

HOW TO BUILD A COMPUTER, AND WHY IT'S WORTH IT

Choosing the right build for what you need



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WHY BUILD A PC?

Cost Efficiency

- You'll get better performance for your money compared to prebuilt systems.
- You'll also avoid paying extra for brand premiums or unnecessary features.

Customization

- Choose exactly the components you want without being stuck with any preset options.
- Tailor the system to your needs—gaming, office work, creative work, etc.

Upgradability

- Easier to upgrade individual parts over time (CPU, GPU, RAM, storage, etc.).
- You can extend the system's lifespan without full replacement.



TYPES OF PC BUILDS

Gaming Build

- Prioritizes a powerful GPU, typically being a NVIDIA RTX or AMD Radeon.
- Is much more suitable for high-resolution, high-FPS gaming than other options.

Workstation Build

- Focuses on CPU cores and RAM, and if often used for video editing, 3D modeling, and software development.
- Often includes a professional GPU like a NVIDIA Quadro or AMD Radeon Pro.

Budget Build

- Made for cost efficiency, and prioritizes value over raw power.
- Uses only entry-level or mid-range components.



PC COMPONENTS

CPU (Central Processing Unit)

Motherboard

GPU (Graphics Processing Unit)

RAM (Random Access Memory)

Storage (SSD/HDD)

PSU (Power Supply Unit)

Case & Cooling (Air or Liquid)



PLANNING TOOLS

PCPartPicker

Helps you pick compatible parts, calculates total wattage / checks for bottlenecks or incompatibilities, and shows price comparisons and user-submitted builds. Easily the most important piece of prep you can do is visit PCPartPicker and put your build in to see if it all works together well.

Manufacturer Websites

Use Intel, AMD, NVIDIA, ASUS, MSI, and other websites for exact product specifications and compatibility details.

The screenshot displays the PCPartPicker website's build configuration interface. At the top, there's a navigation bar with links for 'Builder', 'Products', 'Guides', 'Completed Builds', 'Trends', 'Benchmarks', and 'Forums'. Below the navigation is a main heading 'Pick Parts. Build Your PC. Compare and Share.' followed by a subtext about providing part selection, pricing, and compatibility guidance for do-it-yourself computer builders. A prominent blue button labeled 'Start Your Build' is centered below the subtext. The main content area is titled 'Part List' and shows a table of selected components with columns for Component, Selection, Base Price, Prime Price, Shipping, Tax, Price, and Where to Buy. Components listed include an AMD Ryzen 5 7600X 4.7 GHz 6-Core Processor, Thermalright Peerless Assassin 120 SE ARGB 66.17 CFM CPU Cooler, Gigabyte B650M D3HP Micro ATX AM5 Motherboard, Silicon Power Value Gaming 32 GB (2 x 16 GB) DDR5-6000 CL30 Memory, and Silicon Power UDS 2 TB M.2-2280 PCIe 4.0 X4 NVME Solid State Drive. Below the table, there are sections for 'Build Guides' featuring 'Entry Level Intel Gaming Build', 'Excellent AMD Gaming/Streaming Build', and 'Glorious AMD Gaming/Streaming Build', each with images of the hardware components.

THINGS TO KNOW - CPU

CPU Brands

- Intel: Known for strong single-core performance; great for gaming.
- AMD: Excellent multi-core performance; good for multitasking and budget-friendly options.

CPU Sockets

- Must match your motherboard (e.g., Intel LGA1700, AMD AM5).
- Because of this, always choose the motherboard after selecting your CPU.

Cooling

- Some CPUs come with stock coolers, but others may need aftermarket cooling.



THINGS TO KNOW - MOTHERBOARD

Form Factors

- ATX: Standard size, has a lot of expansion slots.
- Micro-ATX: Smaller, fewer slots, budget-friendly.
- Mini-ITX: Very compact, few ports, great for small builds.

CPU Sockets

- Must match your CPU (e.g., Intel LGA1700, AMD AM5).
- Because of this, always choose the motherboard after selecting your CPU.

Chipset Differences

- Budget vs. premium chipsets affect features like overclocking, I/O options, and PCIe lanes.



THINGS TO KNOW - GPU

GPU Brands

- NVIDIA: Known for ray tracing, DLSS, and CUDA cores (Also great for creative content in Adobe).
- AMD: Competitive performance and pricing; supports FSR instead of DLSS.

Key Specs

- VRAM (Video Memory): 8GB–16GB is typical for modern gaming.
- Core Count & Clock Speed: Impacts rendering speed, but there isn't an exact standard.

Physical Fit

- Ensure your case supports GPU length and has enough clearance, otherwise it won't be able to fit.



THINGS TO KNOW - RAM

How Much RAM?

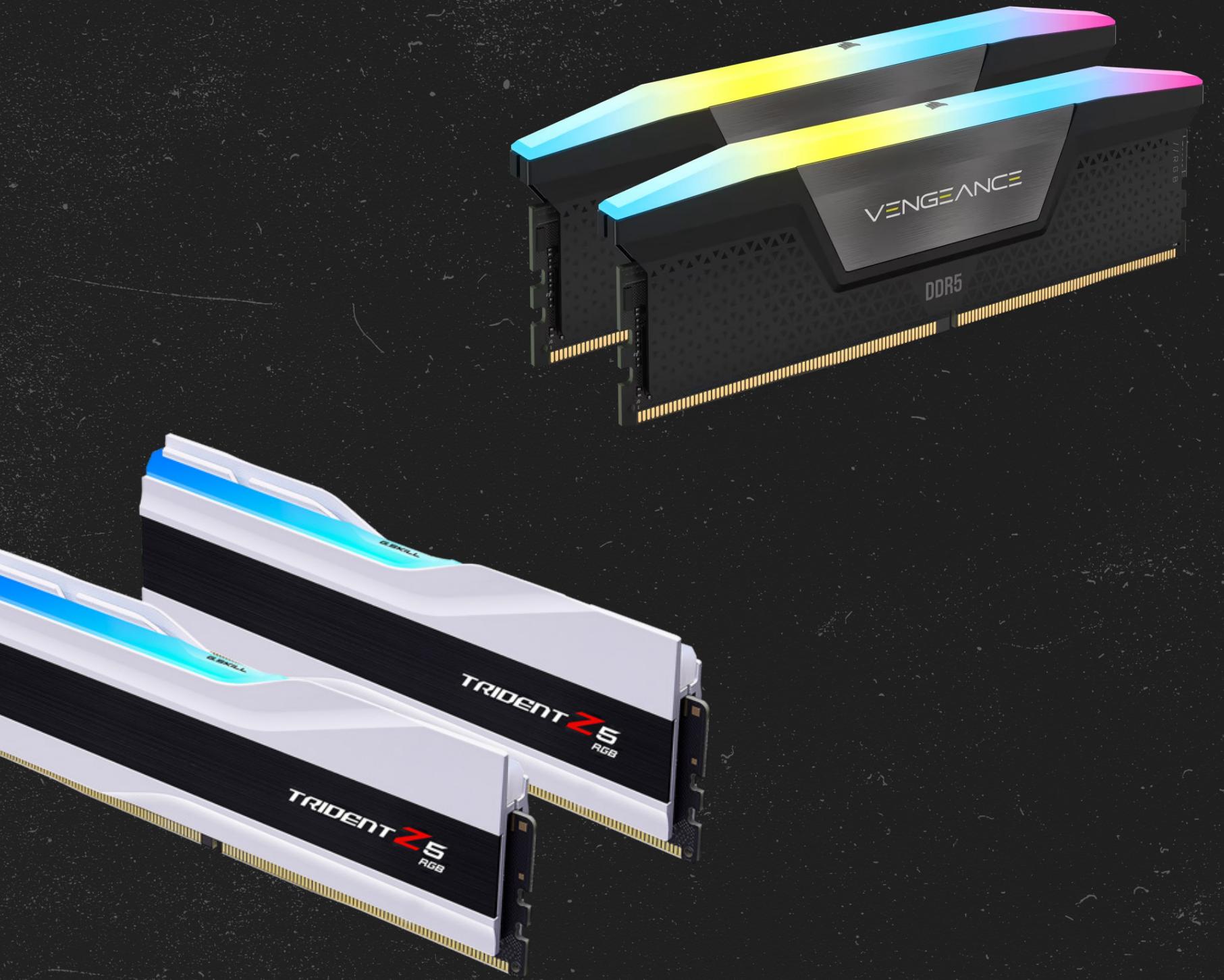
- 16GB: Recommended for modern gaming and most users.
- 32GB: Ideal for heavy multitasking, creative workloads in Adobe, and streaming.

Key Specs

- DDR Generation: DDR4 (common), DDR5 (faster and newer).
- Speed: Measured in MHz (e.g., 3200MHz, 6000MHz); faster speeds improve performance in some tasks.

Channels

- Dual-channel RAM (2 sticks) offers better performance than a single stick.



THINGS TO KNOW - HDD / SSD

Storage Types

- HDD (Hard Disk Drive): Cheaper per GB, good for mass storage but slower.
- SSD (Solid State Drive): Faster, reliable, no moving parts.

SSD Categories

- SATA SSD: Faster than HDDs but uses older connection; good for budget builds.
- NVMe SSD (M.2): Uses PCIe lanes, up to 6x faster than SATA. Mounts directly to the motherboard.

Recommended Space

- 500GB or so for a workstation, 1TB - 3TB for a gaming or video production PC.



THINGS TO KNOW - PSU

Efficiency Ratings

- 80+ Bronze, Silver, Gold, Platinum, Titanium — higher rating = more efficient, less heat.
- Gold is a great balance of price and efficiency for most users.

Modularity

- Non-Modular: All cables are permanently attached.
- Semi-Modular: Some cables are removable.
- Fully Modular: All cables are detachable.

Brand Matters

- Avoid generic or ultra-cheap PSUs — they risk damaging your components.



THINGS TO KNOW - CASE

Key Features

- Airflow Design: Mesh panels, fan mounting options, and cable routing.
- Drive Bays: 2.5" and 3.5" mounts for SSDs and HDDs.
- Front Panel I/O: USB 3.0, USB-C, audio jacks, power/reset buttons.
- Tempered Glass: For aesthetics, but may limit airflow.
- Cable Management Space: Behind the motherboard tray.

Form Factors

- Full Tower: Best for high-end builds and expansion.
- Mid Tower: Fits ATX and smaller boards.
- Mini Tower: Compact, with limited space for parts.



THINGS TO KNOW - COOLING

Air Cooling

- Uses a fan and heatsink combo in most cases.
- Simple, reliable, and affordable.

Liquid Cooling

- All-in-One systems use liquid to move heat away from the CPU.
- Quieter and better for high-performance or overclocked CPUs.
- Requires radiator mounting (120mm, 240mm, 360mm, etc.).

GPU Cooling

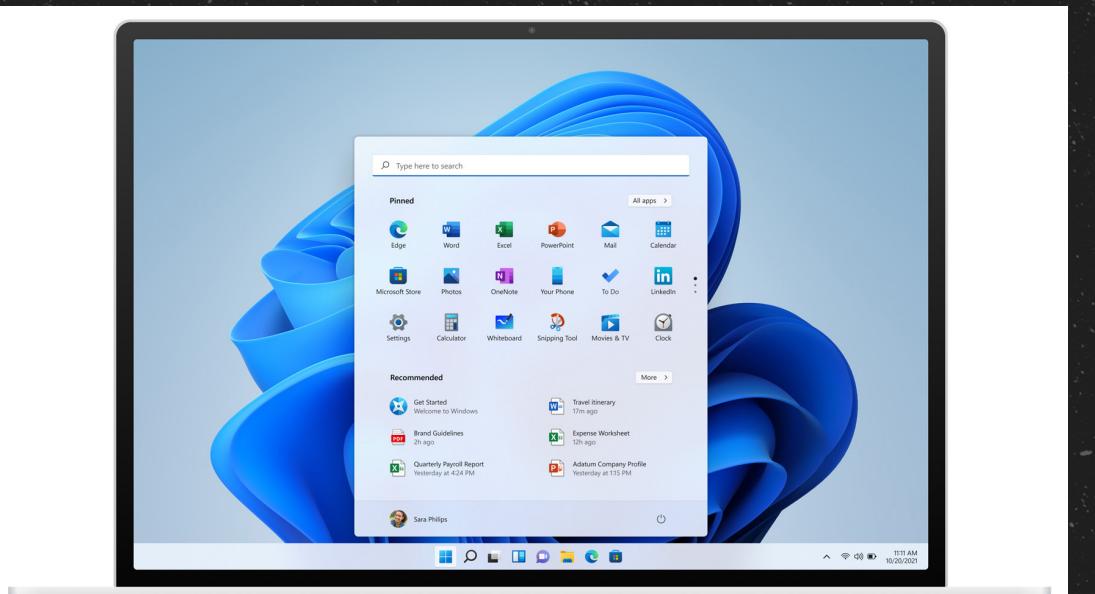
- Most GPUs come with built-in fans, but make sure your case provides enough ventilation around the GPU area.



THINGS TO KNOW - OPERATING SYSTEM

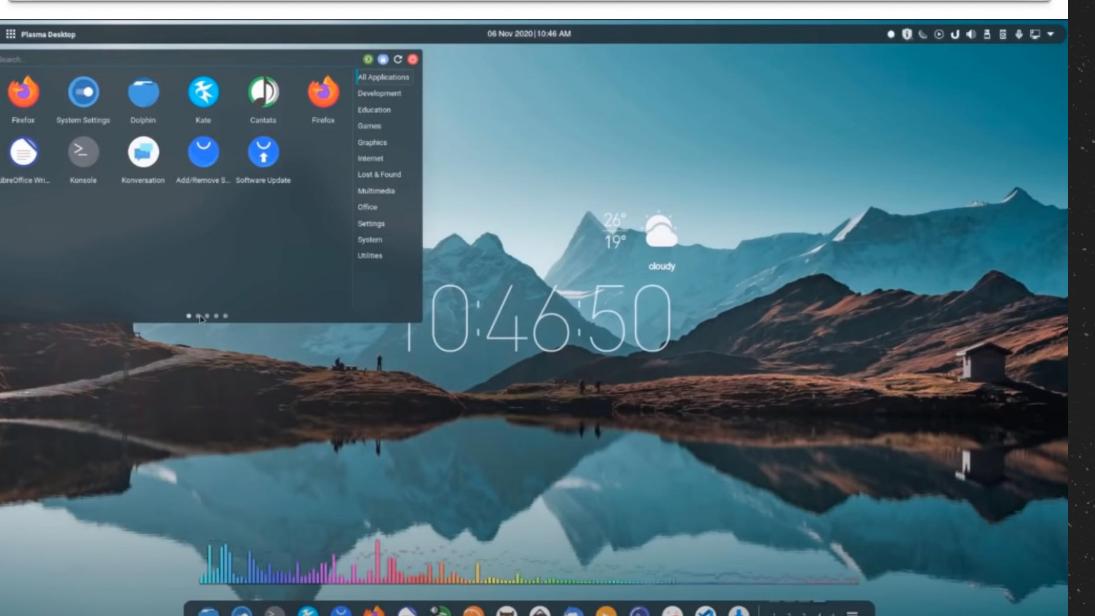
Windows 11

- Best for gaming, general use, and compatibility.
- Supports most hardware and software.
- Requires a license key.



Linux

- Free, open-source, good for developers and advanced users.
- Lightweight and secure, but limited game support.



Windows 10

- Still widely supported (Although that's ending soon); similar to Windows 11, but less optimized for new hardware.



THINGS TO KNOW - PERIPHERALS

Monitor

- 1080p @ 60–144Hz: Budget or casual gaming.
- 1440p @ 144Hz: Great balance for mid/high-end gaming.
- 4K @ 60–144Hz: High-end builds, productivity, and content creation.



Keyboard

- Mechanical: Tactile feedback, long-lasting; great for gaming and typing.
- Membrane: Quieter and cheaper, but less responsive.

Mouse

- DPI/CPI affects pointer speed — customizable for gaming.



GETTING READY

Essential Tools

- Phillips-head screwdriver (magnetic tip recommended).
- Anti-static wrist strap (optional but safer).
- Thermal paste (may be included with CPU cooler).
- Flashlight (for seeing small connectors or dark case corners).
- Cable ties or Velcro straps for tidy cable management.

Safety Tips

- Touch metal (like your case) frequently to discharge static.
- Avoid building on carpet or in high-static environments.
- Work slowly and carefully, a lot of force or friction can create a lot of static.



PREPARING THE CASE

Open the Case

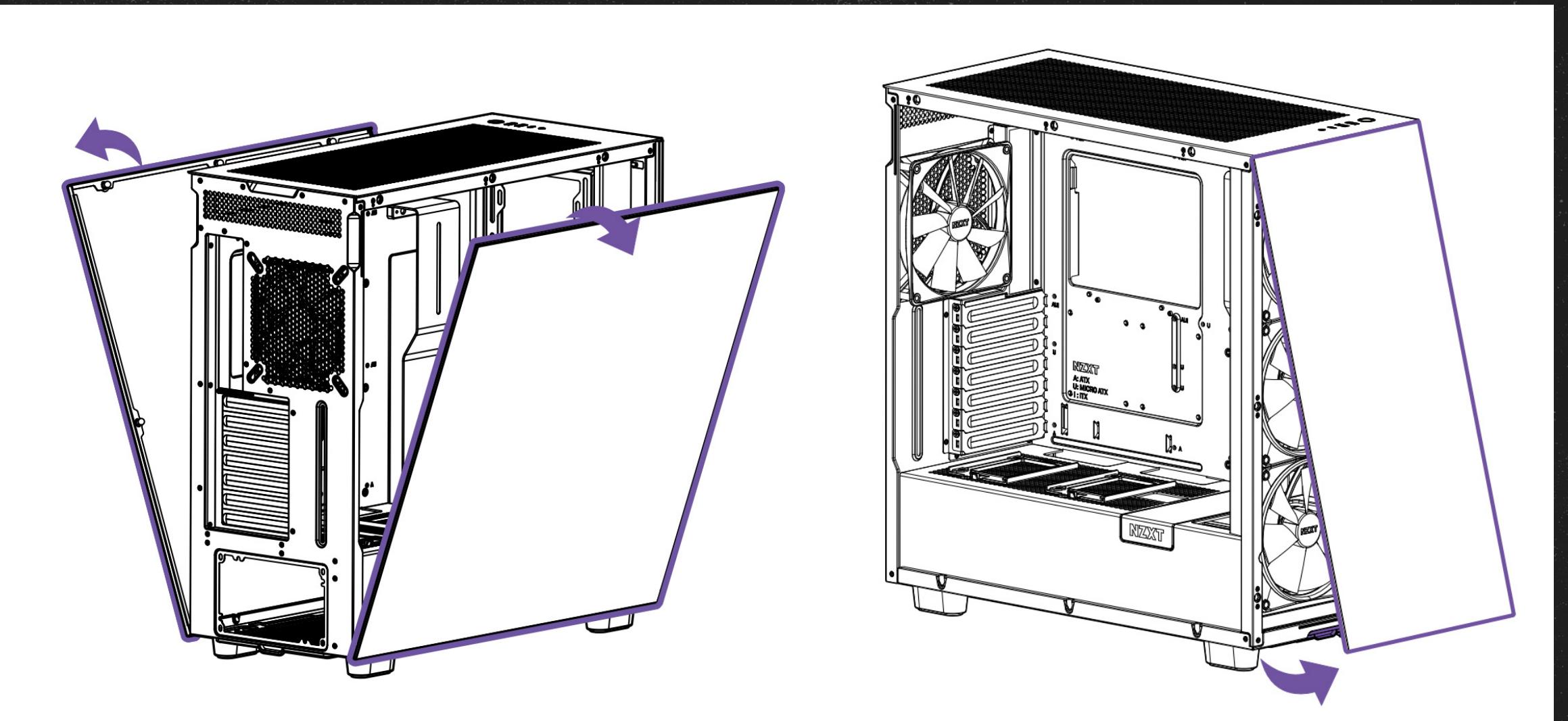
- Remove the side panels (usually secured with thumbscrews).
- Lay the case flat on its side with the open motherboard tray facing up.

Pre-Install Fans (if needed)

- Install any additional case fans before components go in (it's very unlikely you'll need to do this).
- Follow the airflow layout: intake at front/bottom, exhaust at top/rear.

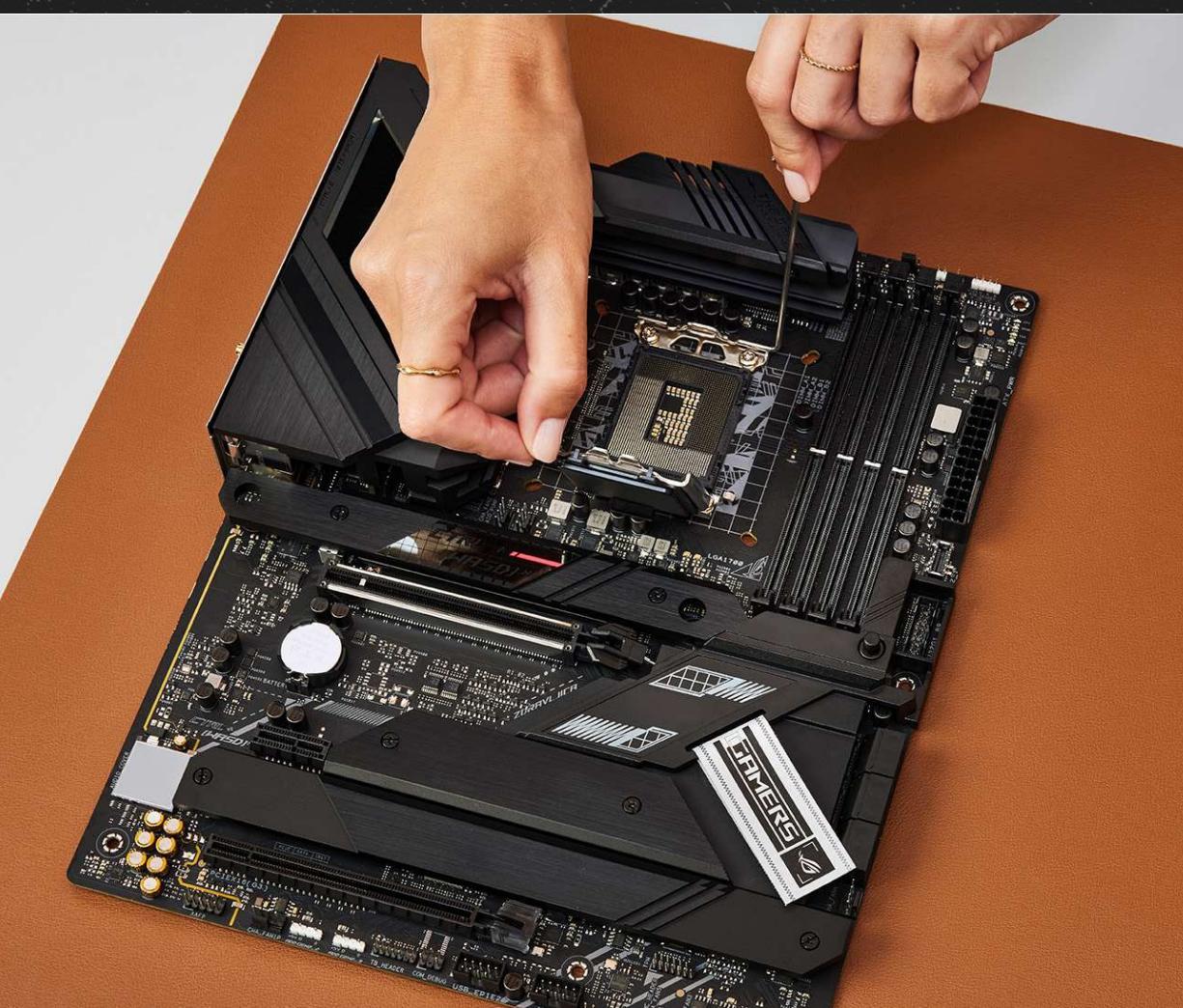
Route Front Panel Cables

- Identify and route: USB, audio, power switch, reset switch, power/HDD LEDs.
- Run them through case grommets to keep the main area clean.



INSTALLING THE CPU

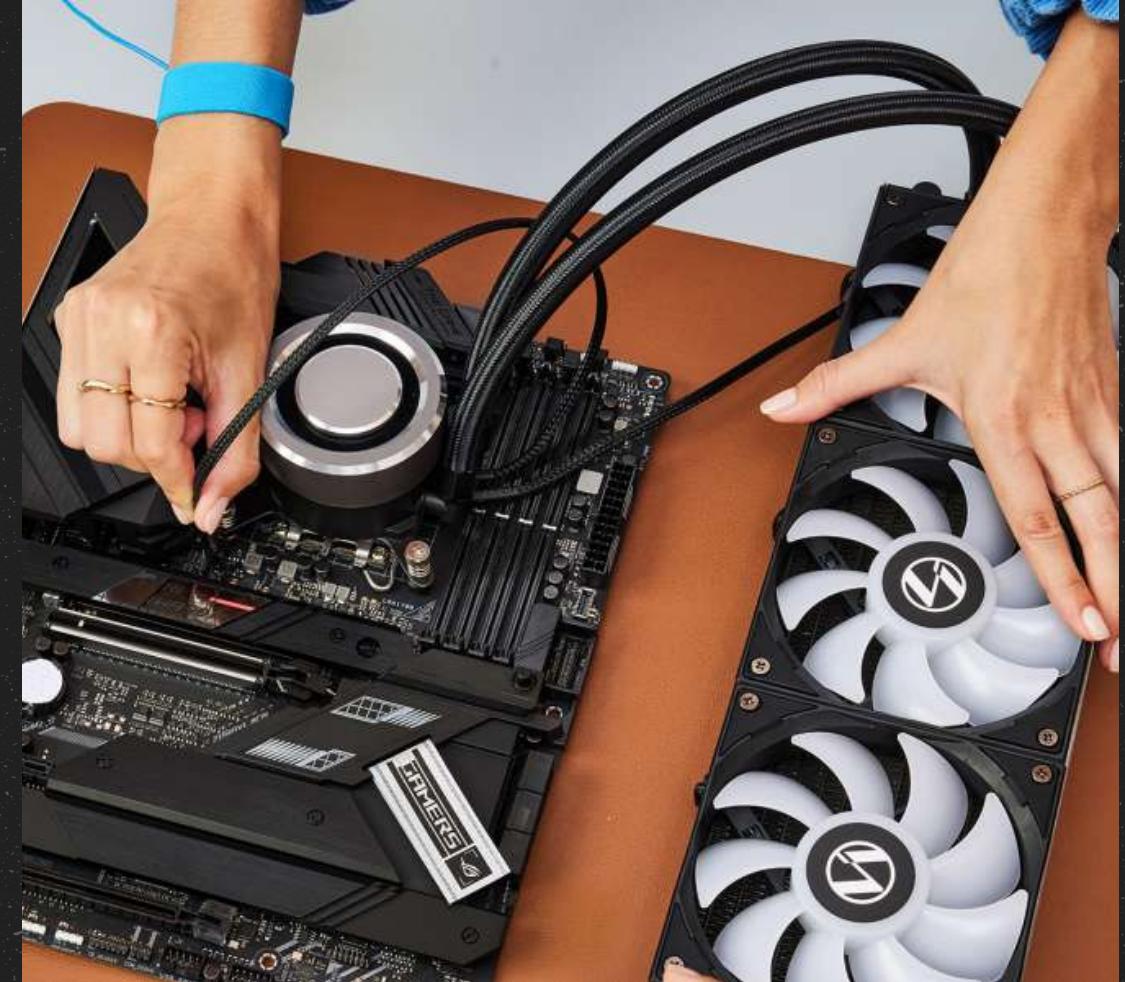
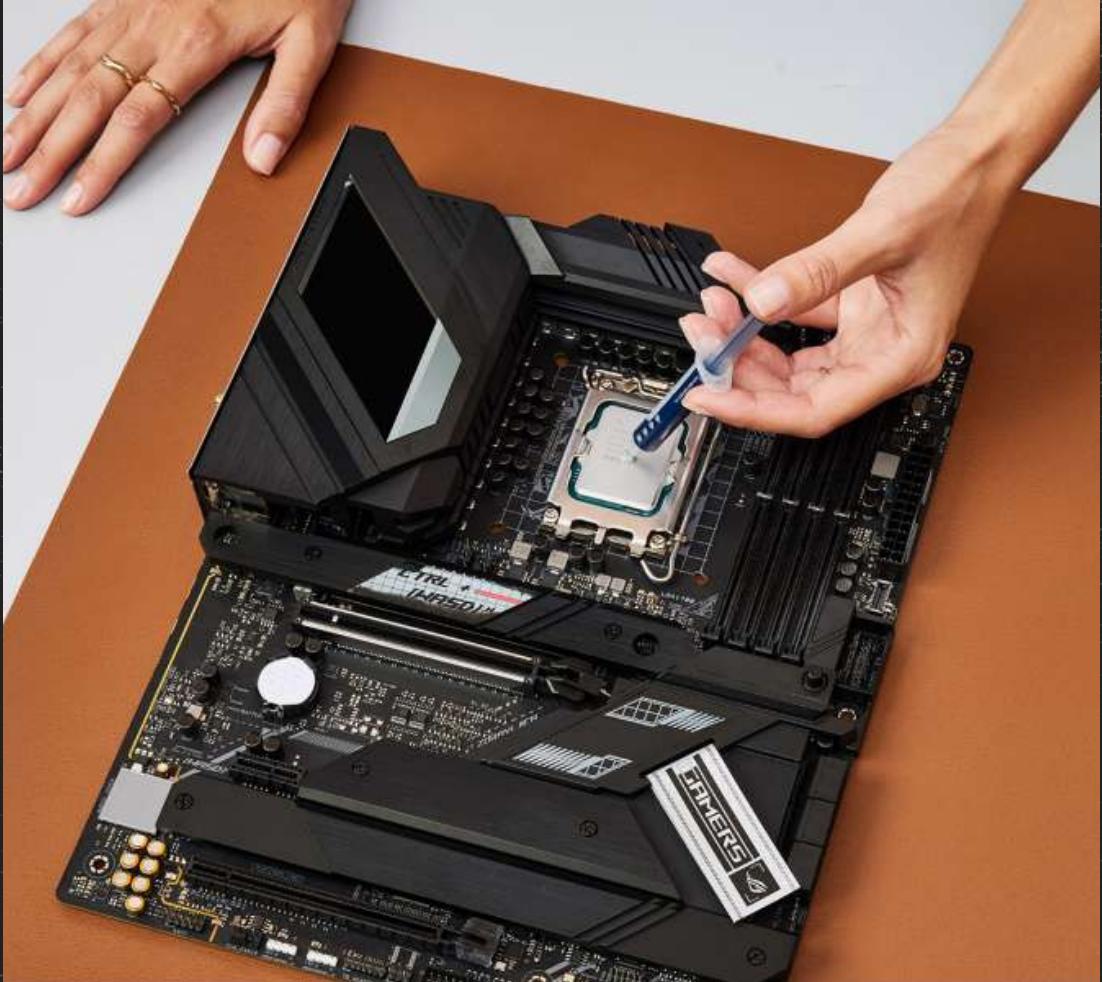
- Take the motherboard out of its packaging and put it on your work surface. Find the CPU socket, which will be covered with a protective plastic cap. In one corner of the plastic cap, or more commonly, on the socket itself, you'll see a small arrow—take note of where this arrow is.
- Next to the CPU socket, you'll see a small metal lever. Press down on the lever and pull it gently to the side (away from the socket) to open the socket tray.



- In one corner of the CPU, you'll see an arrow. Line this arrow up with the arrow on the socket and gently place the CPU onto the socket.
- Once the CPU has been gently seated, you can lower the retention lever down and push it back into place. Lowering the lever may require a good amount of force.

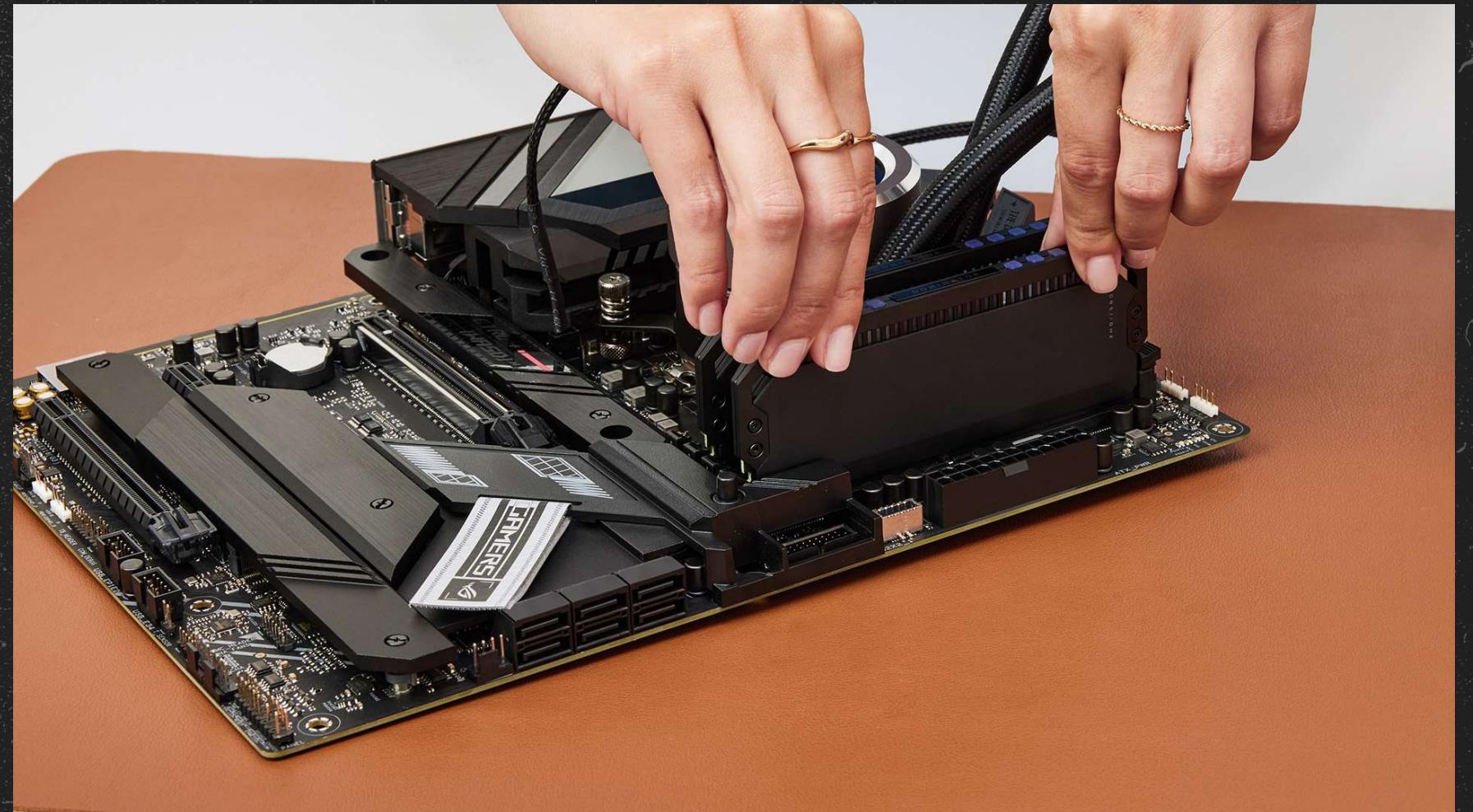
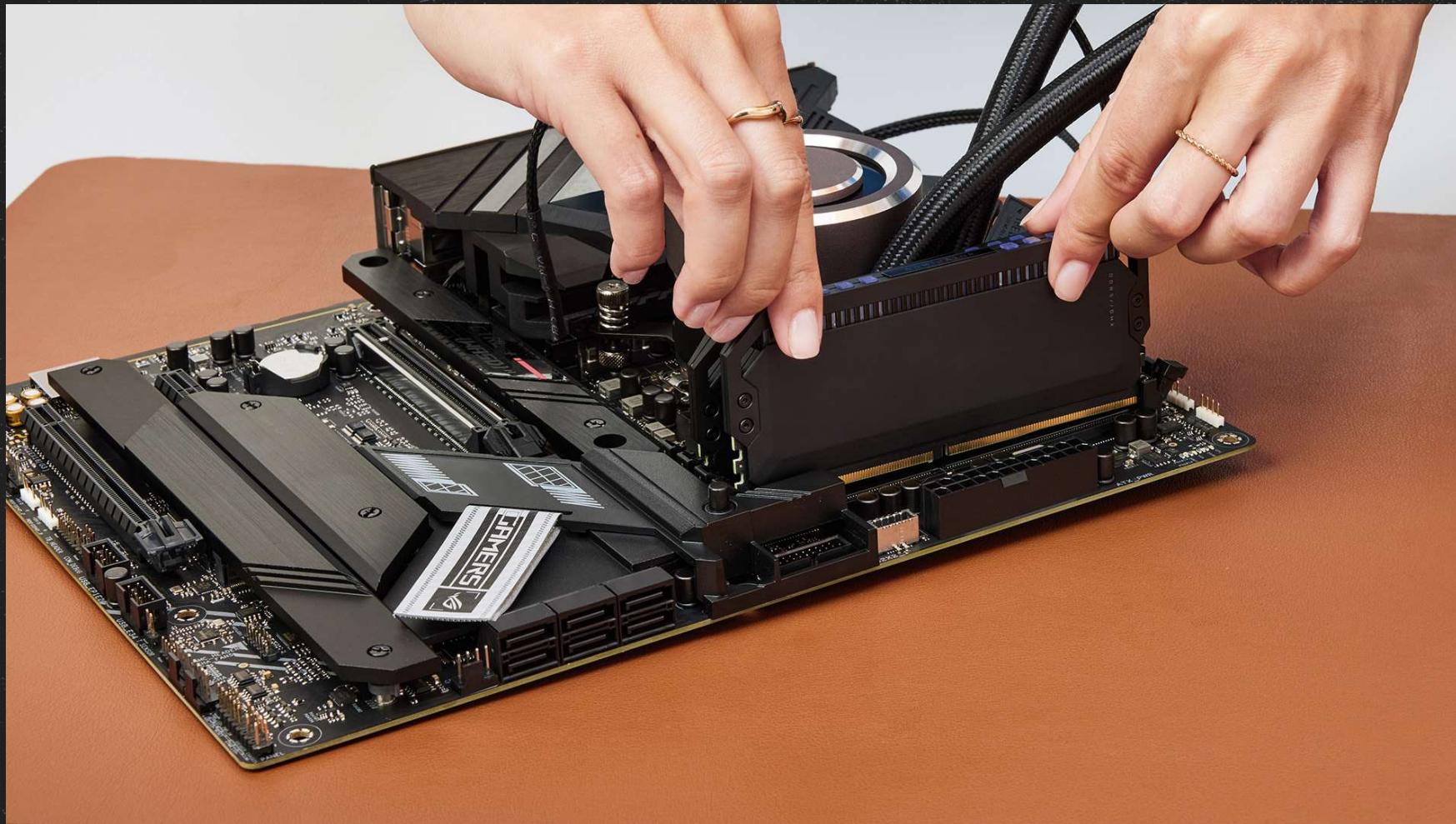
INSTALLING THE COOLER

- Some coolers require a mounting bracket. The motherboard may have a bracket pre-installed; you may need to remove this bracket if your cooler doesn't need a bracket, or replace this bracket if your cooler uses a different bracket. Do this before putting the motherboard inside the case.
- Some coolers come with thermal paste pre-applied to the conductive material (which sits on the CPU) and some coolers do not. If your cooler does not have pre-applied thermal paste, you will need to manually apply thermal paste before you seat the cooler. To apply thermal paste, squeeze a small dot (no larger than a grain of rice) onto the middle of the CPU. Then, place the cooler on the CPU—the pressure will spread the thermal paste adequately.



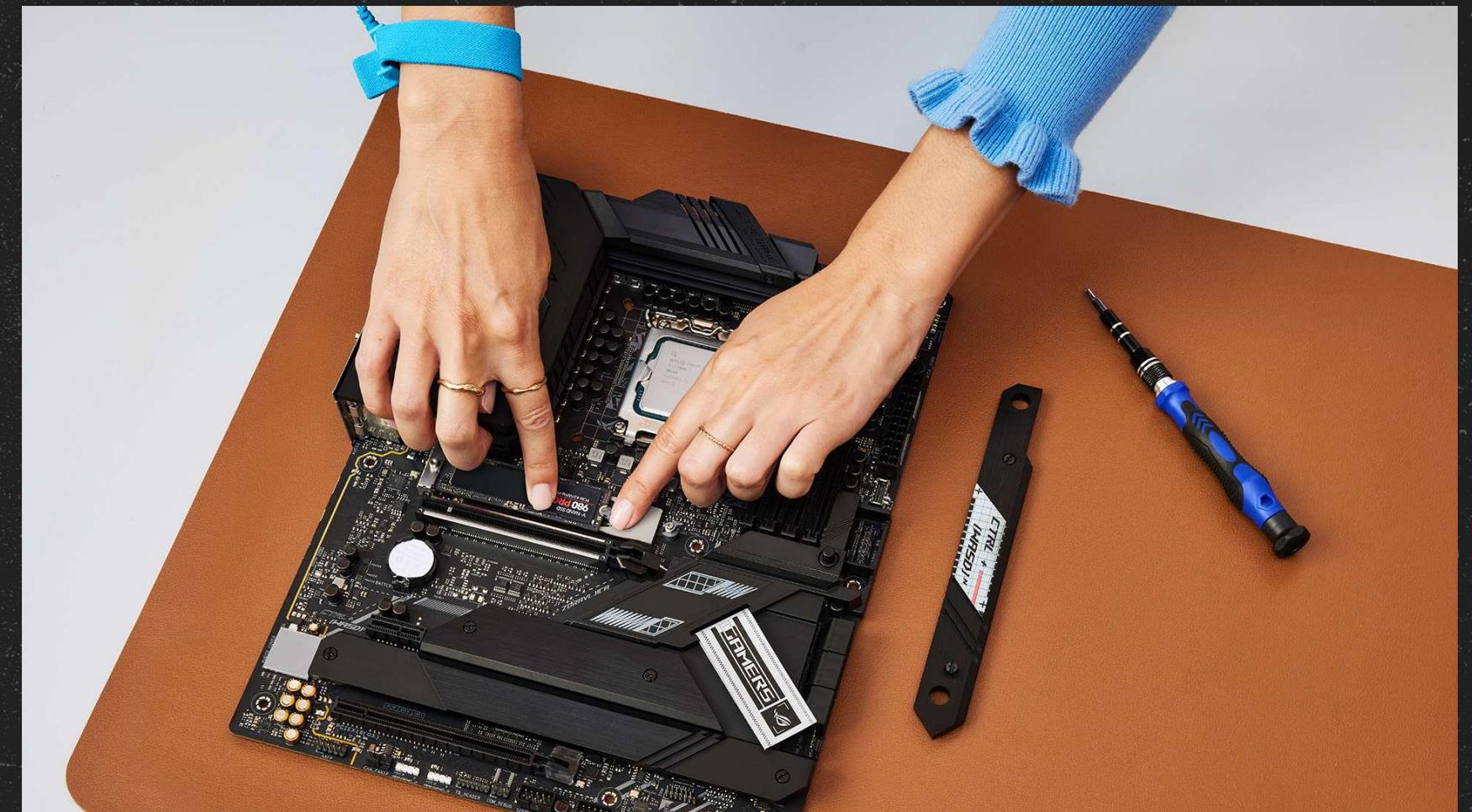
INSTALLING THE RAM

- Determine how many RAM slots your motherboard has (most have either two or four). If you're going to fill all available RAM slots, simply snap the RAM into place. If you're not going to fill all of the RAM slots, consult the user manual to find the correct configuration and populate the RAM slots accordingly. If you don't have the manual, then normally, with two slots; install one stick into the left side. With four slots and one stick, also install in the left-most slot. With two sticks, install one into the left most slot, and with the other, put it into the third slot.



INSTALLING THE STORAGE

- If you want to install an M.2 SSD, now is a good time to do so. First, find the M.2 slot on your motherboard. It's a small, horizontal slot with a tiny screw across from it. If you can't find it, if you find multiple M.2 slots, or if you are planning on installing more than one M.2 SSD, consult the user manual that came with your motherboard.
- Slide the M.2 SSD gently into the slot. When it's fully seated, it will stand off the motherboard about a 35-degree angle. Push the SSD down and replace the tiny screw to lock it in place.



INSTALLING THE MOTHERBOARD

- If your motherboard came with an unattached I/O shield—a rectangular sheet of metal with cutouts for the motherboard's ports—you should first snap it into place in the back of your case (make sure it's oriented correctly).
- Once the I/O shield is in place, you can install the motherboard. Double-check to make sure your cables are all threaded through to the correct place, and then place the motherboard (align it with the I/O shield, first). Using a Phillips #2 screwdriver, mount the first screw—the center screw—to hold the motherboard in place. Make sure you do not drag your motherboard across the standoffs attached to the chassis.
- The number of screws that you will need to mount the motherboard will vary based on the board, but a full-size ATX motherboard usually takes nine screws. Fill all available screw holes.



INSTALLING THE PSU CABLES

Main Power

- 24-pin ATX cable to the motherboard (usually on the right edge).
- 8-pin CPU EPS cable to the top of the motherboard (4+4 on some PSUs).

GPU

- Most modern GPUs require 6-pin, 8-pin, or multiple connectors.

Storage

- SATA power connectors for 2.5"/3.5" drives, but no cables needed for M.2 slots.

Cable Management

- Route cables behind the motherboard tray for a cleaner look.
- Use Velcro straps or zip ties to keep cables tidy and out of airflow paths.
- Modular PSUs help minimize clutter — only plug in what you need.



(Please note that no two PSU's are the same, and photos can't properly show each step. Please consult your manual for exact specifics.)

INSTALLING THE CASE CABLES

Locate the Front Panel Header

- Found on the bottom-right area of the motherboard.
- Often labeled "F_PANEL" or "JFP1".

Common Front Panel Cables

- Power Switch (PWR_SW)
- Reset Switch (RESET_SW)
- Power LED (PLED+) and (PLED-)
- HDD LED (HDD_LED)
- These are small, individual connectors with +/- polarity (important for LEDs).

USB Headers

- USB 2.0 and USB 3.0/3.2 Gen 1 (thicker blue or teal plug).
- Carefully align the plug with the keyed notch on the motherboard.

Audio Header

- Usually labeled "HD_AUDIO" or "AAFP".
- Found on the bottom-left of the motherboard.



(Please note that no two motherboards are the same, and photos can't properly show each step. Please consult your manual for exact specifics, and YouTube will also be your friend during this step.)

INSTALLING THE GPU

- Find the PCIe x16 slot on your motherboard. It will be the longest PCIe slot and may be a different color than the others. If your motherboard has more than one PCIe x16 slot, check the user manual to see if one slot needs to be prioritized. If any slot can be used, determine which slot you'll be using based on where other components are placed—you want your GPU to have some breathing room.
- Depending on your case, you may need to remove I/O covers (small metal tabs blocking the back panel of your case) to accommodate your GPU's I/O (HDMI, DisplayPort, DVI, etc.) and make it accessible to the exterior of the chassis.
- Remove the GPU from its antistatic packaging and carefully align it with both the rear retention bracket and the slot itself, and then gently push it into the PCIe x16 slot (you may hear a click). The PCIe tab on the motherboard may move into a locked position should you need to reseat the GPU. Once the GPU is fully seated, secure it to the back of the case using one or two screws. If your GPU requires auxiliary power connectors, connect it to the power supply.



CABLE MANAGEMENT

Organizing Power Cables

- Route the 24-pin ATX and 8-pin CPU cables along the edges of the case.
- Use the cable management holes in the case to keep cables out of airflow paths.
- For large cables like the GPU power cables, keep them tight and away from fans.

Cable Ties & Velcro Straps

- Bundle cables into neat groups.
- Avoid tight cable bundles that can restrict airflow or cause overheating.

Test After Boot

- After powering up, check cable positioning again.
- Make sure nothing is interfering with airflow, and secure any loose cables with ties.



(Please note that your cables will vary depending on your build, and no picture can properly display everything. Please use your own discretion when tidying your cables.)

BIOS SETUP

First Boot

- The screen may stay black for a few seconds—this is normal on first boot.
- If nothing happens: check power cables (CPU and motherboard) and RAM/GPU seating.

Access the BIOS

- As soon as the system powers on, repeatedly tap the BIOS key:
- Common keys: DEL, F2, or F10 (depends on manufacturer).
- This opens the BIOS/UEFI setup screen.

What to Check in BIOS

- CPU, RAM, storage devices are detected.
- RAM speed: enable XMP/DOCP profile for rated performance.
- Boot order: make sure your USB or drive with OS installer is listed first.



INSTALLING THE OPERATING SYSTEM

Create a Bootable USB Drive

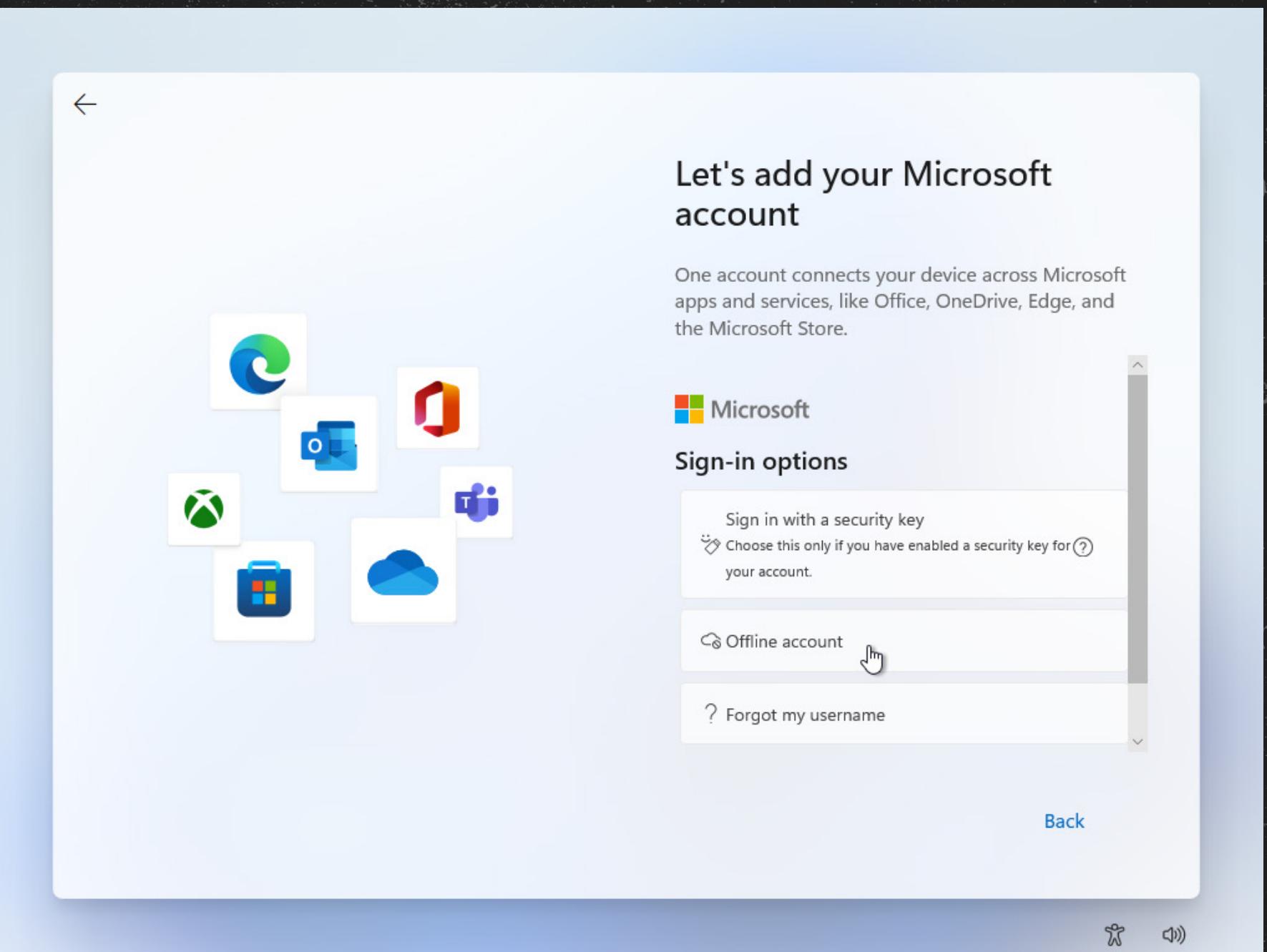
- Use a second computer to download the OS installer.
- For Windows, use the Media Creation Tool.
- Write the installer to a USB flash drive (at least 8 GB).

Install the OS

- Insert the bootable USB into your new PC.
- Choose language and region.
- Select a drive to install the OS (usually your SSD).
- Format the drive if needed (caution: this erases all data).

Post-Install Setup

- Create a user account and set up a password.
- Skip or sign in with a Microsoft account (Windows).
- You'll land on the desktop once setup is complete.



(This guide assumes you are using Windows as it's the most common operating system, but the same general steps will apply to most others as well.)

INSTALLING DRIVERS / UPDATES

Essential Drivers

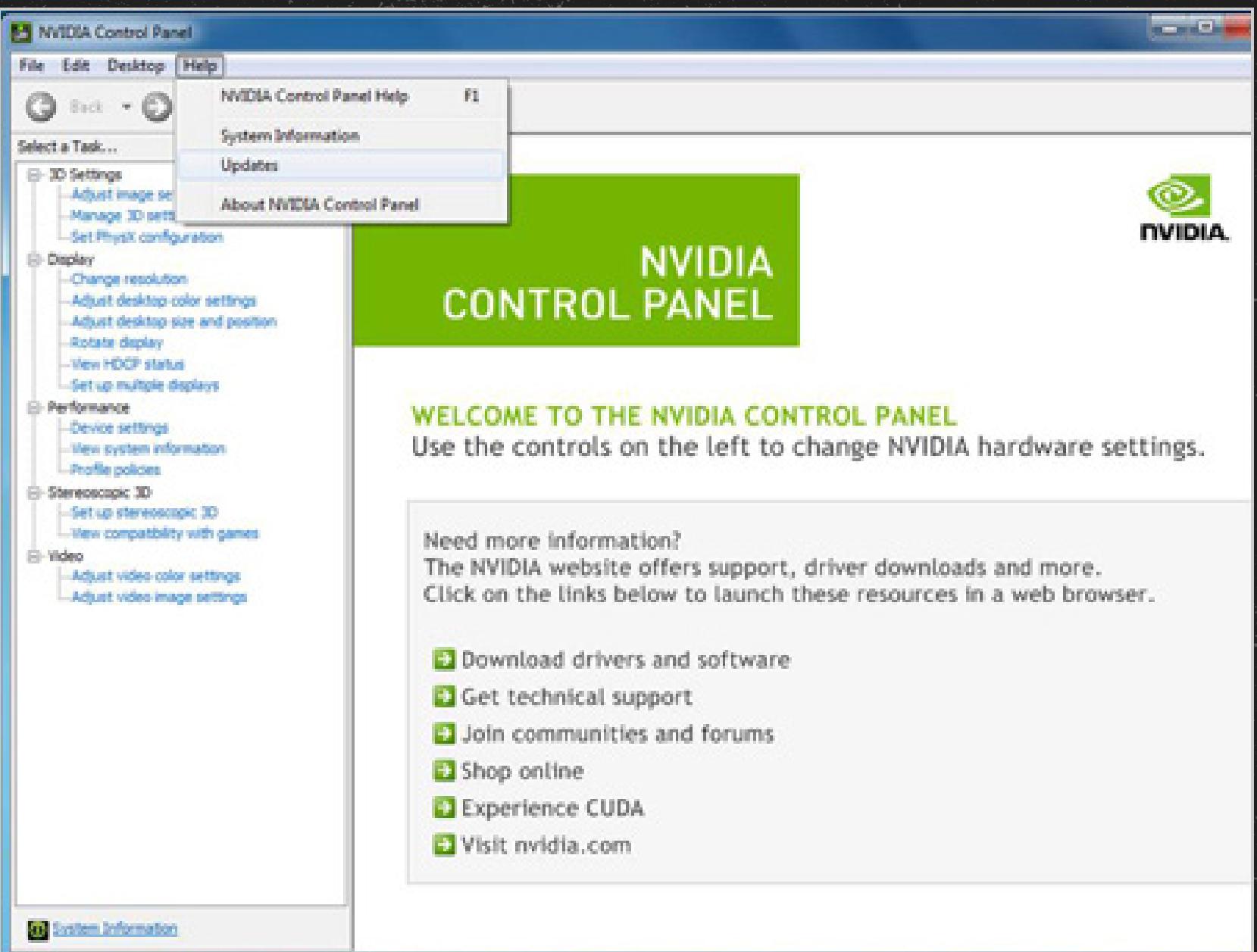
- Go directly to your GPU brand's website:
- NVIDIA: nvidia.com
- AMD: amd.com
- Install the latest version for optimal performance

Motherboard Drivers

- Visit your motherboard manufacturer's support page (e.g., ASUS, MSI, Gigabyte).
- Chipset driver
- Audio driver
- LAN/Wi-Fi drivers

BIOS & Firmware Updates

- Check your motherboard page for BIOS updates.
- Only update BIOS if you need new hardware support or bug fixes — follow instructions carefully.



Congrats! You should now
have a fully working PC to use!



Sources

- **PCPartPicker – Build Guides & Forums**
 - <https://pcpartpicker.com>
- **Tom's Hardware – How-To Guides**
 - <https://www.tomshardware.com>
- **How-To Geek – Step-by-Step Build Guides**
 - <https://www.howtogeek.com>
- **Intel & AMD Official Documentation**
 - Intel: <https://www.intel.com>
 - AMD: <https://www.amd.com>
- **NVIDIA & AMD GPU Setup Docs**
 - <https://www.nvidia.com>
 - <https://www.amd.com>
- **Microsoft – Official Windows Installation Guide**
 - <https://www.microsoft.com/software-download>
- **ASUS, MSI, Gigabyte – Motherboard Manuals and BIOS Guides**
 - <https://www.asus.com/support>
 - <https://www.msi.com/support>
- **Seasonic & Corsair PSU Manuals**
 - <https://seasonic.com>
 - <https://www.corsair.com>
- **YouTube: Linus Tech Tips**
 - <https://www.youtube.com/user/LinusTechTips>