The Ultimate Guide to Choosing a Panel PC



With the innumerable differences in nomenclature, configurations, and features, it can be challenging to determine which panel PC is best suited for your application. We've created this guide, and its accompanying checklist, to help you make an informed decision when selecting and configuring an industrial panel PC. Getting this decision right the first time can save you a lot of headaches, not to mention significant time and money. Every project is unique, but if you're able to answer these key questions in advance you'll be well on your way to a successful hardware deployment.

What does the project require?

This may seem like a question you would expect to have a clear answer to from the start, but it's easy to conflate "what do I want to do?" with "what do I need?". Your unique application will place very specific demands on the hardware you select, and it's important to understand how those factors may impact your decision. You may approach a hardware vendor with a list of specifications (more on that shortly), and while those will be important, the actual use case of the system may impact your choice and configuration in unexpected ways.

If the computer will only be part of the end solution, be it automation equipment, a data logger, or HMI, then you'll need to establish and clearly define what, specifically, the computer will be responsible for once installed. This will help inform everything from memory and storage needs, to processing power, expansion requirements and connectivity demands. On the connectivity side, you'll want to consider what other equipment the panel PC may need to connect to or interface with. Peripherals with proprietary connectors, or systems that require a specific wireless communication protocol, should be evaluated and included in planning during the consideration phase.

It's also important to take into account where your data will live. If the panel PC will collect, process and act on data itself, your needs for wireless or wired network connectivity will be very different than if the system will need to transmit data to a central server or the cloud. Your network infrastructure should also be assessed to ensure it can accommodate the new devices you'll be adding to it.

What's the installation environment?

Once you've clearly defined the "what" of your application, the next important question to ask is "where" your system will be used. This is one of the key considerations in determining the grade of computer that will be best suited for your project, particularly if you're creating a solution that will operate in an environment that's inhospitable to electronics. If your installation environment is subject to extreme high or low temperatures, contains airborne particulates, may subject the system to vibration or impact forces, or contains other devices that produce electromagnetic interference, such as electric motors and solenoids, it's imperative that those factors be taken into account.

Dust, dirt, chemicals and moisture are computer killers. Most traditional computer hardware is cooled using fans to pass air over the heat-generating components of the system. In many industrial environments, that air is accompanied by contaminants that are deposited inside the computer as the air moves through. That particulate can quickly build up, causing overheating or shorting that can instantly destroy the computer, causing downtime and data loss. Fanless systems prevent this type of damage by implementing alternative cooling technologies, like heatsinks and heat spreaders, to cool the system passively. By using convection to cool the system, the fan can be removed and enclosures without openings can be utilized, helping to protect internal components and eliminating moving parts, creating a fully solid state solution (assuming solid state storage SSD drives are being used).

In terms of operating temperature, if your application will subject the computer to ambient temperatures under 0°C (32°F) or above 40°C (104°F), you should probably consider a rugged panel PC, which utilizes components rated for temperatures at the extreme ends of the scale. Further, if the computer will be exposed

to frequent or prolonged vibration or impact forces (like those common with in-vehicle installations), it's best to use a rugged system. Rugged panel PCs are designed with fewer non-permanent connections and often utilize vibration-dampening technologies. Rugged systems also typically have the best EMC protections, often doubling the requirements of industrial systems for maximum protection.

In some instances it may be most practical or cost effective to consider an additional enclosure for your hardware, particularly if you plan to install or utilize equipment outdoors. If you choose to install your system in an enclosure, be sure to evaluate the airflow to determine if additional fans or other active cooling solutions will be required. Whether you utilize an enclosure or not, be sure to account for how you'll mount or install your devices. Panel PCs are most commonly mounted on an articulating arm or directly into walls or equipment. Every device is unique, so be sure to understand how it will mount and consider any preparation necessary to make the process as easy as possible.

What are the desired technical specifications?

Now we come to what is often the first, and sometimes only, item that many hardware evaluations focus on. For your project, you likely have a list of specifications and features that you require of your panel PC. Your needs will, of course, be unique, and the importance of individual configuration options will vary widely, but be sure to consider each of the following carefully.

Processing

The powerplant of your panel PC, the choice of processor can be complicated depending on the use case for the system. Minimum software requirements, power consumption, thermal management and the number of simultaneous tasks that the system will handle are just some of the factors that may play into your choice between the wide range of available CPUs from Intel, AMD, ARM and others. You, or those on your team, may also have preferences or concerns about particular processor manufacturers that will need to be vetted. This is where having an outside party help you with configuration can pay dividends as they're often able to leverage past experience configuring systems for applications similar to yours that can help inform your decision.



I/O Ports

How you connect the system to the rest of your infrastructure is a crucial element in ensuring an easy installation. LAN ports for networking, serial ports for machine to machine communication, video outputs for display interface and USBs in varying generations and form factors will all need to be carefully considered and accounted for. Depending on the system you choose, you may be able to customize the I/O coastline. In some instances, however, you may be limited to what's available on the motherboard, or what's been selected by the computer manufacturer to be populated, so make sure you understand what you need and what can and can't be configured. I/O ports are also a common delivery portal for adverse electromagnetic compatibility conditions, so understanding the desired I/O complement can mitigate unexpected complications during rollout or testing for any desired industry or application-specific certifications.

Storage

The amount and type of storage you select will go a long way to future proofing your chosen computing solution. You'll want to consider not only how much storage space you need now, but how much you may need in the future. In some instances, storage can be upgraded or hot swapped, but it's best to think about your long term needs in advance to prevent data overruns that might require additional external hardware to support. For most industrial applications, solid state storage drives will be preferred, but for some use cases spinning drives may be a viable, cost-effective solution. It's also important to consider how you'll architect your data and whether you'll want/need to set up a RAID solution to protect mission critical information. This is also the stage at which you'll want to think about how much local storage and computing you'll need, versus what can be stored and/or processed in the cloud. On-premise Edge Servers are an increasingly popular option to help minimize both latency and bandwidth costs.

Memory

The amount and type of RAM will greatly impact the operating speed of your system. Like the processor selection, your choice in RAM will ensure that the system can perform the requisite simultaneous tasks your project requires. The more RAM you configure, the better your systems will be at multitasking. Keep in mind that there is a limit to the amount of RAM that a given motherboard can support. The frequency of the RAM also needs to match that supported by the motherboard. Higher RAM frequencies ensure a faster data transfer, which, in turn, makes for faster task processing. The motherboard specifications will also dictate whether the system will support dual-channel communication with the memory controller, effectively allowing you to double RAM bandwidth by allowing simultaneous access to the RAM modules. This is another instance where working with an experienced hardware vendor can take a lot of guesswork out of the process.

Power

The installation location for your systems will inform how they'll be powered, and you'll want to make sure that your chosen system supports both the input voltage and connection standard available. For example, if you will be directly connecting your systems to power they may not each require a separate power adapter, which could save significant costs depending on how many systems you plan to install. Industrial panel PCs may offer support for variable power input, ranging from 12-48VDC, which can provide some flexibility, but it's important to understand your power setup in advance. Be aware that many systems require a power

adapter to properly protect from damage or malfunction when integrated. Only a subset of systems can run on DC power and fewer of those can run on a DC power system shared with other devices. Having a clear understanding of your power system is crucial to ensuring a safe and reliable installation.

Wireless

Wireless connectivity is becoming ubiquitous among consumer devices, but industrial systems most frequently need to be specifically configured with the desired wireless card if Wi-Fi, Bluetooth, 4G or LoRa connections are necessary. In addition to the card itself, be sure to consider the number, type and size of antennas you'll need. Integrated antennas are seldom sufficient, particularly in industrial settings, to enable reliable connectivity and if space is at a premium. There are also legal constraints regarding antenna gain that can differ by geographic location, as well as functional constraints including antenna polarization and coax loss, all of which are also dependent on the number of total radios in the device. Having a plan for where and how antennas will be installed or mounted is imperative. If you're considering panel mounting your system within an enclosure, you'll likely need to route antenna cables outside of it to ensure a reliable signal.

Operating System

Your choice of operating system will be informed by the software or applications you intend to run. Understanding which flavors of Windows, Linux or your OS of choice, that your selected hardware will support, or can be pre-configured with, will save you a lot of potential compatibility headaches over time. For some embedded applications, you may not require a pre-installed OS, which can save significant cost, but it's important to verify that up front.

Other Software

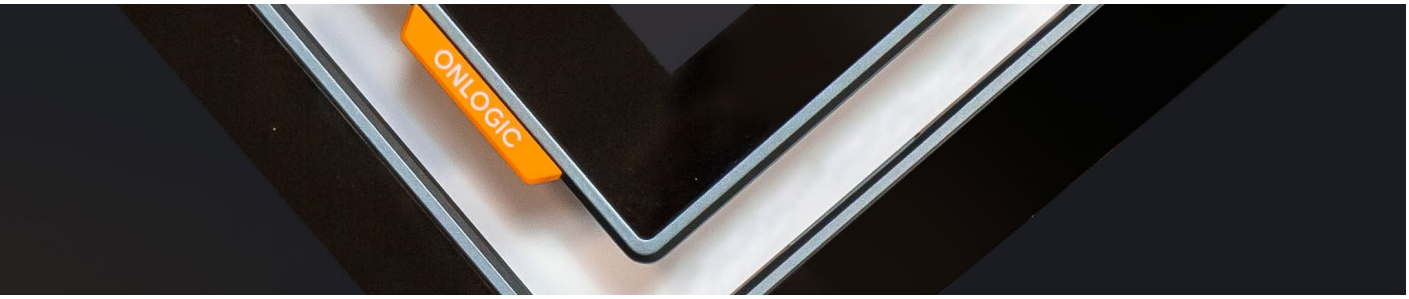
Understanding the entire software stack that will be installed on the system can inform everything from processor selection, to RAM requirements and storage needs. You may also be able to leverage your hardware vendor to pre-image any software prior to shipping your systems, saving you a great deal of time and making fulfillment to your customers, or installation into your products or facility much easier.



Display Specifications

Last, but certainly not least, you'll want to consider the size, type, and features of the display. Some panel PCs offer limited flexibility, while others allow you to mix and match the compute and display depending on your needs.

- **Screen Size:** Panel PCs can range from as small as 5 or 6 inches, all the way up to 20+ inches or more. In addition to the display itself, you'll want to keep in mind installation requirements, like the dimensions of the cutout in a control cabinet or wall to install the system. What you'll need to display, how far away you'll need to see it, and the number and type of on-screen interfaces and messages will all need to be considered to ensure you choose the right screen size for your project.
- **Touch Interface Type:** Panel PCs are commonly available with either resistive or capacitive touchscreen displays. Capacitive screens use conductive materials that respond to inputs from electrical conductors, like your finger. Resistive screens rely on pressure being applied to the screen to register an input. Capacitive screens are traditional more accurate and responsive, while resistive screens can be operated while wearing gloves.
    - **Surface Capacitive (SCAP) vs Projected Capacitive (PCAP):** Though they are by far the most popular touchscreen type for consumer electronics, because capacitive screens have traditionally required contact by ungloved hands, they have struggled to gain traction in the industrial space, where resistive touchscreens are still very popular. More recent advances in capacitive technology, specifically Projected Capacitive screens, provide the sensitivity and accuracy advantages of surface capacitive screens, while also allowing for conductivity through thin materials, like latex surgical gloves. PCAP screens are now a viable option for a wide range of industrial applications and should be considered alongside resistive displays when making a configuration decision.
- **Brightness:** Panel PC displays come in a range of brightness levels intended to offer good visibility depending on the installation environment. Brightness is most commonly measured in "nits", with standard brightness screens ranging from 200 to 600 nits. High brightness displays, which are ideal for heavily lit or sunlight-exposed installations, will commonly be rated at 800-1000 nits, or higher.
- **IP Rating:** Depending on your needs, you may want to consider the Ingress Protection (IP) rating of your panel PC. If the system will be exposed to dust or moisture, a higher IP rating will help prevent damage to internal components. Industrial touchscreen displays may carry an IP65 or even an IP69K rating, specifically on the front bezel of the screen, meaning that when installed properly they will provide protection from airborne particulate, as well as sprayed water, which can be beneficial if your application will require screens to be regularly washed down.



What is the project time frame?

Going into a project with a clear timeline will help you ensure that your chosen hardware provider can support your project requirements. You'll want to consider whether you'll need a hardware prototype and how long testing on that prototype will take. Having that information will help you to build a roll-out schedule with your hardware provider so that they can ensure an interruption-free supply chain. A short timeline may also limit your configuration options based on available stock at a given vendor, so communication is key. Be up front with your suppliers about when you'll need products and, if you expect recurring orders, how long until you'll need the next batch. The more information you can provide up front, the more likely it is that your selected hardware will be ready and waiting when you need it.

How many systems will you need, and for how long?

In addition to the question about when you'll need to receive that first order, be sure to inform your hardware vendor about how many systems you'll require, and over what amount of time, to ensure adequate stock and minimize lead time concerns. Setting up recurring orders, and/or having an accurate forecast to provide your hardware vendor can significantly reduce instances of backorders or component shortages impacting your project.

Another important consideration, particularly for industrial applications, is component lifecycle. The manufacturers of computer components are constantly updating their offering to keep up with the needs of users. For consumer electronics, those type of product line refreshes are a fact of life, and provide opportunities for users to upgrade their systems as capabilities expand. However, for industrial users, these type of component changes can have far-reaching impacts on a project. If you expect to need a precise system configuration over a long period of time, it's important to understand the lifecycle of your chosen system and its components to make sure it will be available for the life of your project.

In some instances, component changes may not matter as long as the capabilities remain the same. But having to install a different brand or capacity of hard drive, for example, due to a product going end of life, can be highly impactful in certain circumstances. Many medical device manufacturers, for instance, must fully certify their chosen configuration to meet industry standards. Changing even a single component can require expensive and time consuming recertifications. Be sure to consider if your project will be revision sensitive and communicate that to your hardware vendor so they can work with you to anticipate any potential impacts over the life of your project.

What's the budget?

It's a key question at every decision point in any project, and your budget will impact every aspect of the hardware selection process. While you'll certainly have an eye toward getting the best value out of your hardware investment, make sure to weigh the soft costs in your calculations. For example, many industrial, edge or IoT projects have very little tolerance for hardware failures, which can cost hundreds of thousands of dollars in lost revenue, sometimes in as little as an hour or two depending on the application. A few dollars saved per system by using spinning hard drives instead of solid state drives, or electing for an industrial system in an environment where a rugged pc would be better suited, can end up costing your organization a great deal more should failures occur.

On the flip side, an experienced hardware vendor can often help save you money by suggesting the right fit solution, rather than simply providing a one-size-fits-all device that may be overkill for your project. Having an idea of your overall project budget, as well as a target per-system price will help you get on the same page with your hardware provider and act as a guide throughout configuration.

What other services could be leveraged?

While this guide is focused on the hardware for your project, it's important to investigate any other services that your chosen vendor could potentially provide, as well as the factors that will directly impact project success that go beyond system configuration. If hardware isn't your company's specialty, your hardware supplier may be able to take more off of your plate to help you focus on the areas you do specialize in. Some of the elements you may be able to have the hardware manufacturer handle include:

- Hardware Branding
- Custom Labeling
- Enclosure Customization
- Regulatory Certifications
- Direct Fulfillment or Consignment
- Financing

Taking stock up front of what else you might be able to offload to the hardware provider can help avoid delays on the backend if you don't find out until later that you could be having them image your software or assist with fulfillment. Be sure to ask if it's possible to build these types of services into your overall hardware program, even if you don't expect to utilize them until you move your project into mass production.

Choosing, configuring, testing and fine tuning your hardware-based project is a time consuming and complex proposition, which is why it's so important to go into the process as prepared as possible. Even if you have clearly defined answers to the questions above, there's nearly always something that comes up mid-way through the process that can throw you a curveball. Working with an experienced hardware company that specializes in the type of systems you need can go a long way toward making the process easier and giving you the confidence to take your project from idea to reality. The OnLogic team is here to help if you have any questions or need advice about the best hardware option for your unique project. Contact us today, or explore our Tacton line of rugged panel PCs for yourself.

Have questions about configuring your next computer? Our team is here to help.

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The Ultimate Panel PC Selection Checklist



We've collected the most important questions to consider before selecting the panel PC for your automation, HMI, or data visualization project. Armed with answers to these questions, you'll be in the best position to choose your ideal touchscreen solution.

Application

Knowing how the hardware will be used will help inform system selection.

- ☐ What will the system be used for?
- ☐ What will the computer actually be doing once installed?
- ☐ What other systems or hardware will it be connecting to? (Tooling, Sensors, Networks)
- ☐ Where will the data live? (On the system? On a central server? In the cloud?)

Environment & Installation

Understanding where the panel PC will be installed will influence the level of ruggedness required.

- ☐ What type of environment do you plan on installing this system in?
- ☐ What are the extreme low and extreme high temperatures of your deployment environment?
- ☐ Any moisture in the environment? Direct water contact?
- ☐ Any vibration or shock? (Will it be installed in a vehicle or in another vibration or shock-prone location?)
- ☐ Will it be installed inside an enclosure?
- ☐ How do you plan to mount the system? (Panel Mount, Wall Mount, or VESA?)
- ☐ Will the display be in a very bright environment or exposed to direct sunlight?
- ☐ Will operators be wearing gloves when using the device? If so, what kind?
- ☐ Will the Panel PC need to be sprayed down regularly?
- ☐ Will the system be installed in a location where unauthorized access is a concern?

Technical Requirements (in general hierarchy of importance)

Some technical requirements may be obvious, others may present themselves as the project evolves.

- ☐ Do you have a processor manufacturer preference? (Intel, AMD, ARM)
- ☐ What level of processing will you need? (Intel® Atom®, Celeron®, Core™ i3/i5/i7/i9 Xeon® or AMD Ryzen™, EPYC™)
- ☐ Does your application require a graphics processing or vision processing unit? (GPU or VPU)
- ☐ Which and how many I/O ports will you need? (LAN, Serial Ports/COM, Video Outputs, USB [Type A or C?])



- ☐ How do you plan to power the system? (AC Adapter or direct input?)
- ☐ What type of input voltage will you be providing? (12V, 24V, 48VDC)
- ☐ How much storage do you need? (Hot-swap, multiple drives, RAID)
- ☐ How much memory do you need? (ECC or non-ECC?, Wide Temp?)
- ☐ Will you require wireless connectivity (Wifi, Bluetooth or 4G)
- ☐ Do you require or prefer a particular operating system? (Windows or Linux & what flavor?)
- ☐ What other software will you be using?
- ☐ Will you want the software image applied prior to shipping?
- ☐ Do you prefer or require a resistive or capacitive touch interface?
- ☐ What size display do you need?
- ☐ Do you require regular or high-brightness displays?

Time Frame

In addition to the right-fit hardware solution, it's important that your hardware provider can meet all of your project expectations, including timing.

- ☐ When do you need to have a prototype in-house?
- ☐ Once you've received the prototype, how long do you anticipate your testing phase will last?
- ☐ After approving the prototype, when do you anticipate moving to full roll-out?
- ☐ Are there lead time limitations? Other than "as soon as possible," how quickly after ordering would you require fulfillment based on project timelines?

Quantity

The number of systems you require may impact lead times, fulfillment requirements and of course budget.

- ☐ How many systems do you plan to need to complete your project?
- ☐ What are your anticipated order sizes?
- ☐ Do you anticipate recurring orders?
- ☐ What is your anticipated order frequency?

Lifecycle Needs

Particularly for industrial applications, the lifecycle of your chosen system, and its components, is a vital consideration.

- ☐ How long do you expect to continue purchasing your chosen configuration?
- ☐ Will re-certification or other re-evaluation be necessary if a component of the system changes?
- ☐ Is your project otherwise revision sensitive?



Budget

Keeping budget targets front of mind will help inform configuration decisions throughout the selection process.

- ☐ Do you have a fixed budget for this project?
- ☐ Do you have a price-per-system target in mind?

Other Services Required

Be sure to consider the other service options that can be added to create your ideal hardware solution.

- ☐ Do you want to have the systems branded with your company logo or colors?
- ☐ Do you have any custom labeling requirements?
- ☐ Will there be additional engineering required to create the right solution?
- ☐ Are there particular industry or regulatory certifications you require?
- ☐ Will you require dropshipping directly to your end user(s)?

Decision Making Process

Knowing the individuals and processes involved in your hardware decision will aid in efficient selection and configuration.

- ☐ Who are the primary decision makers? (Individual or group?)
- ☐ What is most important to you in choosing a hardware platform and partner?
- ☐ Has the hardware project already been approved internally, or is approval contingent on a viable hardware solution?

Other Existing Challenges

Examining existing challenges will help you, and your hardware provider, avoid them going forward.

- ☐ Have you been using a previous solution for this project? If so, what was it?
- ☐ What was good about the previous solution and what needs improvement in the new solution?
- ☐ What prompted you to change hardware?



Ready To Start Building? Our team is here to help.

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