangement will utilize the aisle space as air plenums and will increase the efficiency of the air conditioning .

Temperature and Humidity

Adhere to the following temperature and humidity guidelines.

Table 1. Temperature and Humidity

	Operating	Nonoperating
Temperature	50 to 90° F (10 to 35° C)	-22 to 140° F (-30 to 60° C)
Humidity	20 to 80% noncondensing	5 to 90% noncondensing

Note: The maximum operating temperature should be decreased by 0.5°C for each 300-meter increase in altitude, up to 3,000 meters. Most hardware is rated to 35°C. Refer to Compaq Quick Specs for specific unit information at http://cssweb2.zko.dec.com/configurationguide/Customs_Configuration_Guide.htm

Floor Loading

All buildings and raised computer room floors are engineered to provide a specific floor loading. When configuring a , ensure that the floor loading specifications are followed. Failure to do so may result in physical injury or damage to the equipment and the facility.

Model	U Height	Width	Depth	Dynamic Load	Static Load
9122	22U	600mm / 23.62 in	900mm / 35.43 in	450 lbs / 204.12 kg	1800 lbs. / 816.47 kg

9136	36U	600mm / 23.62 in	900mm / 35.43 in	1400 lbs / 635.03 kg	1800 lbs. / 816.47 kg
9142	42U	600mm / 23.62 in	900mm / 35.43 in	1450 lbs / 657.71 kg	1800 lbs. / 816.47 kg
9842	42U	800mm / 31.49 in	900mm / 35.43 in	CAN NOT SHIP WITH EQUIPMENT INSTALLED	1100 lbs. / 498.95 kg
10622	22U	600mm / 23.62 in	1000mm / 39.37 in	1045 lbs / 474.00 kg	1045 lbs / 474.00 kg
10642	42U	600mm / 23.62 in	1000mm / 39.37 in	2000 lbs / 907.18 kg	2000 lbs / 907.18 kg

Power

The rack should be connected to a dedicated (unshared) branch circuit that is suitably rated for the continuous load of the . The total rack power load should not exceed 80 percent of the branch circuit rating.

Redundant

s devices having redundant power supplies allow the user to provide a backup power supply in either the dual or N+1 designs. In both cases, the load is balanced across all available supplies. In the dual design, each power supply can handle the demand. In an N+1 design, there are typically three power supplies for a requiring at least two to handle full load. If one fails, the other two remain on line with enough capacity to meet needs. It is important that the wiring and branch circuitry to each supply be rated to the maximum current draw for the power supply. Routing the power through separate PDUs, circuits, panels, and even different phases of the three-phase may provide additional redundancy.

Nonredundant

For nonredundant s, all components should have all AC power cords plugged into the same power distribution device (PDU or UPS). The device should be suitably rated for the connected load. If the total load exceeds the rating of the selected device, obtain a suitably rated device, or add a second device and divide the load equally between the power distribution devices.

High Line Voltage Versus Low Line Voltage

While the best setup for your data center application will be driven by your particular facility requirements, Compaq recommends that you install your rack-optimized equipment for operating at High Line voltage (200-240V AC).

All Compaq products that are optimized for rack mounting have wide range power supply inputs designed to operate at a voltage range of 100-240V. Here are a few of the benefits that support High Line operation of your installation:

- Smaller wiring conductors and connectors for the same power level requires half the current.
- Greater capacity in a single cabinet. For the same size circuit, almost twice the power can be delivered to a rack at high line versus low line. Example: A 115V 30A branch circuit can deliver 3450VA to a rack, while a 230V 30A branch can deliver 6900 VA to a rack.

- Some products require 200-240V input power to operate at their full rated capacity.
- Power supplies run cooler at higher input voltages and therefore will last longer and improve overall availability.

Grounding and Earth Leakage Current

For proper operation and safety, the equipment must be properly grounded. In the United States, install the equipment in accordance with NFPA 70-1999 (National Electric Code) Article 250 as well as any local and regional building codes. In Canada, install the equipment in accordance with Canadian Standards Association, CSA C22.1, Canadian Electrical Code. In all other countries, install the equipment according to any regional or national electrical wiring codes such as the International Electrotechnical Commission (IEC) 364 parts 1 through 7. Furthermore, ensure that all power distribution devices used in the installation—such as branch wiring and receptacles—are Listed or Certified grounding-type devices.

Because of the high ground-leakage currents associated with multiple servers connected to the same power source, a reliable grounded (earthed) connection is essential before applying power to the . Compaq recommends the use of a power distribution unit (PDU) that is either permanently wired to the building's branch circuit or is provided with a nondetachable cord that is wired to an industrial style plug. NEMA locking-style plugs or those complying with IEC 60309 are considered suitable for this purpose. Compaq does not recommend using common power outlet strips for this equipment.

Observe the following limits when connecting the product to AC power distribution devices:

- For UPS products and PDUs that have permanently attached AC power cords or are directly wired to the building power, the total combined leakage current should not exceed 5 percent of the total rated input current for the .
- For UPS products and PDUs that have detachable AC power cords, the total combined leakage current should not exceed 3.5 mA.

Qualified Shipping

The 42U, 36U, and 22U racks can be shipped in three configurations.

Standard Pallet (-B21)

The -B21 rack 9000 and 10000 ships on a standard wooden pallet with plastic shrink-wrap around the rack. This rack is ordered with the understanding that the component installation will occur on the customer site. This pallet and rack configuration does not support any component shipping configuration.

NOTE: All wood components of these pallets have been properly treated to comply with the pest-free certifications required by foreign countries

Shock Pallet (-B22)

The -B22 version of the 9000 or 10000 series rack ships on a shock pallet. The shock pallet is designed to allow the rack to be shipped f loaded and configured with equipment installed in the rack. The shock pallet ensures that the rack is capable of handling the weight of installed equipment during shipment without damaging the rack or the precision components within. The packing and unpacking procedures each take less than one-half hour and require at least two people to complete.

The shock pallet is required when shipping any 9000 or 10000 series rack loaded with equipment. For your convenience, these racks can be ordered with the shock pallet and all required packaging materials. Note: the 9000 and 10000 series racks use different shock pallets.

To move your data center or relocate pre-configured racks, a spares kit is available to support your efforts. Contact your local Compaq reseller for information on spares kits.

The rack 9842 has not been qualified at this time.

NOTE: All wood components of these pallets have been properly treated to comply with the pest-free certifications required by foreign countries

Crated Pallet (-B23)

When the -B23 version of the rack 9000 and 10000 is ordered, it ships enclosed in a wooden crate. This configuration provides more protection for the empty rack for use in air-freight and other rugged transportation modes.

The 9842 is not available in a crated pack at this time.

Configured Rack Shipments

This section describes the procedures and materials required to enable shipments of configured Compaq 9000 and 10000 Series racks.

Model	U Height	Width	Depth	Shipping Options
9122	22U	600mm / 23.62 in	900mm / 35.43 in	pallet (-B21) shock pallet (-B22) crate (-B23)
9136	36U	600mm / 23.62 in	900mm / 35.43 in	pallet (-B21) shock pallet (-B22) crate (-B23)
9142	42U	600mm / 23.62 in	900mm / 35.43 in	pallet (-B21) shock pallet (-B22) crate (-B23)
10622	22U	600mm / 23.62 in	1000mm / 39.37 in	pallet (-B21) shock pallet (-B22) crate (-B23)
10642	42U	600mm / 23.62 in	1000mm / 39.37 in	pallet (-B21) shock pallet (-B22) crate (-B23)

*NOTE: The rack 9842 CAN NOT ship with equipment installed.

Qualification of Rack Components

A *component* is a term used in this document to mean a physical device intended to be mounted in the rack. Examples of components include, but are not limited to:

- Slide- or rail-mounted s such as server or storage units
- Shelved devices such as keyboards and displays
- Side-mounted “zero-U” Power Distribution Units (PDUs)
- Fan kits that mount to the rack roof

Components must be qualified prior to consideration for common carrier shipment methods. Prior to successful qualification, components should be shipped in their individual shipping containers, or they may be shipped in the rack, provided that the rack and the shock pallet are shipped by way of a dedicated carrier. For current information on shipping configurations, contact your representative or Compaq reseller.

For further information, see the section “Modes of Shipment.”

Packaging Materials

This section discusses the best practices for shipping qualified components in a rack 9000 and 10000 on a shock pallet.

Standard

- Refer to the Bill of Materials for shipment of the various racks, sorted by rack height.
- Figure 2 shows the normal packaging material that is shipped with the empty rack as it arrives at the customer configuration site.

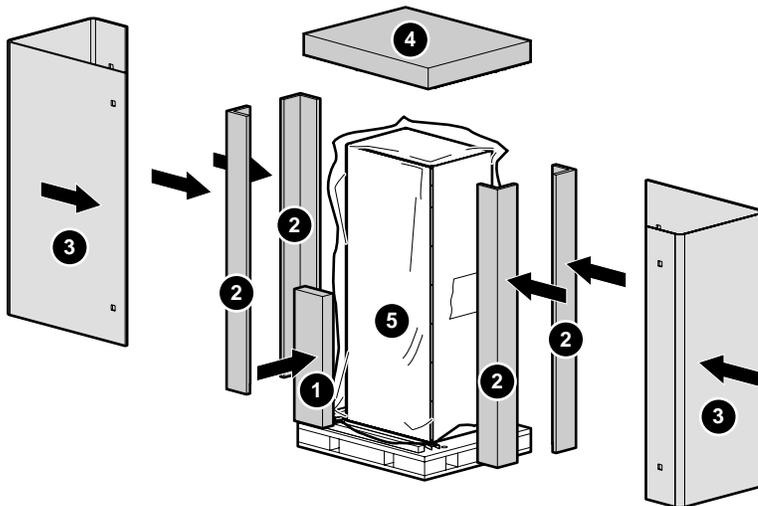


Figure 2: Compaq rack on shock pallet

- 1.Ramps are placed vertically on the side of the rack during shipment, typically held in place with the stretch wrap.
- 2.Corner posts
- 3.Corrugated sheets
- 4.Cap
- 5.Antistatic bag
- 6.Stretch wrap (not shown)
- 7.Banding (not shown)

Note: Compaq manufacturing sites are required to order items 1, 3, 4, 6 and 7 separately.

Preparation for Shipment

All racks require some preparation for shipment, regardless if qualified components are used. These requirements are listed under “General Considerations (All Shipments).” A qualified component has been tested for common carrier shipment conditions, often with the aid of specific hardware. This hardware, if required, is included in the accessories shipped with the product. If a component is being shipped that has not been qualified, additional preparation may be required. See the section “Special Considerations.”

Site Survey

To determine if a configured rack is suitable for shipment, be sure to examine the receiving facility site conditions. Circumstances requiring special handling of the rack, such as inadequate door height clearance or having to move the rack in a horizontal orientation, may justify a decision to install components after the moving process.

The dedicated carrier usually has the ability to perform site surveys. Among other elements, the site survey should determine:

- What are the hours the facility is open for deliveries?
- Does the facility have a dock? Can it be accessed by a 48-foot trailer?
- Are appointments required?
- Is movement across rough surfaces likely?
- What are the clearances for freight elevators, doorways, or other obstacles?

Additional discussion of these considerations may be found in “Mode of Receiving and Delivery.”

General Considerations (All Shipments)

Before beginning these procedures, make sure you understand and follow these precautions.

WARNING: To reduce the risk of personal injury or damage to the equipment, be sure to remove all nonrack-mounted monitors and other nonrack-mounted equipment. This category includes all components not mechanically fastened to the rack structure.

The following are the minimum requirements for qualifying components for shipment in a Compaq Rack 9000 and 10000 mounted on a shock pallet:

- Use a torque wrench to tighten all front panel mounting hardware and rail/slide connections to 20 in-lb (2.2594 N-m). Use provided mounting hardware to secure any spring-loaded slides to the mounting rails.
- Use the shipping hardware provided with each component. This hardware is typically found in the accessory box. The Server Immobilization Bolt (SIB) is a large red thumbscrew and is easily installed from the rear of the rack.
- Dress and secure all data and power cables. Cables should be tie-wrapped to prevent movement of cables that may place a load on connector assemblies or that may cause fraying due to friction. Wire-formed cable management clamps are provided with each rack for this purpose. Some components provide sheet metal cable management extensions or spring loaded cable retainers that should be utilized in all cases.
- Firmly close front and rear doors.

- Reuse any packaging materials that were initially provided with the rack.
- Use a tie-wrap on the cable management arms to prevent movement of cables.
- Check to ensure the rack mounting brackets are properly secured to the pallet. The bracket should be at an angle to the pallet deck (see Figure 8) and should not be loose. Ensure that the bolt securing the bracket to the pallet is torqued to 150 in-lb (16.9455 N-m).
- All racks should be secured in the trailer/truck to prevent the rack from potentially falling on its side during vehicle turns.

Special Considerations

Additional requirements for nonqualified components for shipment in a Compaq Rack 9000 and 10000 that is mounted on a shock pallet are listed below:

- Replace any wing nuts with hex- or square-head nuts and appropriate locking hardware.
- Inspect the for unsupported mechanical structures. Look for cantilevered chassis s with little or no rear support or large chassis s with rails mounted to the extreme top or bottom of the chassis. Be especially attentive to any free movement of the component while mounted in the . In some cases, it may be beneficial to use supplemental packaging materials to brace these components. The white foam from the shipping containers of the components works well in these situations.
- Remove batteries from any UPS and ship separately. See Table 2 for packaging details and part numbers. In circumstances where the UPS front bezel is no longer screw-supported on one side, secure the bezel to the UPS chassis with tape (non-residue preferred) or ship the bezel separately.
- Do not ship backup media in either tape drives or in tape library units.
- Use double-sided tape to secure the keyboard to the keyboard drawer, or ship the keyboard separately.
- Some shipping regulations require specific identification of the batteries enclosed with the package. For example, the US Department of Transportation requires a pack enclosing a UPS battery be marked to indicate a non-spillable lead acid battery was enclosed. For CTO Rack shipments destined for the EU, specific markings of all battery systems are required, including the real-time clock batteries found in each server.
To comply with these requirements, Compaq provides a family of decals that may be applied to the shipping carton; these are listed in Table 2A. Markings are pre-printed on the cartons for the Return Kit Spares packaging found in Table 2B.

WARNING: When reinstalling the battery, a spark may be observed when reconnecting the spade terminals. Be sure to hold the connectors by the insulated housing. To prevent rotation of mounting rails, ensure that the front panel mounting screws are in place when reinstalling the battery.

Modes of Shipment

Compaq recommends that you ship an unqualified rack through a dedicated carrier. A dedicated carrier is best-qualified and best-equipped for providing shipping service. The results of a site survey may also mandate the special handling capabilities of a dedicated carrier.

Dedicated Air-Ride Carrier

Dedicated carriers (for example, North American Van Lines and United Van Lines) offer dedicated shipments and maintain specifically trained electronic equipment moving teams.

Dedicated carriers should be used whenever possible. Guidelines for selecting a dedicated carrier include the following considerations:

- A dedicated truck shipment can be set up with no transfer points where the equipment is unloaded/reloaded enroute to its destination.
- These carriers are accustomed to special handling arrangements and will provide any necessary materials.
- The rack assembly is secured within the truck.
- Dedicated carriers are required for shipment of any rack with at least one component that has not been qualified.

Common Carrier

Common carriers (for example, Yellow Freight) typically provide movement of freight that usually requires multiple unloading and reloading when shipments are consolidated at transfer hubs.

Observe the following guidelines when using a common carrier:

- Use a qualified rack configuration that has been tested to the expectations of this environment.
- Use a shock pallet and referenced shipping hardware.

Air Freight

Because the rack cannot be safely tipped or placed on its side during transit or storage, air cargo doors must have height sufficient for the rack to be loaded and removed without tipping. Consult your freight forwarder for available aircraft configurations that satisfy your particular rack height.

Mode of Receiving and Delivery

Knowledge of the receiving site is an important planning consideration, as special equipment or arrangements may have to be made. Think about the following issues:

- Enquire whether the receiver has a shipping dock with adequate height for a truck to load and unload the equipment. Without a dock, specialized equipment such as bob-tail trucks and forklifts may be required. If the rack is to be rolled across a parking area, panels of plywood or Formica are recommended to minimize the vibration induced into the rack.
- Be aware that the 42U rack is 85 inches (2159 mm) high on the pallet and exceeds standard 7-foot doorways. Since a loaded rack cannot be tilted without substantial risk to handlers and the rack itself, the rack will have to be depalletized for passage through the standard 7-foot door frame.
- Use the shock pallet to move the rack. Pallet jacks are recommended when moving the rack inside a building structure.
- Consider that alternative handling schemes may be required in areas with elevated floor structures with inadequate ramps (for example, lifting the rack with eyebolts in the top frame for floors with an incline greater than 15 degrees). When negotiating any ramp, keep the front of the rack pointed uphill to minimize the possibility of the rack tipping.

WARNING: To reduce the risk of personal injury or damage to the equipment, do not attempt to move large equipment racks by yourself. Obtain adequate assistance to stabilize the rack during movement, or hire professional equipment riggers.

Installation Instructions

To install a Compaq Rack 9000 and 10000 cabinet into a shock pallet:

1. Unpack and attach the ramp rails to the pallet.

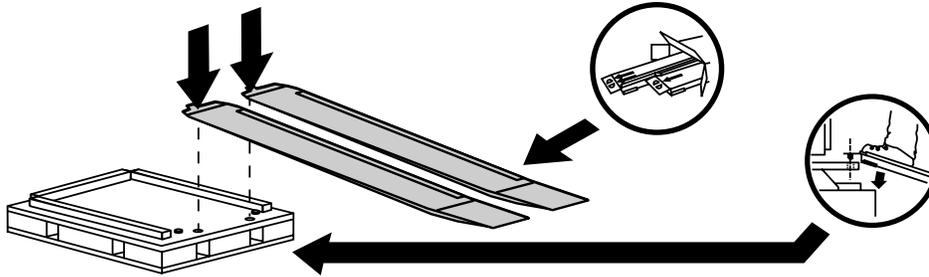


Figure 3: Attaching ramp rails

Note: If components have been removed for shipping, care should be taken to ensure that the rack is stable prior to rack installation onto the shock pallet. Place the remaining components in the lower portion of the rack to ensure that the rack is not top-heavy or unstable during shipment.

2. Roll the rack up the ramps (with fixed casters up the ramp first) and place the rack on the pallet. When rolling the rack up the ramp, make sure to push firmly on the door frame and not the door mesh.

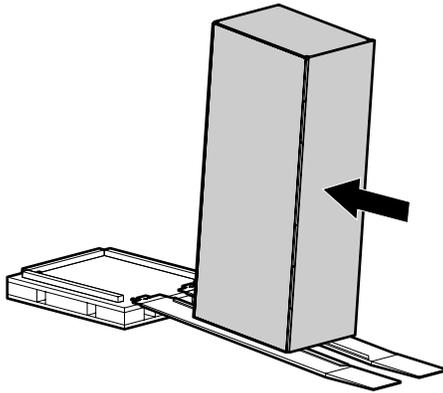


Figure 4: Placing the rack on the pallet

3. Remove the ramps from the pallet and repack the ramps in the original box.

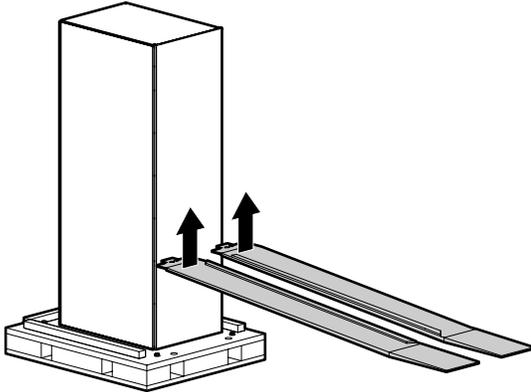


Figure 5: Removing the ramp assembly

4. Place a metal shipping bracket under each leveling foot. Extend all four leveling feet until they just touch the top surface of the brackets. The leveling feet should be between 0.75 inch (19.05 mm) and 0.88 inch (22.35 mm) from the pallet deck. Place the shipping bracket onto the leveling feet through the keyhole in the bracket.

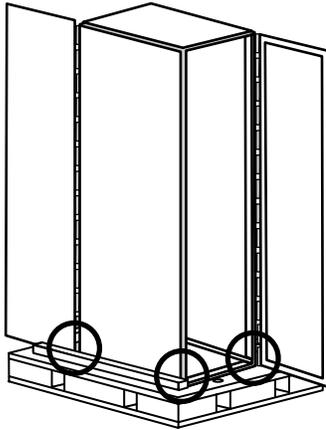


Figure 6: Positioning rack onto pallet

- Center the rack on the pallet, and position the hold-down brackets with bolts and lock washers into the threaded holes in the pallet deck.

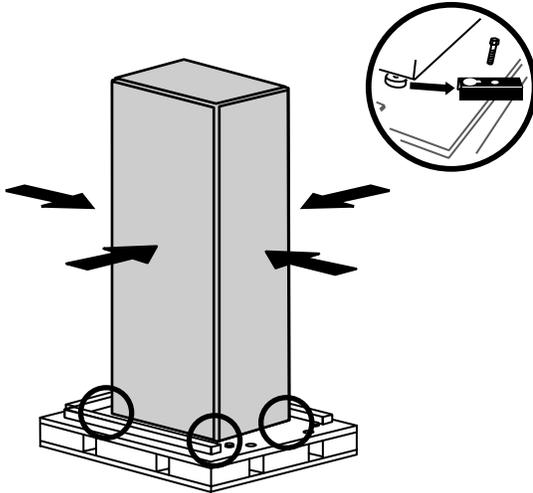


Figure 7: Positioning the hold-down brackets

- Tighten the bolts in the four hold-down brackets to 150 in-lb (16.9455 N-m) to secure the hold-down brackets to the pallet. Use a 9/16-in (14-mm) open-end wrench. The hold-down brackets should be angled up off the pallet deck holding the leveling feet in tension.

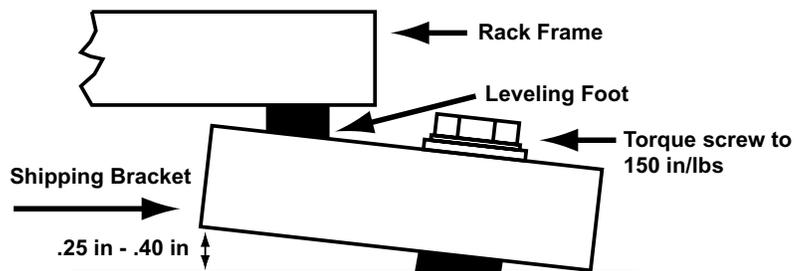


Figure 8: Tightening the hold-down brackets

Note: Before securing the cabinet to the pallet, be sure the leveling foot is between 0.75 inch and 0.88 inch from the pallet deck. Once installation is properly completed, the space between the high end of the bracket and the pallet should be between 0.25 inches (6.35 mm) and 0.40 inches (10.16 mm).

Note: Before locking the rack doors, all servers and other equipment should be installed in the rack. Only equipment certified to ship in the rack 9000 and 10000 should be installed at this time. Equipment not yet certified to ship in the rack 9000 and 10000 should be installed on-site at the final destination to prevent damage to equipment while the rack is in transit.

7. Close and lock both doors.

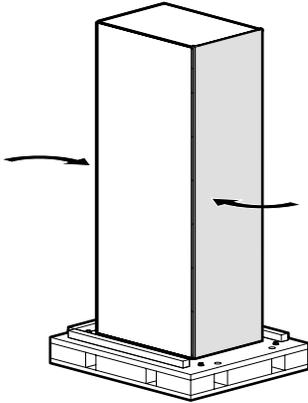


Figure 9: Closing the rack doors

8. Place the plastic bag over the rack and tape the keys to the front of the bag.

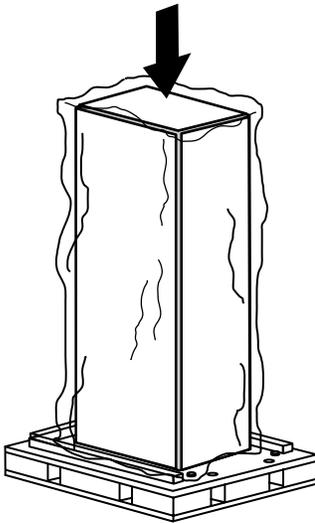


Figure 10: Placing the plastic bag over the rack

9. Place the four corner posts on each corner of the rack. Make sure that the corner posts are properly positioned around the door handles to prevent damage.

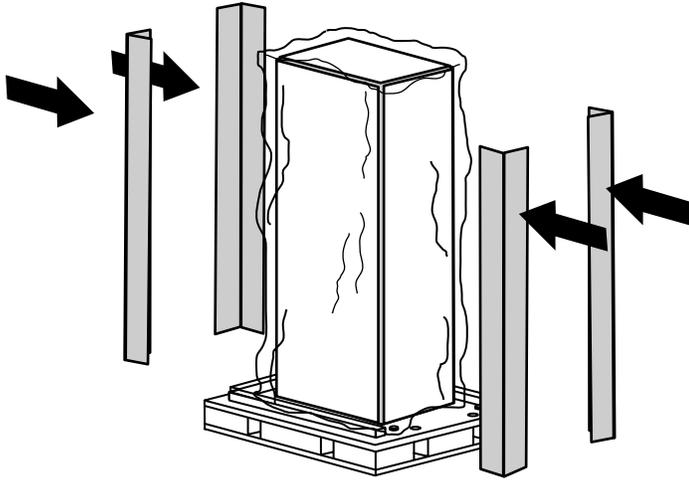


Figure 11: Placing the four corner posts

10. Place the ramp box against the side wall of the rack between the corner posts on either side of the rack. Then stretch-wrap the corner posts and the box containing the ramp assembly to the rack.

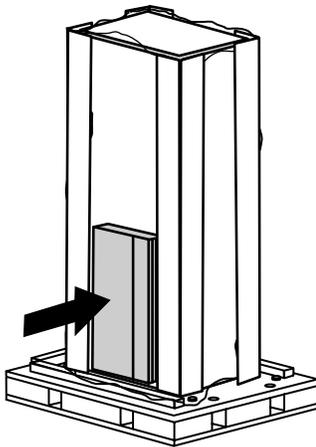


Figure 12: Placing the ramp box against the side wall

11. Place the two tri-wall corrugated sides around the rack.

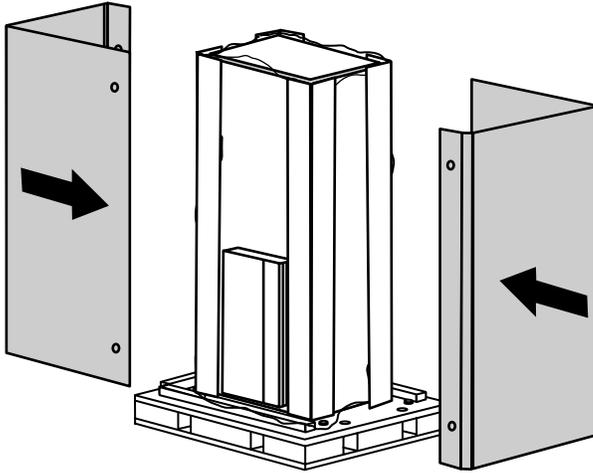


Figure 13: Placing the two tri-wall sides

12. Secure the tri-wall corrugated sides with the metal tri-wall fasteners. Insert an outside metal tri-wall fastener into the upper and lower hole of each corrugated panel. Secure with an inside metal tri-wall fastener, using an 11-mm wrench.

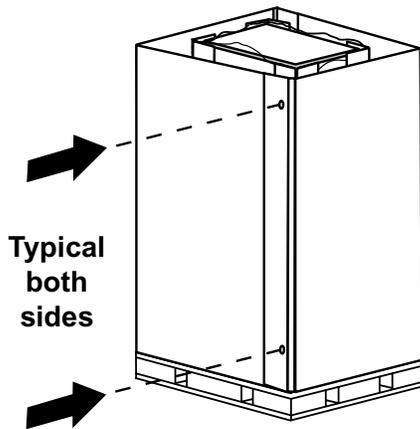


Figure 14: Securing the two tri-wall sides

13. Place the corrugated cap on the top of the assembly.

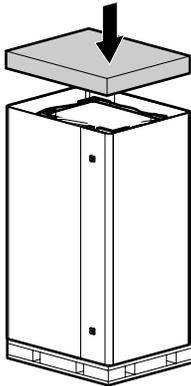


Figure 15: Placing the box cap

14. Secure the corrugated cap and tri-wall sides to the pallet using two applications of banding running from front to back.

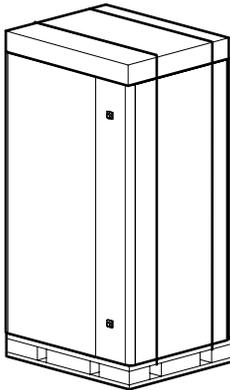


Figure 16: Installed shock pallet

15. Installation is complete.

Installation Service

In the United States, Compaq can arrange to have your rack installed by qualified service providers. This installation service covers the entire hardware installation sequence, from unpacking the components to routing cabling and running a test of the .

Installation can also be provided directly by Compaq authorized service providers.

If you need a precertified solution, Compaq Customs & Solutions can be reached at

www.compaq.com/solutions/customsystems/

Spares Kits

Contact your local reseller for information on spares kits.

Shock Pallet

The following items and quantities are required for assembly of the Compaq Shock Pallet Spares Kit:

- Sheet, cover corrugates (2)
- Inside metal tri-wall fasteners (4)
- Outside metal tri-wall fasteners (4)
- Cushioned pallet (1)
- Corrugated cap (1)
- Ramp assembly (1)
- Hold-down brackets (4)
- Hex-head bolts (4)
- Flat washers (4)
- Lock washers (4)
- Plastic bag (1)
- Corner posts (4)

This kit may contain extra pieces of hardware for your convenience.

Additional Tools and Equipment

- 11/16-in (or 17-mm) open-end wrench
- 9/16-in (or 14-mm) open-end wrench or socket
- 7/16-in (or 11-mm) open-end wrench or socket
- Stretch wrap
- Banding

Battery Decals and Boxes

Compaq provides a family of decals that may be applied to the shipping carton; these are listed in Table 2A.

Table 2A. Power Products: Decals

Part Number	Decal Description
247933-001	Label, Battery Disposal Warning, Cadmium
247933-002	Label, Battery Disposal Warning, Mercury
247933-003	Label, Battery Disposal Warning, Lead Acid
247933-004	Label, Battery Disposal Warning, Other
244014-001	Label, Battery Statement (Non-spillable)

When shipping a battery outside the UPS, use the packaging provided in the Return Kit Spare. Table 2B lists spare batteries for power products.

Table 2B. Power Products: Spare Batteries

Unit	Battery Spare (Battery and packaging)	Return Kit Spare (Packaging only)
R3000	295462-001	242006-001
R6000	401863-001	241965-001
R1500	240789-001	242007-001
R1500 ERM	240790-001	242008-001
R3000 XR	204503-001	234400-001
R3000 XR ERM	204503-001	234400-001

Rack Option Kits

Compaq offers a variety of rack options. For complete information, see the Compaq rack options website at www.compaq.com/rackoptions

Appendix A

Glossary

Ballast	A metal block that can be mounted in the sides of the rack to provide additional weight and protection against tipping.
Chassis/Component	Rack-mountable configuration of a server or a storage .
Dedicated Circuit Branch	A dedicated electrical circuit between a source and distribution point.
EOL (End of Life)	Discontinued products.
Fixed Stabilizer	An anti-tip stabilizer providing stability and support when equipment is installed, removed, or accessed within the rack. It is recommended that you use a stabilizer option kit with a stand-alone rack.
KVM switch	A switch that allows a single keyboard, video display monitor, and mouse to be switched to any of a number of computers.
PDU	Power Distribution Unit.
PNP (Plug-and-Play)	A standard that gives computer users the ability to plug a device into a computer and have the computer recognize that the device is connected.
U	<p>A standard unit of measure for designating the height in computer enclosures and rack cabinets. One U equals 1.75 inches (44.5 mm). Measurements typically go from the bottom of the rack up.</p> <p>For example, a 4U chassis is 7 inches (177.8 mm) high. A 42U rack cabinet has 73.5 inches (1866.9 mm) of usable mounting space.</p>
UPS (uninterruptible power supply)	A device that allows a computer to continue running for at least a short time after the primary power source is lost.

Appendix B

General Specifications

The following table provides torque values for specific rack components.

Table 3. Torque Values (Specific)

Component	Torque (in-lb)	Torque (N-m)
All M6 rack hardware	20 in-lb	2.2594 N-m
Pallet bracket hold-down bolts	150 in-lb	16.9455 N-m

In addition to any specific torque value given in this document, the following tables provide torque values that can be used to prevent over-torquing a fastener.

The following torque values assume SAE (Society of Automotive Engineers) grade 2 hardware or ISO (International Standards Organization) 898 property classes less than 8.8 hardware (for example, 4.6, 4.8, 5.6). Steel hardware for both male and female threads is assumed. For ISO 8.8 or 12.9 and SAE Grade 5 or 8, torque should be determined by the application.

Table 4. Torque Values (Standard hardware)

Measurement	Torque (in-lb)	Torque (N-m)
#4	6 in-lb	0.67782 N-m
#6	10 in-lb	1.1297 N-m
#8	19 in-lb	2.14643 N-m
#10	27 in-lb	3.05019 N-m
1/4-20	66 in-lb	7.45602 N-m
3/8-16	240 in-lb	27.1128 N-m
1/2-13	585 in-lb	66.08745 N-m

Table 5. Torque Values (Metric hardware)

Measurement	Torque (in-lb)	Torque (N-m)
M3	7.6 in-lb	0.858572 N-m
M4	17 in-lb	1.92049 N-m
M5	36 in-lb	4.06692 N-m
M5.5 self tap	40 in-lb	4.5188 N-m
M6	60 in-lb	6.7782 N-m
M8	147 in-lb	16.60659 N-m
M10	292 in-lb	32.98724 N-m
M12	509 in-lb	57.50173 N-m

Contact Us

For comprehensive online support, refer to
www.compaq.com/support

For international information, refer to
www.compaq.com/corporate/overview/world_offices.html

For a list of Compaq products, refer to
www.compaq.com/showroom/

For information on Compaq racks, refer to www.compaq.com/racks

For a list of Compaq rack options and accessories, refer to
www.compaq.com/racksoptions/

For Compaq Customs & Solutions, refer to
www.compaq.com/solutions/customsystems/

Table 6. Departments and Telephone Numbers for the United States and Canada

Department	Telephone Numbers
Consumer Direct	1-800-888-0220
Compaq DirectPlus	1-800-888-5858 (U.S.)
Compaq Partner Direct	1-800-888-5874
Compaq Reseller Locator	1-800-345-1518 (Option 3)
Compaq Canada Reseller Locator and Product Information	1-800-567-1616
Diskette Fulfillment (backup diskettes for preinstalled software)	1-800-952-7689 (U.S.) 1-800-567-1616 (Canada)
Compaq Product Information	1-800-345-1518 (U.S.) 1-800-567-1616 (Canada)
Compaq Product Service & Technical Support	1-800-OK-COMPAQ (U.S. and Canada) 1-800-652-6672
Compaq Presales Product Information	1-800-AT-COMPAQ (U.S. and Canada) 1-800-282-6672