

Size Matters

Especially When

Choosing a Network Rack

A Rack & Cabinet Buyer's Guide for IT Professionals

SIZE REALLY DOES MATTER

Despite what you may have been told in the past, we're here to tell you that Size Matters. Especially when you are searching for a new rack or rack-mount enclosure (aka cabinet) to hold all your network equipment and servers. In fact, it is not just one dimension that must be carefully considered before choosing a new rack or cabinet, but every dimension.

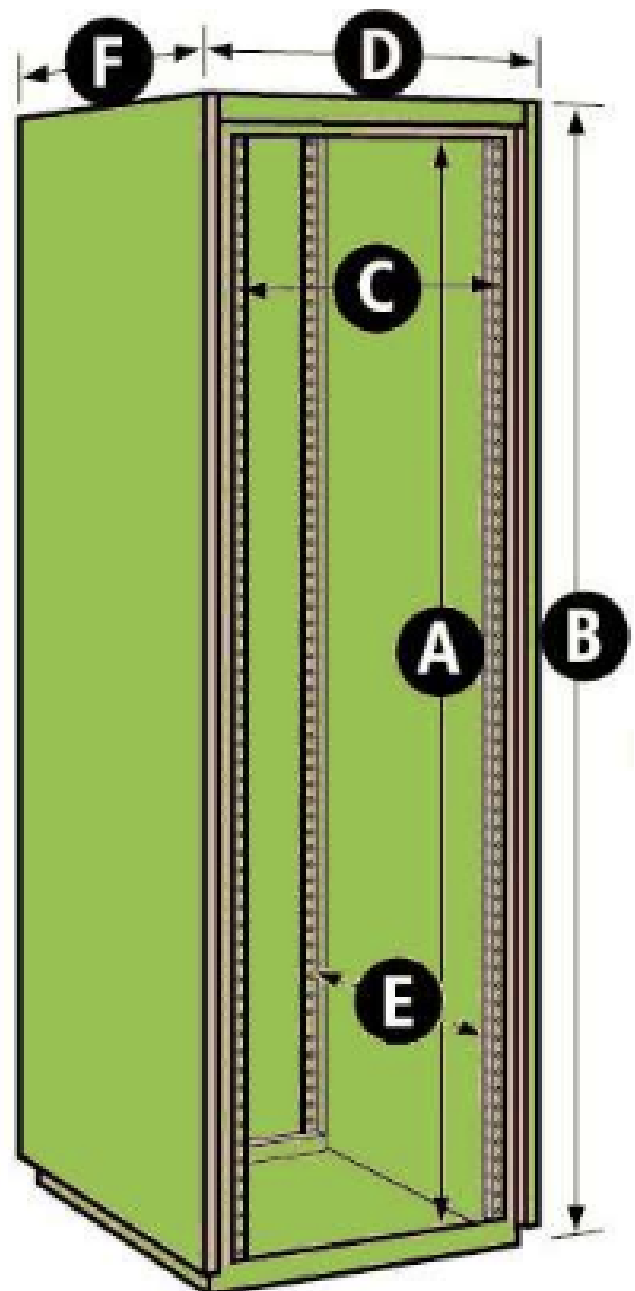
Far too often, IT Professionals select a new a rack or cabinet based on one key measurement like Height (or total rack units/U) instead of considering all of them. Reliance on such incomplete selection criteria frequently results in the purchase of a new rack that fails to meet all requirements, as well as the substantial out-of-pocket expense to return-ship the rack via motor freight carrier.

This Rack & Cabinet Buyer's Guide is intended to help IT professionals avoid those costly returns by explaining the importance and relevance of every dimension of racks and cabinets, and providing tips for ensuring the rack they eventually purchase meets all their needs.

As you read through this guide, please note that only rack-mount **enclosures** like network equipment and server cabinets have both Internal and External dimensions. Because of the way 2-post and 4-post **open racks** are designed, they only have one Width and Depth because the front and rear vertical mounting rails represent both. Only the Height of open racks can have two measurements – with one being the mounting height (measured in Rack Units) and the other the actual height (which will be several inches more to account for the horizontal frame above and below the mounting rails). Regardless of whether you are shopping for an open rack or enclosed cabinet, review every dimension covered in this guide so you understand how to determine your requirements for each.

The image legend below identifies each of the measurements defined in this Buyer's Guide:

- | | |
|---------------------|--------------------|
| A – Internal Height | D – External Width |
| B – External Height | E – Internal Depth |
| C – Internal Width | F – External Depth |



PART 1

INTERNAL HEIGHT

When manufacturers market their cabinets and racks, they typically specify the Height using Rack Units, which represent the maximum amount of rack-mountable space for your network equipment and servers.

One rack unit (1U) equals 1.75" (4.4 cm) of usable space, usually measured on the vertical mounting rails. So a piece of equipment that takes up 2U of space, for example, will use 3.5" of rack space. And a 42U rack will offer a total usable space of just over 73".

The most common mistake IT professionals make when choosing a rack or cabinet is selecting one based solely on how many rack units it has – mainly because they calculate their total Rack Unit space requirements based on their primary equipment (like servers, switches, patch panels, and UPS's), and forget to add in the rack space needed for secondary equipment that will also eventually be rack-mounted (i.e. cable managers, shelves, PDUs). By choosing a rack with barely enough space to mount your primary equipment, you may not have room for the non-critical but essential accessories.

Additionally, when you make a purchasing decision based solely on the fact that all your equipment will fit in the rack, you have failed to strategically plan for open/unused space around your high-heat assets (i.e. servers). Even if your servers are smart enough to shut themselves down when they get too hot (as opposed to overheating and frying the mother-boards, as was common years ago), the result is still a network service outage. So always plan adequate empty space for ventilation and air flow – especially when choosing a rack-mount enclosure with side panels and doors.

The final consideration is room for future growth. It is always advisable to choose a rack that offers some extra space where you can mount equipment that may eventually be added to your network. If the rack you are considering is too short to provide empty spaces for air flow and future devices, consider choosing the next size taller (one with more rack units).

RACK UNIT (U)

A "Rack Unit" is a common increment of equipment space height, abbreviated as "U". It is defined by EIA 310 as a unit of measure used to describe the height of a server, switch, or similar device in relation to the rails of the rack in which it gets mounted, and as the maximum equipment racking capacity of cabinets & racks.

BUYER'S TIPS: CALCULATING YOUR INTERNAL HEIGHT REQUIREMENTS

When choosing the internal height of a rack or cabinet, make sure it has:

1. Enough space (rack units) to accommodate all your existing equipment.
 2. Some extra, unused space to allow air-flow / ventilation around servers.
 3. Additional space not already designated for existing equipment for future growth.
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PART 2

EXTERNAL HEIGHT

When shopping for a small rack or cabinet – say between 10U and 38U - the exterior height may not be a dimension of great concern. However, when searching for a full-size rack (42U or higher), there are a number of potential roadblocks that must be considered before selecting a product. Let's start with the most obvious.

Before choosing a rack or cabinet, you need to determine whether or not it will physically fit inside the room where you plan to set it up. Keep in mind that a tight fit is not always the right fit. For example, it would be inadvisable to purchase an 84" tall rack enclosure (like a server cabinet) for use in a room with 7-ft ceilings because the top of the cabinet would be extremely close to the ceiling. The vents or fan tray built into the top panel of the cabinet will be afforded very little space for the heat to escape.

A gap of only a few inches will significantly reduce the effectiveness of a top-panel fan tray from adequately exhausting the heat from your cabinet. Without sufficient ventilation space above a server cabinet, heat will build up inside the cabinet putting all sensitive equipment mounted inside at risk – especially devices mounted near the top.

Furthermore, if that too-tall server cabinet has a solid front door (steel or glass), the enclosure will take on the properties of a kiln. But instead of pottery, the only thing getting fired will be your equipment (and possibly you). So make sure the rack or cabinet you purchase will fit inside its intended room and have adequate space above it for heat to escape.

After verifying that a cabinet or rack will fit into the room where you want it, you must confirm that it can actually get to that room. This requires measuring the height (and width) of every pathway in your building through which the rack must travel before reaching its final destination. Start by checking the height of the

entrance to your building. Then measure the height of every doorway, hallway, and elevator the rack will pass through - being mindful of any obstructions hanging from the ceilings (i.e. sprinklers, exit signs) that reduce the passable height of certain pathways.

When measuring the pathways in your building, be sure to add at least 4" to 6" to the rack's External Height to account for the shipping pallet and the protective packaging used to safeguard racks during shipping. If the extra height from the pallet or packaging presents a problem, remember that most full-size cabinets (and some 4-post racks) come with casters. So you can always remove the pallet to reduce the overall height by several inches, and then wheel it to its destination. But always use at least two people

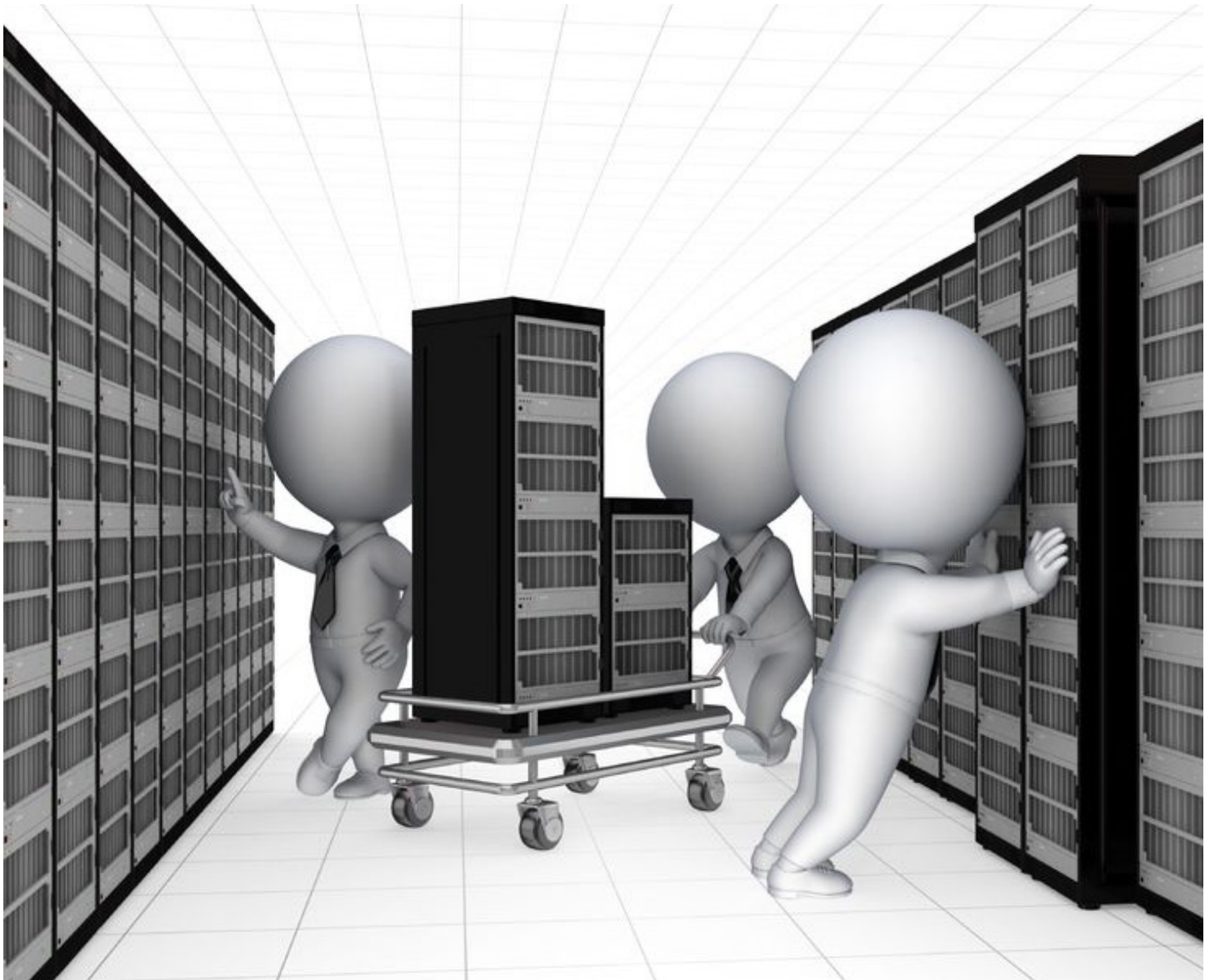


when rolling a cabinet through your building to prevent it from tipping over— especially as you traverse floor obstacles like door jambs and elevator entrances.

If you determine that your building’s pathways are just too short to allow a full-size cabinet to pass through them, you have two choices: The first is to purchase two shorter cabinets that collectively offer the total available rack space you need. But the better choice is to purchase an unassembled full-size server cabinet - often called a knock-down or flat-pack cabinet – because it can easily be carried through your facility and assembled in the room where it will reside. While knock-down cabinets do require assembly, they

are relatively easy to build and are almost always preferable to several small cabinets.

There is a third option that should never be attempted when your building pathways are too short to allow a full-size cabinet to pass through them: Trying to carry the cabinet horizontally through your facility. Even if you can find enough people to carry one, full-size server cabinets can weigh over 400-lbs empty and were not structurally designed to be transported horizontally...or carried. Attempting to do so could result in a bent rack, and a sore back.



BUYER'S TIPS: CALCULATING YOUR EXTERNAL HEIGHT REQUIREMENTS

Make sure...

1. There is sufficient space between the top of the cabinet and the ceiling for ventilation.
 2. The rack will fit through every pathway from the building entrance to its destination.
 3. You consider an unassembled, flat-pack cabinet if an assembled one won't fit through your building pathways.
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PART 3

INTERNAL WIDTH

If you are a technology industry old-timer like me, then you remember when data and telecommunications/ telephony networks were not only managed by two different departments within companies, but were separate industries governed by different sets of standards - with almost no cross-over between the companies who manufactured equipment for each industry. That is why the old PBX phone systems were designed to mount on racks with 23" or 24" wide mounting rails, while data equipment was made for 19-inch rails.

But once the Data Networking and Telecom industries merged into what is now collectively called the IT industry, the Electronics Industry Association defined an equipment mounting standard for all new data and telecom equipment (the EIA-310-D standard) based on racks having 19-inch wide rails (with hole-to-hole centers measuring 18.3"). While this standard applies to all new rack-mountable equipment, there are still lots of the large, legacy phone systems in use that will not fit in 19-inch rails. The existence of those legacy devices is the only reason why Internal Width is still a dimension requiring any consideration.

If you manage the IT equipment for a single location, then you probably already know if you have any legacy equipment that is too wide to mount in 19-inch rails. But for those IT professionals who are responsible

for the equipment and systems in multiple locations, unless you have a detailed equipment inventory for every one of your remote facilities, it would be reckless to purchase a new equipment rack for a remote site without knowing if they have any wide, legacy hardware.

If your company does not have a detailed IT equipment inventory for each of your remote locations – one that includes the physical dimensions of every piece of IT and networking equipment that needs to be rack-mounted - then you do not possess enough information to order a new rack or cabinet. At least not with any degree of confidence that it will meet the needs of your remote office(s).

While the number of extra-wide rack-mount Telco devices still in use are decreasing steadily every year, they are still out there. So before assuming anything about the kind of equipment being used in your remote facilities, contact those sites to find out. Otherwise you take the risk of ordering a rack with the wrong internal rail width

[Please Note: If your company doesn't have IT Asset Inventories for all of your remote locations, call Tech Service Today. We can dispatch skilled IT technicians to any site and document your technology equipment for you.]

BUYER'S TIPS: CALCULATING YOUR INTERNAL WIDTH REQUIREMENTS

Consult your IT inventory to determine the width of every device that will be rack-mounted. If you do not have an equipment inventory, then measure the devices yourself - or ask someone to do it for you if you are buying a rack for a remote site. If none of your equipment requires 23" /24" rails, choose any rack with 19-inch rails.

PART 4

EXTERNAL WIDTH

IT professionals often assume the external width of every EIA 310-D standards-compliant cabinet and rack is relatively close in size because they all have 19-inch mounting rails inside. But that is untrue. The external widths of rack-mount enclosures can range from 20" – 32".

Despite having the same internal rail width as every other rack-mount enclosure, a cabinet with an external width of 32-inches has almost 6-inches of extra space between each side panel and the mounting rails than you would find in a 20-inch wide cabinet. The purpose of all this extra room is for SPACE – a self-coined acronym I came up with to describe any area designed specifically for Securing Power And Cabling Efficiently.

When working with 2-post or 4-post **open** racks, cables are much easier to manage than with rack-mount enclosures because you can attach any size cable manager to them without being constrained by the space limitations imposed by the doors and side panels found on cabinets. While there are a dizzying number of vertical and horizontal Cable Manager styles and sizes to choose from for an open rack, those options decrease significantly when you need to manage cables inside a cabinet. And the size and type of cable manager you choose may actually dictate the minimum external width – or depth – of your cabinet, depending on whether you prefer managing cables in front of/behind the rails, or off to the sides. (Considerations for cable managers' impact on cabinet depth are addressed in the next two sections.)

Before divulging how cable managers can influence the width of the cabinet you choose, it is important to explain why cable management is even a topic of importance within this Buyer's Guide.

For years, IT professionals have used programs like Viso and AutoCAD to create design drawings of their new racks and cabinets. And in almost every drawing I have seen, they included every piece of hardware they



planned to mount in their rack...but not a single cable.

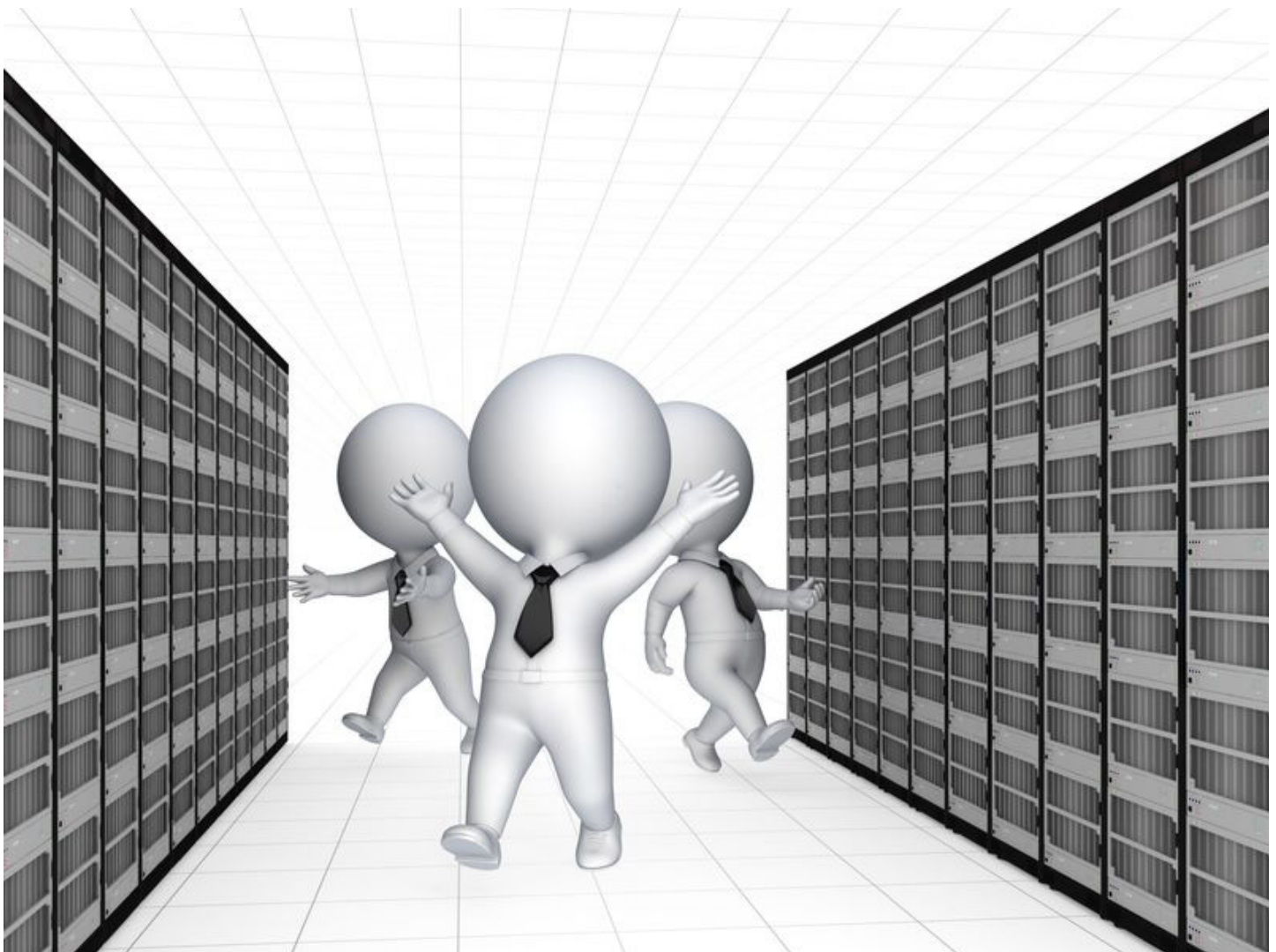
Granted, it is difficult to include power cables and data cables in a rack drawing. But when the cables are out of sight, thoughts of Cable Managers are often out of mind. And if cable managers are not among the items you review when defining the required dimensions of your new cabinet or rack, then you are overlooking the one item that can change your size requirements more than any other.

Historically rack-mount cable managers were designed with rings or channels (which hold the cables in place) projecting out from the face of the cable manager, thereby having a significant impact on the depth of the cabinet required. While these front-facing cable managers efficiently prevent cables from blocking access to the front and back of rack-mount

equipment, in some high-density environments there are just too many cables to fit in traditional cable rings. It is these environments where an extra-wide cabinet is an ideal solution because the large bundles of cables can be managed through ample side-channels where they will not interfere with, nor obstruct access to, the vertical mounting rails.

So how do you determine your external width requirement for a new cabinet? If you need a cabinet to house a couple servers, a switch, and one or two patch panels, and you plan on using traditional rack-mount cable managers (that can accommodate 24-48 patch cables easily), then look for a narrower rack-mount enclosure – which are often marketed as **Server Cabinets**. The External Widths of most server cabinets range from 20" -26" (with the de facto standard being 24-inches because that's the size of the removable tiles in raised floors).

Conversely, if your new rack-mount enclosure will contain lots of patch panels and switches (meaning lots of cables), then your goal is to look for a wider cabinet – which many manufacturers market as **Network Equipment Cabinets**. Equipment cabinets usually have exterior widths between 26" -32" (still with 19" mounting rails) which provide enough extra SPACE between the vertical mounting rails and the side panels for an abundance of cables, cable managers, and even vertical PDUs (power distribution units).



BUYER'S TIPS: CALCULATING YOUR EXTERNAL WIDTH REQUIREMENTS

Determine How Many Cables Your Rack Will Hold. Do this by counting the data ports on every rack-mount device. Add one more cable for every powered device (or two for any equipment with redundant power supplies since they will have two power cables). If you will have a small number of cables (<50), look for a 24" wide server cabinet.

If your cabinet will house high-port count devices like patch panels and switches with Lots of Cables, lean toward a wider equipment cabinet (ranging from 26" – 32" wide). If you want to install cable managers inside the side panels, but don't know what size you need, use the Cable Diameter chart in Part 9 to calculate the minimum diameter of the cable channel that your cable manager must provide.

PART 5

INTERNAL DEPTH

When selecting a new rack-mount enclosure, one of the most critical measurements is the Internal Depth. If you choose a cabinet with the wrong Internal Depth, you will almost certainly need to return it. Fortunately, the method for determining your internal depth requirement is relatively simple.

Start by finding the deepest piece of equipment you plan to mount (usually a server or UPS) and measure its depth. Then add 4" - 6" to that number to account for the space that the cables connecting to the front and/or back of that equipment will require (to prevent exceeding their maximum bend radius). While this number represents your Internal Depth requirement, you should not start looking for a cabinet with at least that much internal depth yet because there is more to be considered.

IT professionals often confuse a cabinet's Internal Depth with the **Maximum Mounting Depth** - the latter being the distance between the front and rear sets of rails when they are set at the furthest points to the front and back of the cabinet. While the difference between these two figures may be just a couple of inches in some cases, there are many cabinets on the market whose internal depth exceeds the maximum rail mounting depth by as much as 12-inches. Understanding how both measurements impact your cabinet decision criteria is critical to selecting the right product.

Let's say you just purchased several new servers that are 32-inches deep, and you are shopping for a 42U server cabinet in which to mount them. You find a cabinet with an external depth of 38" and an internal depth of 35". Certainly 35-inches is deep enough

to accommodate the 32-inch deep servers, right? Surprisingly, the answer is often NO.

While the cabinet's internal dimensions confirm that the servers will physically fit inside, you need to determine if the rails will extend to the depth of 32-inches so the servers can mount at all four corners. It is important to point out here that most server manufacturers offer mounting brackets that allow their servers to be mounted on rails whose depth is set at 1-2 inches shallower or deeper than the server. In this case, the manufacturer's maximum rail depth is only 29" - several inches shallower than the servers. Unless the server's mounting brackets extend at least 1-inch beyond the physical depth of the server, you will not be able to mount your servers in that cabinet.

The same might be true when your servers are a little deeper than a rack's mounting rails. While you may not be concerned with the aesthetic appearance of the servers protruding out beyond the face of the mounting rails, it could be a problem if you purchase a rack-mount enclosure because the server (or the cables attached to it) may prevent you from closing the doors to your cabinet.

In summary, you need to know both the Internal Depth and the Maximum Rail Mounting Depth of any rack before you order it. Since the difference between those measurements can vary from 2"-12" from one manufacturer to another (and sometimes between two cabinets from the same manufacturer), it is imperative that you capture both measurements before ordering a cabinet. If the maximum rail depth is not listed on the specification sheet for a cabinet you are considering, then contact the manufacturer and ask for it.

BUYER'S TIPS: CALCULATING YOUR INTERNAL DEPTH REQUIREMENTS

Take the depth of your deepest piece of equipment and add 4"-6" (to account for cables). This is your Minimum Internal Depth Requirement. Find a cabinet at least that deep. Your deepest piece of equipment must get mounted on all four rails. So the cabinet you choose must have a Maximum Mounting Depth equal to, or greater than, your equipment depth. If the Max. Mounting Depth isn't in the cabinet specs, call the Manufacturer.

If you have a variety of servers with different depths, you can still 4-point mount all of them. Just ask the Cabinet manufacturer to install a third set of vertical rails in your cabinet. While the front of the servers will all mount on the front rails, the back of the shallow servers will mount on the middle rails, while backs of the deeper servers will mount on the rear rails.

PART 6

EXTERNAL DEPTH

While determining the required External Depth of a new rack-mount enclosure may seem like a no-brainer, there are actually several factors to be considered before selecting a cabinet. Let's start with the space surrounding the cabinet, meaning the physical environment where you plan on storing the cabinet. If you are adding one new cabinet to a row of others in a data center, then matching the external depth of the new cabinet to the existing ones may be your only concern. But if the new cabinet will be placed in a smaller space - like a Telecom closet, IDF, or a site manager's office - then you need to evaluate the space outside the cabinet.

As mentioned in Part 2, it is not enough to select a room inside which your new cabinet will physically fit. The room must offer adequate space around the cabinet so the front and rear doors can be opened. Additionally, there must be enough room for a human being to not only move around the cabinet's perimeter, but also mount the equipment and cabling inside the cabinet, and perform moves/adds/changes & troubleshooting.

That extra space outside the cabinet also allows air flow so high-speed switches and servers will not overheat. If you decide to store a cabinet in a small closet, make sure the room either has its own dedicated HVAC system (temperature controls), or you purchase some type of portable cooling device like Tripp-Lite's SmartRack Portable Server Rack Cooling Unit for the room. The best internal equipment cooling fans in the world will not save your servers from frying if there is no system in place to cool the air inside that room.

The second consideration when evaluating the External Depth of a new cabinet has nothing to do with the area outside the cabinet, but rather how much extra space you have inside. You are probably asking yourself "isn't that extra space inside a cabinet part of the internal depth?" In short, it is. But savvy IT professionals need to know exactly how much extra depth a cabinet offers behind the rear mounting rails because that is one of two ideal places to mount vertical cable managers and PDUs (the other being inside the side panels, as discussed in Part 4). To determine exactly how much extra depth a cabinet will provide for cable managers and PDUs, just subtract the maximum rail depth from the external depth of the cabinet.

The practice of using zero U vertical cable managers and PDUs inside the back of cabinets is common because it frees up valuable space on the mounting rails for equipment and servers while also keeping all the cables off to the sides where they won't get tangled (a condition that frequently results in accidental disconnects) or obstruct access to the face of equipment and/or airflow. So, the depth of a cabinet is often dictated by how many users/cables your network has, and whether or not you plan to use large-channel vertical cable managers and/or vertical PDUs. As the number of cables and cable managers goes up, so should the depth (and/or width) of your cabinet.

Keep in mind that several cabinet and rack manufacturers are now offering 48-inch deep rack-mount enclosures to provide the extra depth that IT professionals require in high density environments. Since the maximum rail depth of those cabinets are typically 40-inches or less, they provide ample space behind the rear rails to keep even the most cable-intensive networks organized and out of the way of your equipment.

BUYER'S TIPS - CALCULATING YOUR EXTERNAL DEPTH REQUIREMENTS

- Cabinets intended for small spaces (like a closet or IDF) must have an external depth that will fit in its designated space and offer sufficient room around it for the free, unobstructed opening and closing of the front and rear doors.
 - The external depth of a cabinet must not be so deep that it prevents a person from moving freely around it or prevents them from accessing, installing, and removing equipment through the front and rear doors.
 - Choose a cabinet whose external depth is at least 4"-6" deeper than the deepest piece of equipment you plan to mount so that cables connected to equipment will neither be forced to exceed their allowable bend radius nor obstruct proper closure of the front and rear doors.
 - If you plan to mount vertical PDUs or large-channel vertical cable managers behind the rear rails, make sure the cabinet has the depth needed to accommodate those after the vertical mounting rails have been set to their desired depth.
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PART 7

DOOR TYPES FOR RACK-MOUNT ENCLOSURES (CABINETS)

This section addresses the various types of doors available for rack-mount enclosures/ cabinets to help IT professionals determine which doors will best meet their needs. While types of rack doors are not exactly a measurement (as all previous sections of this guide have been), they do warrant serious consideration when choosing a new cabinet.

There are three basic types of doors that most rack-mount enclosure manufacturers offer: **Steel** (solid and vented), **Glass** (tempered or Plexi), and **Mesh**. While still considered the best solution for housing lots of patch panels and other passive equipment used in large networks, cabinets with Solid Steel Doors are far less common than those with Glass or Mesh doors because they do not provide adequate ventilation (making them a poor choice for storing sensitive electronics), and they prevent the visual monitoring of the equipment inside (unless a door is opened).

Cabinets with glass front doors are the most visually appealing option because they offer clear visibility into all the equipment mounted inside. When placed in high-profile areas where there is lots of foot traffic, cabinets with glass doors enable companies to showcase their technology in the most aesthetically pleasing way. But there is a down-side to enclosures with glass front doors.

Whether glass or steel, any solid front door on a cabinet severely restricts air flow. Ignoring this can be a costly mistake when the cabinet will contain servers and other sensitive network electronics. While there are rack-mount fans and blowers that, when laid out strategically, can provide the air-flow and cooling needed to prevent equipment from overheating, they rely on empty spaces being left above that equipment. So, when planning a high-density solution wherein electronics and servers will occupy every U of space on

your rails, the best choice is a cabinet with a Mesh front door.

While my definition of a steel Mesh door is clear and specific, be forewarned that some rack and cabinet manufacturers use the term mesh loosely to mean any door through which a lot of air can flow. This includes doors that I would describe as perforated steel doors, which are merely a steel door through which hundreds of holes have been punched. So make sure you know exactly what you are getting when ordering a cabinet. This means doing more than looking at a picture of a cabinet because those photos often represent the base model of a customizable product line. If you custom-configure an enclosure, make sure you review all the specifications to confirm that what you see is a true representation of what you get.

While we discussed the impact of environmental space restrictions to the external dimensions of cabinets in previous sections, it is equally as important to consider how those space limitations may influence the doors you choose for your cabinet. When a cabinet will be in a large, open environment, then there is ample room to swing the front and rear doors open without any obstructions. But full-size front & rear doors can be problematic in small spaces.

If your cabinet will be placed in a telecom closet with limited space or in a small data center where it will be situated relatively close to a wall, then look for a cabinet with split-rear doors. Because split rear doors are only half the width of a full-size door, you need far less space to open them. For extremely tight environments, you may want to consider a cabinet with a split front door too.

In addition to single, full-size doors, and split, half-width doors, a third flavor of doors exists in which several short, full-width doors appear on one face of a

cabinet. This gives the illusion that several small rack-mount enclosures have been stacked on top of one another.

These multi-door enclosures - or co-location cabinets, as they are branded by several rack manufacturers - typically have two, three, sometimes even four separate doors on both the front and back. Each door provides access to a single compartment within the cabinet. Since each compartment prevents access to adjacent ones above and below it, co-location cabinets are the perfect solution for multi-tenant buildings wherein each tenant's network equipment is housed in a shared space, inside a secure portion of a shared cabinet.

As you should now understand, there are far more types and sizes of doors for rack-mount enclosures than most IT professionals realize. It is our hope that this segment enables you to be a more discerning, knowledgeable buyer the next time you are in the market for a new network equipment or server cabinet.



BUYER'S TIPS: CHOOSING CABINET DOORS

- If your cabinet will house lots of servers and other sensitive network electronics, always choose a cabinet with mesh front and rear doors.
 - If your cabinet will be used primarily for passive equipment like patch panels and switches (and not for servers), choose whichever doors you find to be the most aesthetically pleasing.
 - If your cabinet will be placed in a tight space (i.e. a closet, IDF, or store manager's office), choose one with split-rear doors (and split front doors if necessary) to reduce the amount of room needed to open the doors and access your equipment.
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PART 8

WHAT'S INCLUDED (OR NOT) WITH YOUR CABINET

In Part 7 we reviewed the various types of front and rear doors available for rackmount enclosures and offered guidance for choosing the type that best meet your needs. But there are a few other door-related feature questions that you need to ask yourself when choosing a network equipment or server cabinet.

The first is: **Are the doors removable?** In some situations, you may want to remove the doors from a cabinet. For example, when you are first mounting all your servers and/or equipment inside you may just want the doors out of the way. Or perhaps you've decided to set up a cabinet in a locked room or closet and there is no need for the additional layer of protection or security afforded by the cabinet doors. Either way, you may find it advantageous to have the option of removing the doors if the need ever arises. So, if the product specifications do not clearly indicate whether or not the doors are removable, then ask the manufacturer.

The next question to ask is: **Are the front and/or rear doors reversible?** Why would this matter? Let's say the cabinet is going into a small telco closet/IDF that has an entry door offset to the left of the room. If the cabinet will sit in the center of the closet, it may be difficult to open the door to your cabinet - or get around the door to access your equipment - if the cabinet door swings open to the left. By choosing a cabinet with fully-reversible doors, you can always switch the side of the cabinet on which the door hinges to suit your preferred side of access to the cabinet.

What kind of locks do you prefer on the doors? Most rackmount enclosures come with locking doors. But did you know there are a number of different lock-types from which you can choose? The most common type of cabinet door locks are the traditional **key locks**. When choosing key lock, find out whether all locks are keyed the same (so that one set of keys will open every cabinet) or if they are keyed differently (which requires

you to keep track of lots of different sets of keys).

Beyond the popular key locks, most cabinet manufacturers also offer optional **push-button combination locks**, hasps (which allow you to attach your own padlocks), and even **electronic and biometric locks**. Make sure you think about which method of security and access best meets your needs, and then choose a cabinet that offers the kind of locks you desire.

When contemplating the topic of security and access into your cabinet, the doors aren't the only option you need to consider. **Are the cabinet's side panels removable and/or lockable?** If you are planning to mount PDUs and/or cable managers to the sides of your front and rear vertical mounting rails, the easiest way to install them is by removing the side panels. So it is important to determine whether or not the cabinet you are planning to purchase has removable side panels. Additionally, if the side panels are removeable but not lockable, then you probably shouldn't bother putting locks on the front and rear doors because any unauthorized person who wants to tamper with your



sensitive network equipment can easily do so by removing the side panels.

It is also important to consider the mobility of your rackmount enclosure. **Does the cabinet come with Casters and/or Leveling Legs, or are they sold separately?** If you need to move your cabinet through your facility before it reaches its final destination, or if you occasionally need to relocate cabinets, then casters are a necessary option. And if your floors are not level, leg levelers are a critical, necessary accessory to have.

While most racks & cabinets being manufactured today have M6 mounting rails (meaning they have square holes in the vertical mounting rails), there are still some with traditional round, threaded holes (typically 10/32" or 12/24"). As a rule of thumb, if you will be mounting any servers in your rack, then choose one with M6 rails. (You can use a cage nut to convert a square M6 hole into a round one. But it's almost impossible to convert a round threaded hole into a square one.)

Finally, while you can always order them separately, try to find out whether or not your new cabinet comes with **mounting hardware** like M6 cage nuts and mounting screws. Every cabinet manufacturer has their own set of accessories that they either include or sell separately - or do not offer at all. So before you order a cabinet, make sure you know exactly what IS and what IS NOT included.

BUYER'S TIPS – DETERMINING WHAT IS (IS NOT) INCLUDED

If the specifications you find online for a rack-mount enclosure do not clearly indicate exactly what is - and what is not - included with a cabinet, just ask the manufacturer. Remember that just because the picture on the website shows side panels, doors, and locks on a cabinet does not mean that they are always included. As a buyer, it is your responsibility to make sure you know what you are buying before you place an order.

PART 9:

ACCESSORIZING YOUR NEW RACK OR CABINET

The goal of this Buyer's Guide is to educate IT professionals on the importance of every dimension of network racks and cabinets, and offer best practices for determining your exact size requirements before ordering a new rack.

While "accessories" are not a size or dimension of racks & cabinets, they are important items to include in your evaluation process - especially when considering a rack that offers proprietary accessories (like cable managers, fans, and specialty PDUs). That is why this last part is dedicated to the optional items that IT professionals should consider carefully - but all too often don't think about - when shopping for a new cabinet or rack.

Whether you are shopping for a new 2-post rack, 4-post rack, or a rack-mount enclosure to house your networking equipment and servers, it is important to give serious forethought to the most commonly used rack-mount accessories – specifically the optional accessories that are not typically included with a new rack or cabinet. Among the most frequently forgotten, yet necessary components of any well-designed rack-mount solution, are the **Cable Managers**.

Every day CIOs and IT professionals generate rack design drawings for new equipment rooms and data centers, and claim that their plans encompass everything that will go into their racks. But the one item missing from nearly every rack design drawing are cables. When questioned about this apparent oversight, many claim that it is too difficult to incorporate cables into the drawings – especially since no one offers Visio or AutoCAD stencils of cables (even though most manufacturers have drawings for everything else). But as the old "out of sight, out of mind" adage purports, when the cables are not shown on the design drawing, the products needed to organize and manage them are often forgotten.

Every piece of rack-mount equipment requires data cables to provide network connectivity, and power

cables to run them (with the exception of passive devices like patch panels). If you fail to incorporate cable managers in your new rack plans, then you will probably end up with a rack similar to those featured every Friday in Tech Service Today's IT Disaster Of The Week photo blog.

When shopping for a 2- or 4-post open frame rack, you typically find optional **vertical cable managers** – or Cable Channels – available that span the full height of the rack. You can also choose a generic solution like slotted duct raceway that can be cut-to-size to fit most the height of almost any open frame rack. But because cabinets are enclosures with side-panels covering the space where the full-size cable channels get mounted on open racks, vertical cable managers for cabinets are usually not one long, contiguous piece, but rather a sequence of rings or hoops.

Vertical cable management rings allow you to organize your cables and prevent them from blocking access and visibility to the face of your equipment. To minimize the possibility of electromagnetic interference (EMI), consider mounting vertical cable rings down both of the rear rails of a cabinet. By doing so, all of the power cables can be routed through the rings on one side while the data cables can be run through the rings on the opposite side.

If your new rack will house any high-port-count data equipment like patch panels and switches, a **horizontal cable manager** should be positioned directly above or below that equipment. Ideally you should consider mounting smaller horizontal cable managers both above and below the equipment so that the cables connecting to the top-ports can be routed through the cable manager situated above the equipment, and vice-versa. If cables from the top and bottom ports are both routed to a single cable manager positioned above or below the equipment, then it reduces your access to one row of cables and increases the potential for accidental disconnects.

Another critical consideration to keep in mind when choosing vertical and horizontal cable managers for a cabinet is the impact they can have on your rail depth. For example, let's say you have chosen a cabinet that offers a maximum rail depth of 30-inches because your deepest piece of equipment to be mounted are several 28-inch deep servers. Additionally, your cabinet will also house several 48-port patch panels. Because of all the cables connecting to those patch panels, you have chosen some extra-deep horizontal cable managers that stick out 4-inches in front of the front rails.

If you did not move the front rails backward (from their factory default location) when you first set up your cabinet, then chances are good that a 4-inch deep cable manager will prevent the front door from closing. Conversely, if you planned carefully before mounting any equipment, and you adjusted the front rails back 3-4 inches to make room for the deep cable managers, then you effectively reduced your cabinet's maximum rail depth from 30-inches to around 26-27 inches. Because of the reduced mounting depth, your servers may no longer be capable of mounting at all four corners.

BUYER'S TIP for Calculating the Right-Size Cable Managers

The biggest challenge most people face when trying to select cable managers is determining which size cable manager will accommodate all their cables. Using the cable dimensions chart below, multiply the diameter of the types of cables you have by the number of cables you need to manage. Then look for cable management rings/channels whose inside diameter is large enough to accommodate the total square inches of space that your cables require. It is also a good idea to leave yourself a little wiggle room, and room for future growth (additional cables).

Cable type	Diameter
Category 5e	0.28"
Category 6	0.32"
Category 6a	0.34"

EXAMPLE: A cable manager with 3" rings will hold approximately 100 Cat5e Cables.

In addition to cable managers, there are a number of other rack accessories that should be considered before placing an order for a new cabinet or rack. For starters, are you planning to set up your racks or cabinets side-by-side in a row? Then you should ask the manufacturer for a **Baying Kit** (aka multi-cabinet Joining Kit) to ensure that they can be connected together properly.

If you are planning to mount your new rack or cabinet to the floor or a wall, the hardware you require is rarely something you can purchase from the rack manufacturer. The reason why most rack manufacturers do not include the **wall-/floor-mounting hardware** with their racks is that they would have to include a massive variety of bolts and screws to account for every possible kind of floor and wall (concrete, drywall, raised floors, plywood, plaster, granite, marble, stone, wood, etc.). So write down the dimensions of the floor/wall mounting holes on your new rack and take them to your local hardware store where they can guide you toward the appropriate hardware for your walls/floors.

In addition to purchasing the hardware needed to mount your new rack or cabinet to the wall or floor in your facility, you should also make sure you have an ample supply of **equipment mounting hardware**. While 12/24 or 10/32 mounting screws are often included with whatever rack-mount equipment you purchase - and sometimes with the racks themselves - they are easily lost.

It is also important to note that most 4-post racks and cabinets being made these days feature M6 rails which have the large, square mounting holes. While the M6 holes are exactly what you need to mount most servers, your other rack-mount equipment was likely designed to mount on threaded rack rails (meaning smaller, round holes). To mount that equipment on M6 rails, you need M6 Cage nuts which effectively turn those square holes into round ones. Regardless of the type of rails you get with your new rack, always make sure you have a plentiful supply of the screws and/cage nuts needed to secure all your rackmount equipment.

The last type of rack accessories warranting serious exploration are **Power Distribution Units (PDUs)**. Companies like APC and Tripp Lite have countless standalone and rack-mountable PDUs to choose from, as well as Uninterruptible Power Supplies (UPS). The simplest means for determining your PDU requirements is to start by counting the number of rack-mount devices that require power - remembering that devices with redundant power supplies will require two outlets. Once you have calculated how many outlets you need, answer these questions:

1. **Do you want an on/off switch on your PDU?** While a power switch allows you shut off power to all connected devices simultaneously, it also serves as a potential point of catastrophic failure because accidentally flipping the switch can take your entire network down.
2. **Do you want a Basic, Metered, Monitored, Switched, or Dual-Circuit PDU?** To better understand the differences between each type, Tripp Lite offers a great overview of each.
3. **Do you need Surge Protection on the power strip or PDU?** In most cases, you will not because your PDU will likely be plugged into a UPS. But if you are not using a UPS, then a PDU with built-in surge protection is a worthwhile investment.
4. **Do the power plugs from every piece of rack-mount equipment match the type of outlets/receptacles on the PDU?** APC offers a fantastic Rack PDU Selector tool to help you find a PDU with the right outlets and sufficient power to support all the devices you want to connect.
5. **Do you want the outlets/receptacles on the front or back of the PDU?** Regardless of whether you plan to mount a horizontal PDU or power strip on the front or rear rails, there are many reasons why some IT professionals prefer outlets on the front or back of their power strips. For example, power cables are thicker than data cables, and therefore have a lower allowable bend radius. That means they will stick out further than your data cables. If those power cables are on the front of your rackmount power strip/PDU, it could prevent a cabinet door from closing. Additionally, front-outlet

power supplies require the data cables to be placed nearer to the data cables in your cabinet or rack, increasing the possibility of EMI. In these cases, a PDU with outlets on the back is a better choice.

6. **Do any of the power cords for your rack-mount equipment have the big power-block transformers on the plug end?** The big block transformers at the end of some power cords are a source of frustration for almost every IT professional because the outlets on most PDUs are spaced so closely together that the power bricks block access to the outlets on either side of the one into which they are plugged. If you have run into this situation, do not go out and purchase another PDU. Consider purchasing a short AC power extension cord/cable which can plug into your PDU without blocking adjacent outlets (with the transformer block plugging into the end of the power cord). gets plugged into the female end of the cable, thus restoring full access to every outlet on your PDU. Companies like C2G, Tripp Lite, and Black Box offer these power extension cables in lengths of 1-foot or less to keep this outlet-saver solution clean and neat.

A final note about PDUs. Most manufacturers of rack-mount enclosures (cabinets) now offer server cabinets with built-in PDUs - usually situated off to the side of the vertical mounting rails or inside the back frame of the cabinet (beside the rear door). These non-traditional, "zero U" rack power supplies are increasing in popularity among IT professionals because they eliminate the need for PDUs to occupy any of the valuable space on their mounting rails. So check with the manufacturer of your rack or cabinet to see if they have optional PDUs that you can consider.

BUYER'S TIPS – RACK-MOUNT ACCESSORIES TO CONSIDER

- Vertical and Horizontal Cable Managers
 - Cabinet & Rack Joining Kits and Hardware for Wall/Floor Mounting
 - Equipment Mounting Hardware
 - Power Distribution Units (PDUs)
 - Rackmount Fan Trays and Filler Panels
 - Patch Panels
 - Ladder Rack
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SUMMARY FROM THE AUTHOR

We hope the knowledge and suggestions offered in this document will help IT professionals everywhere become more confident, informed buyers of racks and rack-mount enclosures. Should you ever need help setting up a new rack or cabinet, or mounting your equipment and cabling in your racks, contact Tech Service Today for the fastest, most reliable on-site technical services available in North America.

Tech Service Today is not a manufacturer or reseller of racks or cabinets. However, we are uniquely qualified to offer our expert advice because our technicians service IT equipment and networks at thousands of customer locations every year. Our 20,000 skilled technicians install, troubleshoot, repair/replace, and even decommission racks & cabinets, and every kind of IT equipment imaginable including network cabling & hardware, telecom/phone systems, PCs/servers/printers, and Point of Sale, Digital Signage, sound/security, and audio/video systems.

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