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DISK CABINETRY

For Client Server Disk

DEVICE INSTALLATION AND MOUNTING
Supplement (to Cabinet Users Guide)

PRODUCT TYPE
HARDWARE

StorageTek

Device Installation and Mounting

Disk Cabinet Supplement

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Summary of Changes

Date	Edition	Description
May 2000	First	Initial Release
Sept 2000	Second	Product nomenclature changes
Oct 2001	Third	Updated to reflect the use of new D-Series products
Nov 2002	Fourth	Updated to reflect the use of the new B-Series product line
May 2004	Fifth	Added cabinet movement restrictions and information on how to add devices and FC cables when stacking above 1x8.

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Preface

StorageTek's Client Server Disk devices and adjustable mounting rails were designed for StorageTek's Client Server Disk and OPENstack™ cabinets.

If you are planning to use StorageTek's adjustable mounting rails in a 19-in. cabinet that is already at the customer's site, you must first make sure that StorageTek's Client Server Disk devices will fit into the cabinet and then make sure that the Adjustable Mounting Rails will attach to the non-StorageTek cabinet. Otherwise, it is highly recommended that you use the mounting rails that were designed by the manufacturer of the particular cabinet that you are using.

Organization

This book contains the following information:

Chapter 1 "Preinstallation Considerations" provides Client Server Disk product information to help you decide whether or not your B-Series or D-Series devices will fit into a non-StorageTek cabinet..

Chapter 2 "Installation" describes cabinet movement restrictions, including device and cable installation. Also covered is how to install adjustable mounting rails as well as important considerations for using these rails in non-StorageTek cabinets.

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Alert messages signal the reader to special information pertaining to a concept, a procedure, or other information.

Note: Provides additional information that might be of special interest. A note can point out exceptions to rules or procedures. A note usually, but not always, follows the information to which it relates.

CAUTION:
Informs the user of conditions that might result in damage to hardware, corruption of customer data or application software, or long-term health hazard to people. A caution always precedes the information to which it relates.

WARNING:
Alerts the user to conditions that might result in injury or death. A warning always precedes the information to which it pertains.

Related Publications

Additional information is contained in the following publications, some of which are delivered with this product.

Publication	Part Number
CBNT M02 Rackmount Cabinet User's Guide	95914
CBNT M03 and M04 Rackmount Cabinet User's Guide	95932
CBNT F40 Rackmount Cabinet User's Guide	96100

Comments and Suggestions

A Reader's Comment Form at the back of this publication is for communicating suggestions or requests for change. We encourage and appreciate reader feedback.

Preinstallation Considerations

1

The following pages provide information to make sure Client Server Disk devices are installed in acceptable cabinets that will provide adequate space, power, and cooling.

Cabinet Specifications

To make sure of function, performance, and reliability in all StorageTek and non-StorageTek cabinets, the following Client Server Disk device requirements for installation into 19-inch rackmount cabinets must be understood.

- Volume of space needed
- Cooling
- Power

Also your cabinet should conform to EIA-STD-310-D. Cabinets that conform to this specification use vertical mounting flanges (Nema Rails). All Client Server Disk devices were designed to fit into cabinets that conform to this 19-inch rackmount cabinet specification.

Note: Refer also to your site preparation guide or systems assurance guide to make sure that the non-StorageTek cabinets will work for your particular Client Server Disk solution.

CAUTION:
Whenever possible, your best bet is to use the mounting rails designed for your particular cabinet.

"Space Allocation and Weight" on page 1-2 provides information about various Client Server Disk devices to help make sure that adequate width, depth, and height exists within a cabinet.

Following this information are sections that help make sure you have enough cabinet ventilation, AC power outlets, and current supplied.

Space Allocation and Weight

Table 1-1 shows the space needed for various Client Server Disk devices. If you are using non-StorageTek cabinets, make sure that your cabinets have adequate width, depth, and height.

Table 1-1. Client Server Disk Device Parameters

Device	Width	Depth	Height	U Space	Weight
D-Series Drive Modules and Array Modules	449 mm (17.7 in.)	559 mm (22 in.)	132 mm (5.2 in.)	3	33 kg (73 lb)
Control Module (Controller) for the B- and D-Series Disk Subsystems	445 mm (17.5 in.)	631 mm (25 in.)	175 mm (6.9 in.)	4	44 kg (97 lb)
BladeStore Disk Arrays (Blade Trays)	447 mm (17.6 in.)	838 mm (33 in.)	264 mm (10.4 in.)	6	72 kg (160 lb)

It is is also very important to make sure that you are aware of the weight of each device. It is always best to stack the heaviest devices at the bottom of the cabinet as well as devices that are required to be extended for maintenance.

Note: StorageTek cabinets no longer offer the mounting tray feature. There are instructions, however, included in this manual to help you with such an installation, including strong recommends to make sure that to-be-extended devices are placed near the bottom of the cabinet, and do not exceed the weight and height limits. All cabinets that will be extending devices out for maintenance must have the extender leg feature.

Client Server Disk cabinets have an extender leg feature in this case, however, if you are using non-StorageTek cabinets, you must make sure that your cabinet will function safely under all possible conditions.

It is also highly recommended that the mounting rail (shelf) thickness be 16 gauge (1.6 mm or .060 in.); furthermore, that the mounting rail thickness not reduce the width to less than 450 mm (17.72 in.) or the height by more than 1.5 mm (.060 in.).

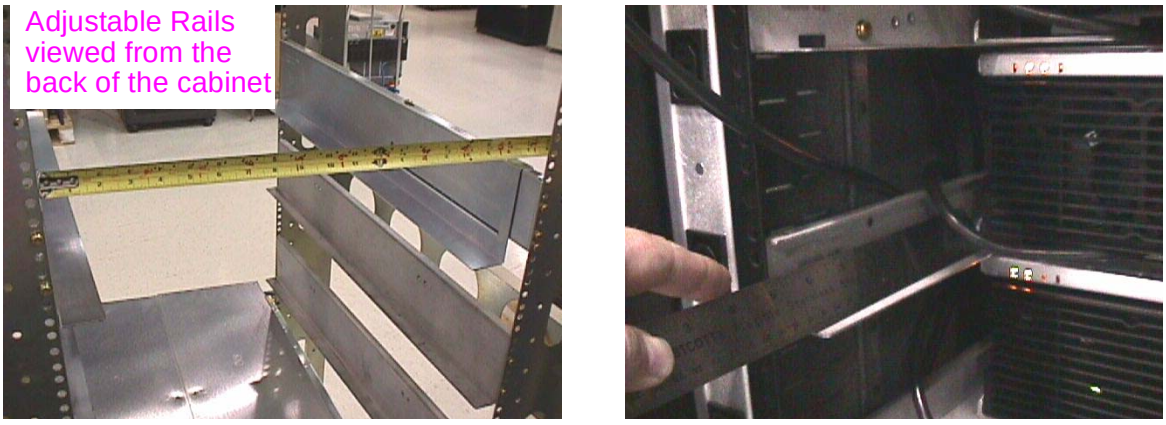
The depth parameters listed above are absolute minimums, providing just enough room to physically fit a device. Additional depth is required to route cables and remove field replaceable units (FRUs).

Also front door clearances must be checked to ensure that there is adequate space to accommodate front covers, as well as the removal or opening of the front cover to gain access to FRUs.

Measuring Cabinet Parameters

Figure 1-1 on page 1-3 illustrates how to measure width and depth to make sure that your cabinet and mounting rails will suffice.

Figure 1-1. Measuring the Cabinet



Make sure that you have adequate access to connectors and FRUs with at least 254 mm (10 in.) of uninhibited space behind your devices.

Ordering Mounting Rails

The interior width required in your cabinet (from the interior surface of a mounting rail to the opposite interior surface) is 450 mm (17.72 in.). When ordering StorageTek's adjustable mounting rails (feature code AR01, as shown in the left-side photographs in Figure 1-1 and in chapter two), you must make sure that non-StorageTek cabinets conform to EIA-STD-310-D, or order the mounting rails designed specifically for your particular cabinet.

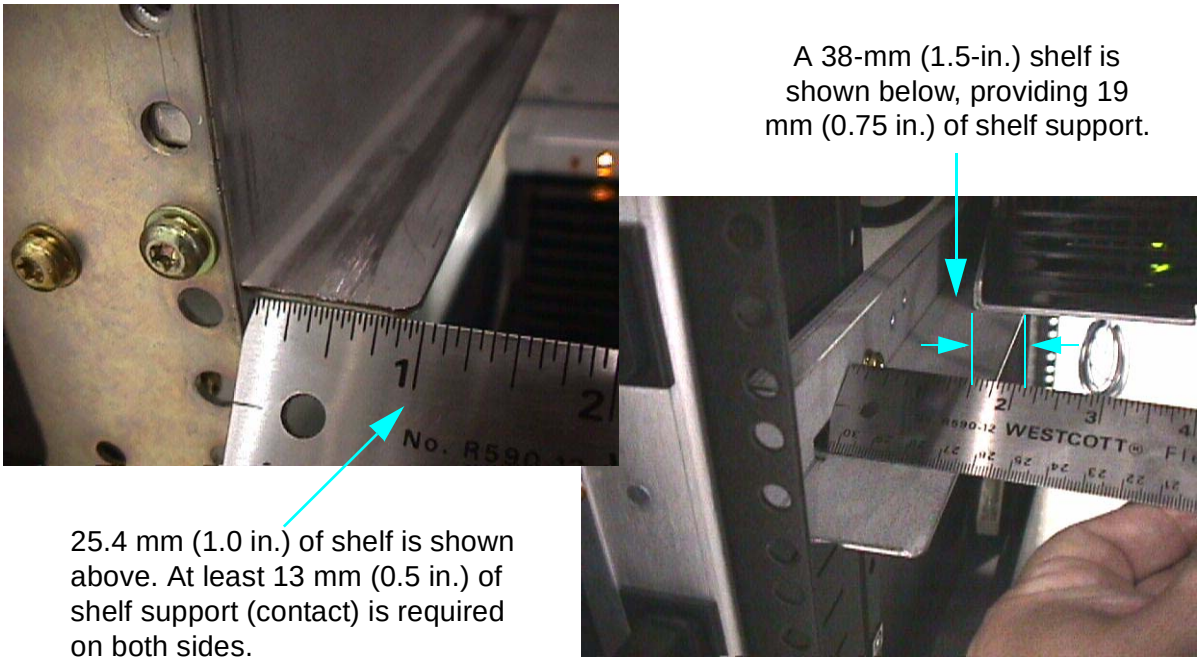
The primary consideration is that the Client Server Disk device will safely span the distance between the shelf portion of the mounting rail. We recommend that the rail shelf or lip extend into the cabinet approximately one inch on both the left and the right.

Note: When ordering special devices for your Client Server Disk cabinet, you may notice that some devices do not adequately span the width of the cabinet enough to safely mount on the rails. In these cases, special mounting hardware must be ordered to enable mounting.

The rackmount kit, which provides a mounting tray (P/N 312034602) to span the 450 mm distance between mounting rails, is no longer offered.

If you are installing into non-standard cabinet, the following illustrations show how to measure the shelf portion of your mounting rail.

Figure 1-2. Measuring the Shelf Portion of the Mounting Rail



Extend a measuring tape across the width of the cabinet to make sure that a mounting surface is available from 0 to 1 inch on the left and from 16.7 to 17.7 inches on the right.

For non-standard cabinets, it is recommended that you order mounting rails with one inch or more of shelf. A minimum of 50 percent of the shelf must be used to provide support to the device, with no front or back obstructions to interfere with cabling or FRU removal.

Cooling

Make sure that you have an adequate exchange of air from the inside of the cabinet to the outside (ambient) temperature. The fans or blowers inside the Client Server Disk devices move air from the front of the cabinet (intake) to the back of the cabinet (exhaust); and this air must be vented to the outside of the cabinet.

It is recommended that cabinet doors are 50-to-70 percent vented so that intake air is primarily at ambient temperatures, and as much cooling as practical may occur for proper cross-ventilation.

Having an adequate exchange of air will help ensure that your Client Server Disk devices have adequate heat dissipation and will function efficiently.

Power

Ideally, cabinets must have Power Distribution Units (PDUs) that are supplied by separate and independent AC power circuits. This will help ensure that your Client Server Disk devices will continue to operate in the event that one of the customer's circuits is lost. StorageTek's Client Server Disk cabinets come with two AC power cords for this purpose. They also have two separate PDUs or grids to supply redundant DC power supplies in each of the devices.

It is important, therefore, to make sure that your cabinet provides redundant power. It is also important to make sure that each PDU is capable of providing the AC current required by each device that you install into the cabinet (with power cords that extend from both redundant PDUs to the AC inputs of the redundant DC power supplies on each device). Table 1-2 indicates the amperes needed to operate various Client Server Disk devices.

Table 1-2. Power Requirements

Client Server Disk Device	Current in Amperes (Amps)
9170-Series Drive Modules and Array Modules	3.6 Amps at 100v or 1.8 Amps at 200 volts
B- and D-Series Drive Modules and Array Modules	3.9 Amps at 100v or 1.65 Amps at 240 volts
B- and D-Series Control Modules (Controller Trays)	2 Amps at 100v or 1 Amp at 240 volts
BladeStore Disk Arrays (Blade Trays)	9.3 Amps at 120v or 4.7 Amps at 240 volts

Add up the load of each device and make sure that both your PDU and your customer-supplied AC power source are rated high enough to both supply the power needed and function safely. For other devices, refer to the regulatory agency label on the back of the unit.

For additional information on Client Server Disk specifications, refer to StorageTek's rackmount cabinet user's guides or to your particular Client Server Disk device installation manual.

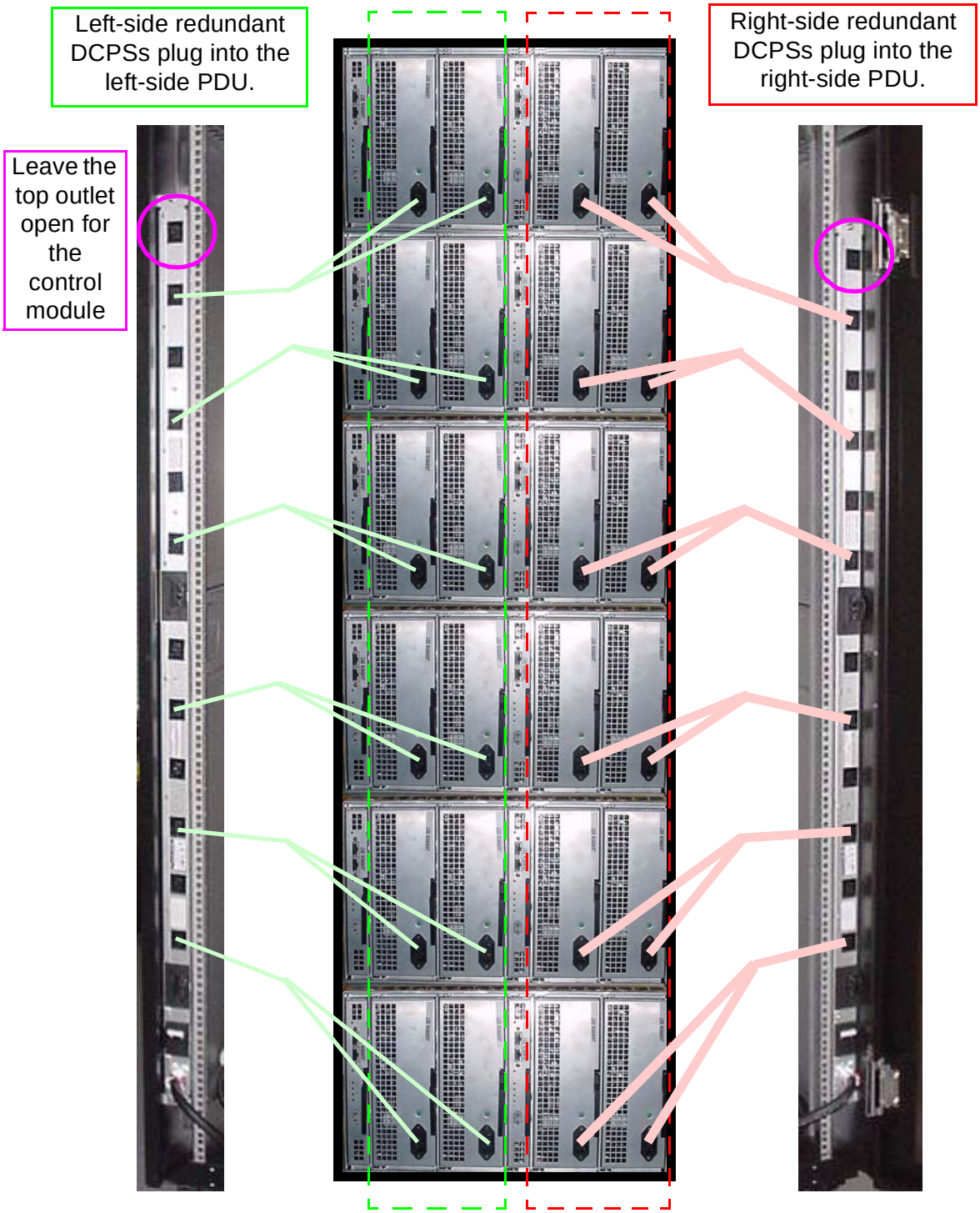
Refer also to the Site Preparation Guide for your particular B-Series, D-Series, or BladeStore product solution. These manuals will often have power ratings and calculations for various product configurations—providing amps, volts, watts, kVA, and BTU (heat dissipation) for the most sophisticated of customer presentations.

Distribution of Power

To ensure that your cabinet maintains two redundant sources of AC (and DC) power, the following BladeStore example shown in Figure 1-3 has been

included here. Follow these guidelines to ensure that your AC power is properly routed and distributed.

Figure 1-3. Power Routing and Distribution - BladeStore Example



Installation

2

The following pages provide information to assist with the movement and placement of your rackmount cabinet, as well as the installation of adjustable mounting rails, which can be used with a variety of cabinet types.

Moving Cabinets

There may be a high center-of-gravity in your rackmount cabinet whenever devices are placed high in the cabinet (especially if empty space is left underneath). Also any cabinet's weight that exceeds 454 kg (1000 lbs), especially when the weight is not distributed uniformly within the device, may cause a narrow column of weight that again contributes to a high center-of-gravity. For this reason it is required that all cabinet movements be done on a surface that does not exceed a 10 degree angle. All ramps must be verified to be 10 degrees or less, especially when any devices are installed above the 28U mark.

WARNING:
The following disk subsystems must have devices above 28U removed prior to any movement to relocate the cabinet.

- **All D-Series Disk Subsystems (9176, D173, D178, D220, D240, D280)**
- **All B-Series SATA Disk Subsystems (B220, B280)**
- **All future products of a similar design that positions the bulk of the weight in the same general areas.**

The above disk subsystems have been found to present a tip-over potential under certain conditions, and we wish to be cautious whenever it involves the safety of individuals as well as the safety of the customer's data.

Reconfiguring and Recabling Removed Devices

If devices were left out or removed to facilitate a safe delivery, you will need to install the (separately packed) devices to complete your customer's disk subsystem order. The following illustrations depict the typical maximum configuration that will be shipped as well as the internal Fibre Channel cabling scheme to use to finalize the order.

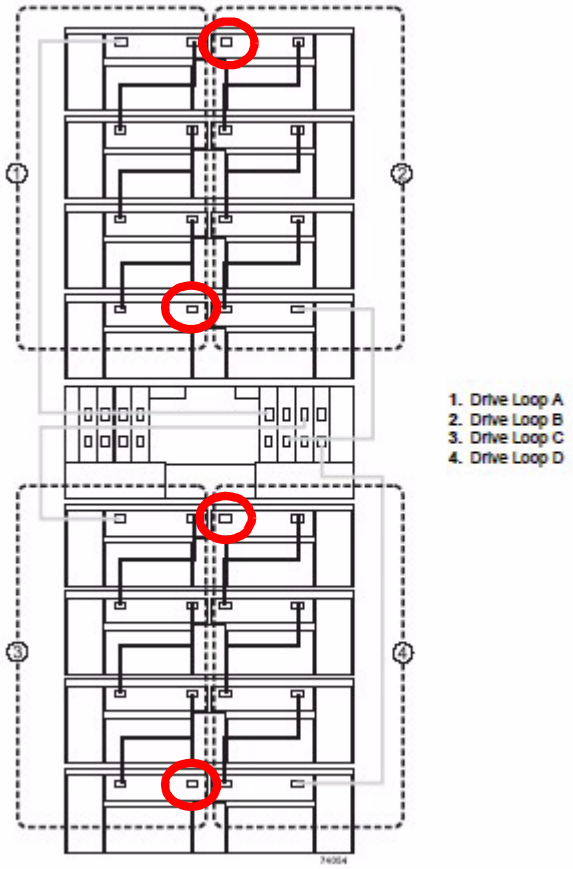
Procedure

1. Position the cabinet into its final position.
2. Install rails and all missing devices into the appropriate slots.

   Note: It is not necessary to remove and reposition the devices that are currently installed in the cabinet, however it is important to make sure that the FC drive loops are balanced for performance.

3. Identify the ends of each drive loop. See Figure below.

Figure 2-1. Typical 1x8 Disk Subsystem configuration and cabling



4. Route a two meter FC cable from the end of Drive Loop C to the ESM input on the first additional drive module (ninth drive module in the stack).
5. Do the same for Drive Loop D.
6. Extend both of these Drive Loops to the next odd (eleventh) drive module, if present.
7. If a tenth or a twelfth drive module is installed, extend Drive Loops A and B up to the tenth drive tray (and then to tray 12 if present).

   This will help ensure that there are redundant drive loops, as well as an equal number of trays/LUNs handled by each loop.

Customer Cabinet Installations

If you are installing a Disk subsystem into a 19-inch cabinet not supplied by StorageTek, you should obtain special mounting hardware, enabling you to install your Client Server Disk solution into the customer's standard 19-inch rackmount cabinet. Instructions are provided below.

Adustable Mounting Rails

Adjustable rails are provided to fit a depth from 720 mm (26 in.) to 787 mm (31 in.) in a cabinet using vertical mounting flanges (Nema Rails) that conform to EIA-STD-310-D. A standard tool kit is needed to assemble the rails to the cabinet. Also a torque wrench is needed to ensure that hardware (10-32 Torx screws) are torqued to their specified range.

Note: Refer to your site preparation guide (systems assurance guide) and cabinet manuals to make sure that the customer's cabinet and these mounting rails will work for your particular Client Server Disk solution.

CAUTION:
Make sure that your customer's cabinet meets your Client Server Disk device width and depth requirements to enable fit and access to replaceable parts.

Parts provided for this installation process include:

- Left adjustable rail and slide
- Right adjustable rail and slide
- Twelve 10-32 Torx Screws (Thread Forming) - one-half inch

Note: Miscellaneous parts (extra screws, washers, clip nuts) are included with your installation kit depending on your cabinet's Nema rail style. Other hardware may be needed to enable your mounting rails and devices to fit a variety of different 19-inch racks. Unfortunately, hardware can not be supplied to fit every possible cabinet, so be prepared to go to the local hardware store.

Mounting Procedures

The following steps and illustrations show how to assemble StorageTek's Adjustable Mounting Rail onto a cabinet that conforms to EIA-310-D.

1. Orient the left and right adjustable rails so that the slide is to the rear of the cabinet.
2. Slide the rail open to the depth of the cabinet's mounting flanges, and install two 10-32 Torx screws in the viewable screw holes on top (A) of the slide.

3. Level each adjustable rail on the full or half U mark, and install 10-32 Torx screws through the front and rear mounting flanges (B) to secure the adjustable rails to the cabinet. See below.

Figure 2-2. Adjustable Mounting Rail Installation—Fastener Locations

Using four 10-32 Torx screws, secure the front and back (two each) of the adjustable rail to the available (visible) holes as seen through the Nema rail mounting flanges.

Use holes that will not interfere with device mounting.

Note: If you have a cabinet with square holes in the Nema rail mounting flange, you will need the special clip-nuts for square holes or the square shoulder washer, P/N 31176990x to center the Torx screw in the hole.

4. Make sure that the rails are level from left to right and from front to back, and then torque all flange mounting screws to 30-inch-lbs.

   Note: Make sure that the distance between each inside surface to the opposite inside surface is greater than the width parameters needed to install your Client Server Disk devices.

5. Torque the top mounting rail screws (Step 2) to 30-inch-lbs.

WARNING:
Due to the weight of some storage devices, it is highly recommended that at least two persons install Client Server Disk devices.

Note: Your adjustable mounting rail uses 3U of vertical space; therefore, devices smaller than 3U will have some wasted space. Refer to your cabinet manual for information concerning the internal vertical space unit U.

6. You are now ready to install your D-Series/B-Series devices.

Refer to your solution's installation manual or release notes for specific device installation procedures. In some cases a rack shelf or mounting tray will be required for devices that are too narrow to safely span the distance between shelves.

Also read the following section on space allocation to make sure that you are using an acceptable cabinet for the solution that your customer purchased.

WARNING:
At least two persons are needed to install Client Server Disk devices.

Space Allocation

It is very important to make sure that you have enough space allocated to fit your StorageTek devices into your cabinet. To make sure of proper space allocation, three parameters must be understood:

- Width
- Depth
- Height

The following photographs illustrate the important factors to consider when installing Client Server Disk solutions into a non-StorageTek cabinet.

Width Parameters

Figure 2-3. Width Parameters

The width needed to accommodate (for example) an Client Server Disk D-Series Drive Module is 449 mm (17.7 in.), so the width required to fit this device into the customer's 19-inch rack is at least 450 mm (17.72 in.).

Depth Parameters

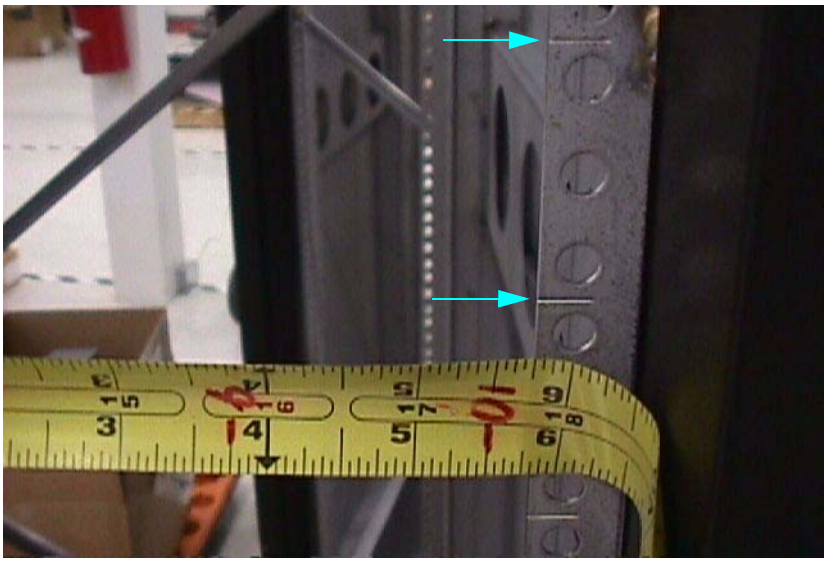
Room must be provided to allow cables to be attached and Field Replaceable Units (FRUs) to be removed from both the front and the back of StorageTek's Client Server Disk devices. Figure 2-4 shows a D-Series Drive Module example where FRUs are approximately 300 mm (11.8 in.) long; therefore, that much space is required to safety remove and replace FRUs.

Figure 2-4. Depth Parameters

Height Parameters

Vertical height measured in U increments must be understood so that when devices are stacked in a cabinet, you will be able to efficiently use the cabinet's internal vertical space.

Figure 2-5. Height Parameters



Most cabinets will show markings (as shown above) to indicate internal vertical space (U), i.e. vertical height used-up inside of the cabinet. In the above picture of the M03 rackmount cabinet, a width of 451 mm (17.75 in.) is also indicated.

The most important factor to remember is to stack your devices in full U (or in some cases in half U) increments. Cabinet trim pieces are typically designed to accommodate full U device spacings. This means that you should line up the bottom of the mounting rails with the U mark (see Figure 2-5), just above the previously installed device.

Note: You can also install at half U increments if your cabinet is designed for these device sizes.

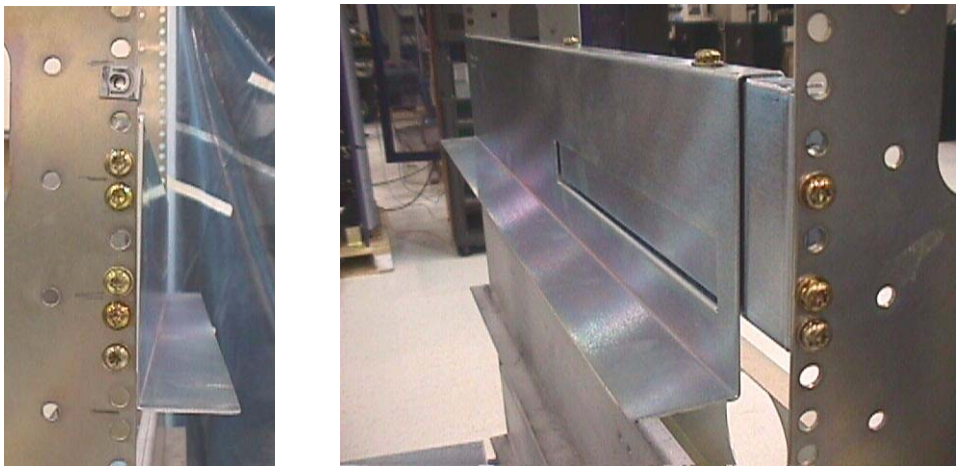
Your Client Server Disk cabinets and devices are designed to work together to provide a professional appearance for our customer's business environment; so maintaining the cabinet's desired U spacing is important to the cabinet's internal structure and ultimate appearance. Table 2-1 provides an example of the vertical space needed to install some Client Server Disk devices.

Table 2-1. Client Server Disk space allocation examples

D-Series Drive Modules (or Array Modules)	3U	133.4 mm	5.25 in.
B- and D-Series Control Modules (Controllers)	4U	177.8 mm	7.00 in.
BladeStore Disk Arrays (Blade Trays)	6U	266.8 mm	10.5 in.

Full U Installation Example

Figure 2-6. Full U Installation Example



Front View Back View

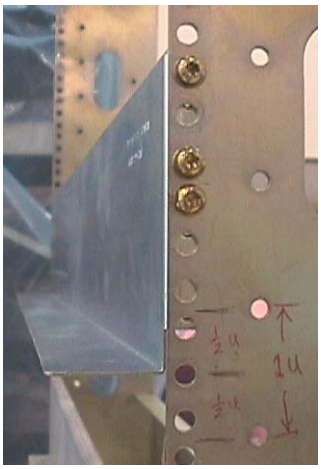
Figure 2-6 show an adjustable mounting rail installation on a full U mark (front and back view). In this case (and in the case of half U installations) a minimum of one screw must be installed to place the device, and then a minimum of two screws are needed for permanent installations.

Clip-nuts (as shown in the left photo) may also be needed for devices over 3U.

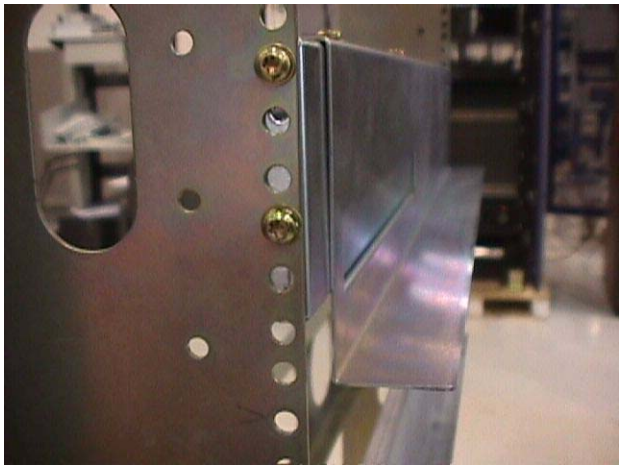
The screw heads that you see in the photos above are all of the locations of extruded holes that line up with the adjustable mounting rail installed in the full U position (bottom of the rail aligned with the U mark).

Half U Installation Example

Figure 2-7. Half U Installation Example



Front View



Back View

Figure 2-7 shows a half U installation.

Again, the screw heads that you see in the photos above are all of the locations of extruded holes that line up with the adjustable mounting rail installed in the half U position (that is with the bottom of the rail aligned midway between the U marks as shown in the left photograph).

Also, if the devices that you are installing onto the mounting rails are greater than 3U in height, then you may need to install clip-nuts onto the cabinet's Nema rail vertical mounting flange.

Note: At the completion of your device installation, always make sure that both your rails and devices are secured to the cabinet and that Torx screws have been tightened to 30 inch-lbs.

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