Episode Book

EPISODE #5907

Rackmounting a Desktop: Size, Cases, and the Swap

PUBLISHED	12 October 2026 at 14:07 UTC
DURATION	23:55
LISTEN	myweirdprompts.com/episode/rackmount-desktop-conversion-guide-50825/
HOSTS	Corn, Herman, Hilbert
SCRIPT MODEL	deepseek-flash
VOICES	chatterbox-regular (chatterbox-local)
PIPELINE	V5.4
SOURCES	16 cited by the research (listed at the end)
BOOK GENERATED	19 October 2026 at 17:41 UTC

SYNOPSIS

Daniel has a working desktop and an empty 4U slot in his rack, and wants to know what it actually takes to move one into the other. This episode works through the whole procedure: how rack units define your envelope (and why "4U" doesn't mean seven inches of usable room), why depth is the unstandardized dimension that sinks builds, and which three measurements — cooler height, GPU height and length, PSU depth — decide whether your parts come across. Then it's on to chassis selection: why workstation cases like Sliger, SilverStone, and Rosewill exist separately from server chassis, what to check before buying, and the real-world build logs where a Noctua NH-D15 turned out to be five millimeters too tall. If you've got a tower under the desk and an empty slot in the rack, this is the sizing conversation to have before you spend anything.

TRANSCRIPT



Corn

Okay, I'll say it straight out. I have been waiting for this one.



Herman

You have not.



Corn

Since the rack episode. The one where we talked about whether anyone should rack-mount a desktop in the first place. Half the people listening went and bought the rails and then had nowhere to put them.



Herman

And now Daniel wants the actual procedure.



Corn

Daniel's question is straightforward. He has a working desktop. He wants to know what it would take to move it, physically, into a nineteen-inch chassis. How do you work out what size you need, how do you pick a case that will actually accept your parts, what does the transplant itself involve, and what does it cost you in money and in an afternoon.



Herman

And he's asked specifically for build logs. Real people, real parts lists, not vendor copy.



Corn

He also asked us to skip cable lengths and peripheral extension, which we did already.



Herman

Noted. Physical hardware only.



Corn

So for anyone sitting with a tower under a desk and a rack in the corner with an empty four-U slot in it, this is the episode.



Herman

Start with the unit itself, because everything hangs off one number. One rack unit is one and three-quarter inches of vertical space. Forty-four point four five millimetres if you like the spec sheet.



Corn

And the width.



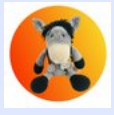
Herman

The width is the part people assume is the whole standard. Nineteen inches across, four hundred and eighty-two point six millimetres, and that is fixed. It's why every case in the world bolts into every rack in the world, whatever they weigh or cost.



Corn

So two U is three and a half inches. Four U is seven.



Herman

Seven inches of faceplate. And here's the thing that catches people on their first purchase: the usable space inside a four-U case is nothing like seven inches tall, because the board sits on standoffs, there's a power supply, there are drive cages. Kingston make the point in a build guide that the usable internal space shrinks once you account for everything else in there. Seven inches is the envelope. It is not the room.



Corn

How many units for an ordinary machine, then?



Herman

For most desktops it lands at two, four, or five U. Four is the sweet spot. That's where a normal ATX board, a full-length graphics card and a decent air cooler will all fit without you having to make a decision that hurts.



Corn

And below that?



Herman

Below that it stops being a transplant and starts being a rebuild. Two U is a specialised place. You want low-profile cards and a compact power supply, and Jeff Geerling's write-up is the honest version of that. He moved his PC into his rack in a two-U case and had to give up his 3080 Ti for an RTX A2000. That's the trade, and he took it with his eyes open. He also noted the CPU and board end up fighting for air on the far side of the case, and that a chip above roughly a hundred watts is going to throttle in there.



Corn

Three U?



Herman

Restrictive. Particularly if you've got an E-ATX board or a tall air cooler. And three U is where people get burned, because it looks so reasonable on a spec sheet.



Corn

There's a forum line about that, isn't there? Someone on Level1Techs.



Herman

A user called regulareel, and it's the best warning on the subject. Don't be like me and get a three-U without double checking the GPU clearances. Now I have a three-U occupying a four-U slot.



Corn

So the case is the wrong size and the rack is paying for it.



Herman

The slot is gone either way.



Corn

Depth next. Because the depth is where this stops being a standard.



Herman

Height and width are standardised. Depth is not. It varies per chassis, and you have to check it per device. Computer Hope's own table lists one-U enclosures at seventeen point seven inches deep, nineteen point seven, and twenty-one point five. Three different depths, all of them one U.



Corn

Same height, same width, three different cases.



Herman

And four U is the same story. Seventeen point eight inches, or twenty-six point four. That's an eight-inch spread on a case with the same model designation. So when someone asks how deep a four-U is, the honest answer is: which one?



Corn

Why does it matter in practice?



Herman

Because your rack has fixed posts and a fixed cable-management zone, and neither of those moves when you buy a case. There's a build log from a person running the Sliger CX4200A who measured his own rack: from the end of the front posts to the far back of the cable management area, twenty point five inches of usable depth. The case is specified at nineteen point eight nine. He said in reality it should just be called twenty. Tight, but it works.



Corn

Half an inch of margin on a machine full of cables.



Herman

And Sliger will sell you the same four-U in fifteen inch, seventeen inch, and twenty inch depths, precisely so you can match it to what you actually have. That's not a marketing choice, that's an admission that depth is the thing people get wrong.



Corn

So the first purchase isn't the case. The first purchase is a tape measure, and the first step is measuring the rack.



Herman

Measure the rack before you measure the computer. If your rack is a twelve-U open frame sitting in a cupboard, none of this matters and you can buy whichever depth you like. If it's an enclosed cabinet with a door, depth is now the whole project.



Corn

And once you know the rack, you measure the machine.



Herman

Three measurements decide everything. The CPU cooler's height. The graphics card's height and length. The power supply's depth. Those are your binding constraints, and the cooler is the one that kills builds.



Corn

Give me the number.



Herman

Four U gives you a maximum CPU cooler clearance of about a hundred and fifty-eight millimetres. Sliger's own four-U pages list air coolers up to a hundred and fifty-three millimetres tall. So call it a hundred and fifty-five to a hundred and sixty depending on the case and how the side panel sits.



Corn

And a normal tower cooler is what, a hundred and sixty-five?



Herman

A Noctua NH-D15 is a hundred and sixty-five millimetres. Which is why there is a build log out there of a man who bought a Sliger CX4200i, discovered his D15 would not go in, and had to buy a hundred and forty-five millimetre NH-D12L instead.



Corn

The cooler is the tax.



Herman

It's the most common one, anyway. And note the shape of that failure. He didn't discover it while researching. He discovered it with the case in his hands.



Corn

Because people measure the board and the card and assume the cooler is a cooler.



Herman

Right. And it's the biggest object on the board and the one nobody thinks about, because it's been sitting in the same tower quietly for four years.



Corn

Graphics card. Give me the clearance figures.



Herman

Sliger's four-U CX4200a supports graphics cards up to a hundred and fifty-eight millimetres tall and up to four hundred and fifty millimetres long. The shorter seventeen-inch variant takes cards up to three hundred and seventy-five millimetres.



Corn

Four hundred and fifty is longer than most cards anyone owns.



Herman

Length is almost never the problem in four U. Height is, and so is the power connector.



Corn

The connector.



Herman

If your card has the power connectors sticking out of the top of the board rather than the end, that plug and its cable have to live inside the same seven-inch envelope as everything else. That's a recurring four-U problem, and it's a difference of maybe fifteen millimetres deciding whether the side panel closes.



Corn

So a card can be short enough and still not fit.



Herman

Because of a plug. And the cable's bend radius on top of that, which nobody lists anywhere and which you find out about the hard way.



Corn

Power supply.



Herman

Standard ATX supplies are supported by a lot of these chassis. Sliger, SilverStone, Lanberg, RackChoice, Codegen. So if you already own a decent ATX unit, odds are it comes across.



Corn

Odds are.



Herman

The trap is going the other direction. If you buy an actual second-hand server chassis instead of a workstation case, you can end up with a proprietary supply and non-standard connectors. There's a Hackaday build using a SuperMicro two-U chassis where the power supply simply did not have the eight-pin PCIe cable the graphics card needed. He had to do custom Molex work to get a GPU running in it.



Corn

He built a wiring harness to power a graphics card.



Herman

To make a server power a desktop. Which is where the honest advice sits: a server chassis is not a big desktop case.



Corn

Can I put a number on the whole thing? What does the size estimate come out as for the average listener?



Herman

If it's a standard ATX board, an air cooler under a hundred and fifty-five millimetres, a card under three hundred and seventy-five, and an ATX supply, four U is your answer and you can stop thinking about it. If any one of those is bigger, you're moving up or you're changing a part. If the card has a top-mounted power connector, add margin.



Corn

That's the whole sizing problem, and the answer is a tape measure.



Herman

So that's the measurement. Now, what do you actually put the parts into.



Corn

The interesting part is that Daniel asked whether server chassis can take desktop parts, and the answer is partially, which is a more satisfying answer than no.



Herman

Partially, with two clear halves. Standard ATX boards and standard ATX supplies go into a lot of rackmount enclosures without any drama. That is true and it's the reason this hobby exists.



Corn

And the other half?



Herman

The other half is that "server chassis" describes a whole industry built around a completely different set of assumptions. Hot-swap bays, redundant proprietary supplies, non-standard front panel wiring, fans that sound like a leaf blower. Buying one hoping to move a gaming PC into it is buying someone else's design constraints.



Corn

So there's a category for this. Workstation cases.



Herman

There is. Sliger is the one that comes up constantly in these builds, the CX4150, CX4170, CX4200 series. SilverStone make the RM400, the RM42-502, the RM52, the RM23-503. Rosewill do the RSV-L4000U. Singularity Computers do an SC four-U. Then Lanberg, RackChoice, Codegen, Advantech, and OneChassis.



Corn

And they're not rack servers with the badges filed off.



Herman

They're built knowing a human is going to put a graphics card and a tower cooler in them. That's the distinction that matters. Front-to-back airflow, room for a long card, an ATX supply, standard standoffs.



Corn

What do you check, then, once you've picked a shortlist?



Herman

Six things. Motherboard form factor, whether it's ATX, E-ATX, or SSI-EEB. Graphics card length and height. Cooler height. Supply form factor and depth. Drive bays. Fan mounts.



Corn

And the motherboard one isn't as simple as "does it fit."



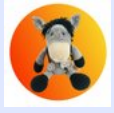
Herman

Kingston make the point that a chassis designed for E-ATX or SSI-EEB will take the smaller formats, because it's built for the biggest board and everything below that bolts in. It doesn't work in reverse. A smaller rackmount case won't take a bigger board, because the standoffs aren't there and neither is the metal.



Corn

You can't drill a standoff into a case and call it supported.



Herman

You can and people do, and then they find out the board flexes.



Corn

Search terms, since Daniel asked for them.



Herman

"Four-U rackmount ATX chassis". "Rackmount workstation case." "Short-depth four-U", if depth is your constraint. "E-ATX rackmount." And "GPU rackmount case", which is what the manufacturers have started calling these, because they know exactly who's buying.



Corn

Now the conversion itself. And I'll say what I think before Herman gets there.



Herman

Go on.



Corn

On paper this is a case swap. Board out of one box, into another. Everything you own comes with you, and the parts list hardly changes.



Herman

That's right, and mostly the hardware does survive it. Geerling kept his board, his memory, his storage, his supply. The CX4200i build kept everything but the cooler. Jay Parry's four-U gaming build kept a six-seven-hundred-K, a GTX 1080, a Corsair AIO and a thousand-watt supply. People reuse their parts. The casualties are the cooler and occasionally the card.



Corn

So the answer to "is this just a case swap" is yes, except for the parts where it isn't.



Herman

It's a case swap with almost no slack in it. And the friction is a design difference, not a bad case. A tower case is two chambers. There's a whole side behind the motherboard tray where cables go and you never look at them again.



Corn

And a rack case?



Herman

One room. There's a build log that says it exactly: with rack cases, you only have one large room to work in. Everything is in that room. The cables, the drives, the airflow. There's nowhere to hide a bundle.



Corn

That's the whole difference, isn't it. A tower is a house with a closet. A rack case is a studio flat.



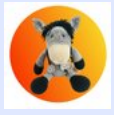
Herman

And some of them are missing things a tower would assume. One builder found his four-U had no rear exhaust fan mounts at all, so he designed and printed his own and put them on.



Corn

He 3D-printed the back of the case.



Herman

Two of them. Then a drive shelf while he was in there.



Corn

The order of operations, then.



Herman

OneChassis set it out step by step and it's the sensible sequence. Power down and disconnect everything. Open the old case and photograph the layout before you touch anything, because you'll want the photograph later. Pull the board, the supply, the drives, the cooling. Then build into the new case in a specific order: board onto the standoffs first, then the supply, then storage, then cooling. Verify the airflow direction before it goes anywhere near the rack. Then a final check before first boot.



Corn

Why the board first?



Herman

Because it's the thing with fixed mounting points and the least room to move. If you fit anything else first you're reaching past it with a screwdriver. And the board goes in at an angle and slides onto the standoffs, which you cannot do with a power supply and a drive cage in the way.



Corn

Cooling last.



Herman

Cooling last, because a hundred and fifty-eight millimetres of metal hanging off the board turns a delicate manoeuvre into a blunt instrument.



Corn

What goes wrong, in the logs.



Herman

The cooler, first and always. The GPU power connector, second. The third one is thermals, and it's the one people don't expect, because they've moved a machine that ran fine in a tower.



Corn

And it doesn't run fine.



Herman

One build log has the CPU hitting ninety-six degrees when the fans stopped. In a tower the same chip was fine. In a four-U enclosure you are dependent on the fans, and there's no thermal mass of dead air to carry you through a stall.



Corn

So the case is a fan-dependent machine.



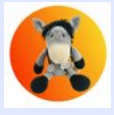
Herman

It's a fan-dependent machine. Which leads us to the workstation side of this, because a rackmounted desktop is still a desktop someone sits at.



Corn

Cooling first, since we're here.



Herman

Front-to-back and nothing else. Kingston's recommendation is three to six hundred-and-twenty-millimetre fans at the front, and a pair of rear exhausts at eighty or a hundred and twenty. Sliger's CX4200a will take up to seven hundred-and-twenty-millimetre fans, so you have room to over-provision.



Corn

And water?



Herman

Closed-loop AIOs are the sensible option and Kingston say as much. A three-sixty radiator is common in four U. Custom loops are hard, and there's a forum voice saying most server cases simply weren't built for water cooling and you might be better off going back to air. He's not wrong for the server-derived chassis.



Corn

Noise. Because a rack is a box in a room.



Herman

It's worse than a tower, and it's worse for a reason worth understanding. A tower has large, slow fans on wide panels. A rack case can end up with small, fast fans in a dense front panel, and small fast fans are loud. Jay Parry's line about this is refreshingly blunt: server fans are very loud. He's talking about stock server fans, but the principle holds.



Corn

Mitigations?



Herman

Bigger case, so four U over two. Quiet PWM fans rather than whatever came with it. A fan curve that doesn't ramp to full at fifty degrees. And sound-absorbing material, which is the last resort because it also costs you airflow.



Corn

Which takes us to the aesthetics point, and I'd like to make it, because it's the bit that gets skipped.



Herman

Go ahead.



Corn

People rack-mount for density and for the way it looks, and that's fine, it's a real reason. But you are paying for it with the two things a tower gives you for free. Cable space and quiet. A tower is a mediocre thermal design with a lot of spare room. A rack case is a good thermal design with none.



Herman

That's the trade.



Corn

It's not a downside. It's the price. It's just better to know it's the price.



Herman

Front I/O, since a workstation means hands. Many four-U cases give you front ports. The Sliger CX4200a has two USB 3.0 Type-A and a USB-C at ten gigabits.



Corn

Which, if you're pulling it out and plugging things in, is the difference between a workstation and a server that happens to have a graphics card.



Herman

And then the money.



Corn

The money.



Herman

Case is two hundred and fifty to five hundred. Sliger's CX4200a is two hundred and eighty-nine dollars. The CX4170a is two hundred and forty-nine. Rack slides are ninety-nine to a hundred and nineteen depending on post spacing. If you don't have a rack yet, Jay Parry's twelve-U open frame was nearly two hundred pounds.



Corn

And the hidden line item.



Herman

The new cooler. And possibly the new card, if you went too small. That's where the budget actually goes, and it's the one you can't know until you've measured.



Corn

Difficulty and time.



Herman

Difficulty is moderate. It's a case swap with tighter tolerances. If you've built a PC before, you can do this. If you haven't, this is not the machine to learn on, because the tolerances leave less room for a mistake. Time is an afternoon to move the parts, and a week of evenings before it researching what will fit.



Corn

A week of looking at a spec sheet and a tape measure.



Herman

Considering the cost of being wrong is a two-hundred-and-eighty-nine dollar case and a new cooler.



Corn

Herman, you've read more of these build logs than I have. Which one sticks?



Herman

The CX4200i one, because of how ordinary the failure was. He did the reading. He picked a sensible case. Then he got it, and the cooler he'd owned for years didn't fit, and he bought a smaller one. That's the entire hobby in one sentence.



Corn

Hm.



Herman

Daniel asked for firsthand versus theoretical and it's a real distinction. The vendor pages describe a world where your parts fit. The build logs describe what you do when they don't. The build logs are the useful ones.



Corn

And they all say the same thing, which is measure first.



Hilbert

What's the actual usable depth on a standard two-post rack?



Corn

Depends on the post spacing, and on how far back your cable management goes. Most people figure twenty to twenty-four inches.



Hilbert

So you don't know either.



Corn

I gave you a range.



Hilbert

A range isn't a measurement. I've got a four-U case at home that isn't four U. Measured it myself, twice, and I've still got the tape.



Herman

How far off?



Hilbert

About half a unit. Three and a half, if you're being generous with the sheet metal. It's got four-U rails and it doesn't fill four U of faceplate, and I've been looking at that gap for six years.



Corn

Does it matter?



Hilbert

Doesn't matter at all until you try to put something above it and the hole doesn't line up.



Herman

So the lesson is that four U is a nominal figure.



Hilbert

The lesson is that four U is a promise made by a salesman. The depth is the trap, you had that right, but nobody talks about the rack. I've got a rack with a front post, a back post, and a third post halfway along that nobody warned me about.



Corn

A third post.



Hilbert

Structural. Previous owner did something with ham radio. There's a bracket welded to it and a hole drilled through the side panel. The case came in at the depth you said, twenty inches, and it still wouldn't go.



Herman

What did you do?



Hilbert

Cut it out. Hacksaw, twenty minutes, one blade. Rack's been fine ever since, structurally speaking.



Corn

Structurally speaking.



Hilbert

It's holding a very heavy CRT monitor right now. I have no concerns.



Herman

You've got a rack with a load-bearing member removed holding a monitor that weighs what, forty kilos?



Hilbert

It's a Sony. It's fine.



Corn

What did you want to tell us?



Hilbert

My brother-in-law buys and sells this stuff. Has done for years. He says the rack is the part that costs you, not the case, and he says the four-U workstation cases are all built to the same depth because they all use the same extruded rail section, and you can't trust him on any of that, because he also told me a two-U would take a full-height card.



Herman

He was wrong about that.



Hilbert

He's usually wrong about one thing per conversation, and it's never the same thing twice, so you can't plan around it.



Corn

So what do we take from it?



Hilbert

If you're buying a rack second-hand, look at the posts before you look at the case. That's it. That's all of it.



Corn

The most common belief here is that four U means your desktop will fit.



Herman

Four U is a height class, not a compatibility guarantee. The cooler and the GPU connector decide whether your specific machine goes in, and both of them are measured in millimetres against a ceiling of about a hundred and fifty-eight.



Corn

Not "it's a four-U, so it's fine."



Herman

Not remotely. And the second one people get wrong is depth. They check the height, they check the width because it's always nineteen inches, they buy the case, and then it doesn't go in the rack because they never measured front post to back post.



Corn

Two measurements. Tape measure, both directions, before you spend anything.



Herman

The guidance here is scattered. Vendor pages describe the ideal, build logs describe the reality, and there's no single document that tells you what your specific machine needs. So you measure your own hardware and you go looking for someone who moved the same card into the same case.



Corn

Which is what Daniel was after the whole time.



Herman

And the four-U sweet spot is probably going to get better served as more people build home labs and AI workstations, because that's a growing market and manufacturers respond to those. But the hundred and fifty-eight millimetre ceiling isn't going to move. That's physics and a nineteen-inch width, and neither of those is negotiable.



Corn

So the machine that fits in a rack is a machine you've already compromised somewhere, or one you built knowing the number in advance.



Herman

And that's the real trade. Density and the look of the thing, against the cable space and the quiet you get for free in a tower.



Corn

Thanks to Hilbert Flumingtop, our producer. If this was your kind of episode, go back for episode thirty-eight fifteen, Should You Rack-Mount Your Desktop PC; episode thirty-five forty-four, What 4U Actually Means; and episode seventeen, Cloud Render Superpowers. This has been My Weird Prompts.



Herman

If you want to send us your own prompt, it's on Telegram at t dot me slash MWP listener bot. And a review helps other people find the show.



Corn

We'll be back soon.

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