Starting from Square One:

Configuring an Industrial PC

A Guide to Finding the Right PC for Your Application

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Contents

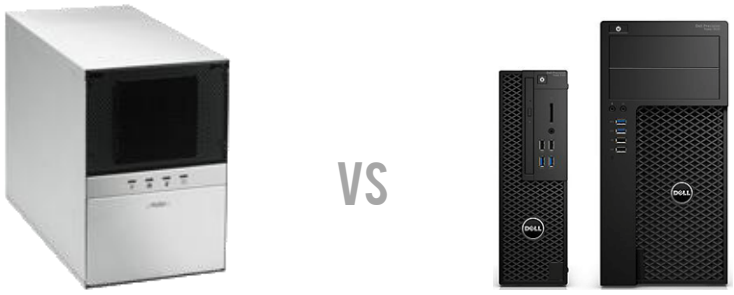
Editor's note: *The information provided in this publication is intended to be a guide. Always consult the product data sheet to determine exact specifications and requirements.*

Chapter 1

So You (Think You) Need an Industrial PC

Industrial-grade vs. Consumer-grade

With so many great consumer-grade computers on the market, it can be tempting to choose one especially when you compare the drastic difference in price point. But realistically, a consumer-grade PC may actually end up costing you more money than you had planned in the long run. Why is that?



Industrial Consumer

1. Longevity

Industrial PCs are designed with longevity in mind. Think about how often you see advertisements for the latest and greatest consumer-grade technology, all trying to convince you that you need a new and improved device. While consumer-grade PCs have constant turnover, most industrial PCs can be successfully operated for 10+ years.

2. Standardized Platforms

The individual components of an industrial PC are all industrial-grade, which provides a 5-7 year availability window. This enables you to standardize on one platform if you will use the same configuration repeatedly. A standard industrial PC configuration ensures that software, I/O and external peripherals aren't affected and the boards and components won't change frequently.

3. Durability

The environment in which the computer will be used is a huge factor in determining whether a rugged industrial PC is necessary. A consumer-grade PC simply won't perform well (and will probably break after a short time) in an environment that is hazardous or prone to a lot of vibration, dust, water, or temperature extremes. Industrial PCs come with ratings to let you know what you're getting, such as a NEMA ratings (an electrical enclosure's ability to withstand environmental conditions) and IP ratings (level of sealing effectiveness against dirt and moisture).

For more information, read '5 Reasons IT Users Have Switched to Industrial PCs'

Click to Read: Part I & Part II

Which Types of Applications Use Industrial Computers?

The chart below provides some examples of industries and applications that utilize industrial computers. If your industry is on this list, chances are good that you'll need an industrial computer. This list is not all-inclusive, however, so when in doubt, consult an expert.

Industrial Computers	
Industries	**Applications**
• Aerospace • Power Generation • Oil & Gas • Chemical • Food & Beverage • Water/Waste • Automotive • Packaging • OEM • Fabrication	• Factory Automation • Test & Measurement • Manufacturing & Assembly • Remote Monitoring & Control • Vision • SCADA & Data Acquisition

It Can't Be *That* Difficult, Can It?

Now that you've determined that you are in the market for an industrial computer, it's time to pick one out – but this task might be more difficult than it seems. Configuring a fully assembled and operational industrial PC can present a challenge to even the most tech-savvy. From form-factor to power to memory and everything in between, there are dozens of options, which means there are dozens of decisions to be made. Chapter 2 will begin to explore some of the questions you should ask as you begin to narrow down the possibilities.

Need Help Configuring Your Industrial PC?

Read a 3-Part Article Series:

10 Tips for Successful Industrial PC Configuration

Click the buttons below to read.

Read Part I | Read Part II | Read Part III

Chapter 2

To Display or Not to Display

Why Might I Need a Display?

You've compared the pros and cons of buying consumer-grade vs. industrial and realize that an industrial PC is definitely the way to go. The first major question you need to ask yourself is…Do I need a display?

If your application requires **monitoring & control** or **SCADA & data acquisition**, then, chances are, you'll need a display – and you need to focus on Chapters 3 and 7 after you complete this chapter. You may want to glance over Chapter 5, as well, since embedded PCs can be configured with a flat panel monitor in some cases.

If your application involves **factory automation**, **test & measurement**, or **manufacturing & assembly**, then you likely do not need a display. Instead, you will want to consider a chassis or embedded PC, which are covered in chapters 4 through 7.

Above: Advantech FOM-7211W Industrial Monitor
21.5" Industrial Monitor with Projected Capacitive Touchscreen, Direct-VGA and DVI Ports, IP66 Compliance. Panel, desktop, wall mount installation.

Below: 21.1" SVGA Industrial Monitor with Resistive Touchscreen, Direct –VGA, DVI and Wide Operating Temperature.

Additional Features:

- Robust anodized coated aluminum front bezel and stainless steel rear cover
- Supports wide operating temperatures
- Increase reliability by enhanced 5-wire resistive touch sensor
- Anti-reflective screen with tempered glass

Chapter 3

Choosing an HMI Display

Types of HMI Display

An HMI display, or Human Machine Interface Display, is ideal for operator interface because it enables the user to monitor system and productivity status, while providing the ability to execute mission-critical changes to the system or process. Using a touch panel computer (TPC), panel PC (PPC), or industrial panel PC (IPPC) provides an easy, efficient method of interaction between a machine and its operator. One item to keep in mind, however, is that the embedded board is already included in an HMI display, so there is not a lot of configuration flexibility to work with.

To learn more, read 'How to Choose the Correct HMI for your Application.'

Touch Panel Computer
TPCs are ultra-slim, fanless, and lightweight stand-alone computers. They stand up well to vibration and are also available in widescreen with multi-touch.

Panel PC
PPCs are rugged but not fanless but offer more I/O that TPCs. Panel PCs are also available in widescreen with multi-touch.

Industrial Panel PC
The toughest of the HMI options, IPPCs have a rugged design, complete with stainless steel chassis (framework) and heavy-duty aluminum front panel to withstand virtually all types of industrial environments.

Ruggedness, I/O and Power Supply

As we touched upon in Chapter 2, each type of HMI display has a varying level of "toughness" and ability to withstand certain environmental conditions. This is probably the first factor that you need to take into consideration when choosing an HMI display. Remember, IPPCs are the most rugged, followed by PPCs, and then TPCs.

Another important factor is the level of I/O needed by your specific application. I/O stands for input/output and basically refers to the communication between your computer and another computing device or peripheral. TPCs have the least amount of I/O expansion capability on the rear of the PC, PPCs have more, and IPPCs have the most capability.

Power supply must also be considered. HMI display power supply options include 24V DC and 120V AC. Please be aware some units are default 24V DC, so if you require 120V AC, be sure to add a power supply and line cord to your order.

Additional Factors

Storage and Operating System are two additional factors to consider when configuring an HMI Display. Learn more in Chapter 7.

Learn More

[Article]

3 Reasons Why Pairing an Embedded PC with your HMI is the Right Move

Click to READ

An Exception to the "Screen = HMI" Rule

Some Embedded PCs can be mounted to a flat panel monitor for interfacing ability.

For more on Embedded PCs, refer to Chapter 5.

Chapter 4

No Display Needed. Now What?

Industrial Chassis vs Embedded PC

Congratulations! Since you know you don't need an HMI display, you've narrowed down your industrial PC choices quite a bit already. Now it is time to determine whether you want to go the industrial chassis route or the embedded PC route. First and foremost, you need to consider two factors: how much space you have available and how much I/O you will need.

Space and I/O

The chart below provides a basic guideline to follow. Simply put, if you need a lot of I/O and have the space for it, a rack mount chassis is the best option. If you have limited space but require lots of I/O, an embedded PC may be the way to go. A wall mount chassis or desktop chassis provides a nice middle ground option.

Rack Mount Chassis

- Largest form factor
- 14-20 slots of I/O
- Most capability to expand I/O

Wall Mount or Desktop Chassis

- Saves space
- 6-8 slots of I/O
- Some ability for I/O expansion

Embedded PC

- Smallest form factor
- I/O intensive
- Cannot change I/O

Chapter 5

Good PCs Come in Small Packages

A Few Facts About Embedded PCs

First and foremost, there are several factors that all embedded PCs have in common. It is important to be clear on these aspects before you decide that an embedded PC is for you.

Advantech UNO-3085G, Intel Core i7/Celeron 800 series Automation Computers

- Small form-factor. Think in terms of 8”x9“x7” for the largest embedded PCs, and as tiny as 2”x6”x5” for the smallest.
- Processor and RAM come on board and cannot be changed.
- I/O expansion is limited.
- They’re fanless.
- Some storage can be added (hard drive or compact flash).

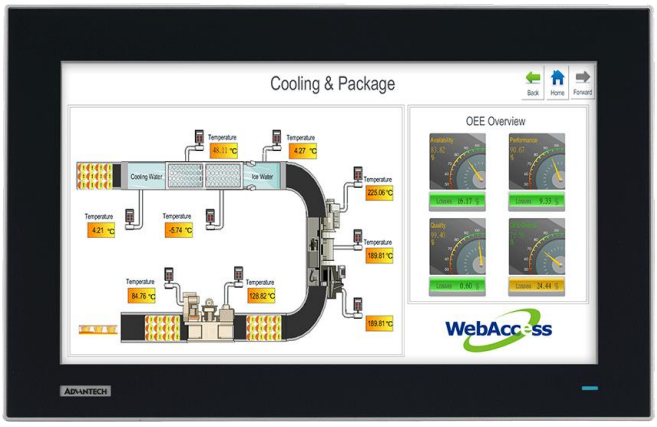
Types of Embedded PCs

There are three types of embedded PCs, all of which are designed to perform well in rugged conditions:

- Din Rail
- Compact
- Full Size

As you can probably guess, full size is the largest, followed by compact, and then the extremely compact din rail. These units can be mounted via din-rail, wall mount, stand mount or panel mount.

Although embedded PCs are generally stand-alone in nature (or commonly referred to as “headless”), there are some instances in which an embedded PC can be combined with or mounted on the back of a flat panel LCD monitor if interfacing is a necessity.



Flat Panel Monitor

An industrial flat panel monitor is just a display – but it can be utilized with an embedded PC. FPMs can withstand high temperatures and levels of vibration, as well as dirt, dust and moisture. They are also available in widescreen with multi-touch.

Although processor and RAM come standard, there are a couple of options to add storage, including a hard drive or compact flash.

Lastly, don't forget about power supply. Similar to an HMI Display, the power supply for an Embedded PC comes in two options: 24V DC and 120V AC.

Additional Factors

Storage and Operating System are two additional factors to consider when configuring embedded PCs. Learn more in Chapter 7.

Learn How to Select an Embedded Automation Computer, 8 Key Factors

Read a 2-Part Article Series:

Chapter 6

Chassis, Chassis, Choose a Chassis

Compact Chassis

Desktop/Wallmount Chassis

Rackmount Chassis

Rack Mount, Wall Mount, and Desktop Chassis

As mentioned in Chapter 4, rack mount chassis are the largest form factor with the greatest number of I/O slots. Rack mount PCs are installed in a cabinet. Wall mount and desktop chassis are smaller, the difference between the two being that a wall mount chassis can tilt on its side, whereas a desktop chassis rests upon a flat surface.

Each of these industrial chassis undoubtedly offers the most configuration flexibility as compared to embedded PCs and HMI displays. Beginning at the board level, there are several options available. A PICMG 1.0/PICMG 1.3 SBC (Single Board Computer) with a PICMG 1.0/PICMG 1.3 passive backplane is ideal if you will require a great deal of I/O. Remember that you can't combine a PICMG 1.3 SBC with a PICMG 1.0 backplane or vice versa. If your application does not require much additional I/O, your chassis simply needs an ATX, microATX or mini-ATX motherboard.

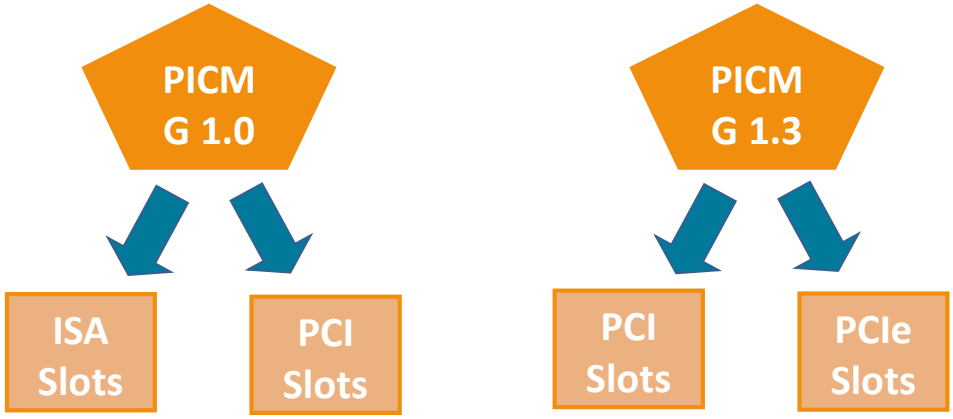
Optical Drive

Regardless of whether you choose rack mount, wall mount, or desktop storage, each of these selections can be configured with a CD-ROM or DVD-RW, which is dependent on your security requirements.

Installing I/O Cards in Your PC

If you require legacy ISA slots, you will need to use a PICMG 1.0 SBC and passive backplane, keeping in mind that these will only include ISA and PCI slots. There are not any motherboard form factors that support ISA.

If you will be using a combination of PCI (Peripheral Component Interconnect) and PCIe (PCI Express) slots, a PICMG 1.3 SBC and passive backplane is one option. Other options include an ATX, microATX or mini-ATX motherboard.



Lastly, when considering I/O card installation, keep in mind that not all PCIe cards are the same. Options include X1, X4, X8 and X16. Refer to the motherboard or passive backplane data sheet to find out if it will accommodate the different types of cards your application requires.

Power Supply

Whether your chassis is rack mount, wall mount, or desktop, it is critical that you have enough energy to provide power for both your PC and for any additional internal or external I/O peripherals. Have a lot of I/O? Be prepared to have a lot of power. Most industrial chassis power supplies are available in ATX form factor ranging from 300W to 700W. Redundant power supplies are also an option if your security requirements dictate such.

Additional Factors

Storage, RAID, and Operating System are three additional factors to consider when configuring any type of chassis. Learn more in Chapter 7.

Chapter 7

You're Not Done Yet! Further Considerations…

Operating System

The software your application requires will need a specific OS (operating system), regardless of whether the software was sourced or developed in-house. Long story short, be sure that your PC supports the OS you need! The product data sheet for your motherboard, SBC, Embedded PC, TPC, PPC or IPPC is an invaluable resource when determining what will work, although a DOS, Linux or CE environment is a bit more complicated and may require additional support from an industrial PC specialist.

Storage

Depending on the chassis or specific Embedded PC or HMI Display you have selected, options may include:

- 2.5" and 3.5" hard drives
- mSATA devices
- 2.5" SLC, MLC and ULC solid state drives
- or SLC, MLC and ULC compact flashes

SLC storage devices boast the fastest performance, while the slowest performance is seen in MLC storage devices. It should be noted that SLC devices are significantly more expensive than ULC & MLC storage devices.

Expert Tip:

ULC storage devices are becoming increasingly popular due to impressive performance during boot-up and aggressive pricing.

If vibration is a factor in your environment, the most suitable options are a solid state drive, mSATA device or compact flash. No vibration issues? A hard drive will get the job done.

Smaller embedded and touch panel PCs tend to be restricted to compact flash and mSATA devices, whereas larger embedded and touch panel PCs will accommodate any option, with the exception of 3.5" drives. These may even support both a compact flash and a 2.5" storage device for optimum storage capacity.

IPPCs will accommodate any type of storage device, but have limitations as to how many devices can be installed.

If you will need more than one storage drive, a chassis solution will work best, allowing for the installation of removable drives for redundancy (*see RAID below*).

RAID (Industrial Chassis Only)

RAID, which stands for Redundant Array of Independent Disks, must be taken into consideration when an industrial chassis is being operated in mission-critical applications that require redundancy (storing the same data in multiple locations). RAID allows multiple hard drives to be combined into one storage unit. The distribution of this data is dependent on the RAID level being utilized.

Although RAID levels include 0, 1, 5 and 10, RAID levels are not a type of rating system. When comparing RAID levels, it is imperative to understand that the levels classify functionality and performance, including data availability and integrity. RAID is an option often supported onboard the SBC or motherboard, but can be added as a PCI or PCIe card if needed.

RAID Options			
	Disk #	**Block Type**	**Redundancy**
RAID 0	Minimum: 2	Striped	None
RAID 1	Minimum: 2	Mirrored	Excellent
RAID 5	Minimum: 3	Striped	Excellent
RAID 10	Minimum: 4	Striped & Mirrored	Excellent

**RAID 5 is the most cost-effective option*
**RAID 10 is the best solution if cost is not a factor.*

Where Do I Go From Here?

We've covered a lot of industrial computing ground so far in this eBook, but you may have further questions remaining. Just know this: We are here for you.

Although the technology is complex, President & CEO RAD DeRose has focused on customers first for over three decades. Working with our technical experts, you can rest assured that we will listen to your concerns and take the time to fully understand your needs.

After the sale? You will receive lifetime technical support so that your systems can remain up and running, 24/7/365.

Simply put, your satisfaction is how we measure our success.

'Shared Values Cement a Long-Term Partnership'

ADVANTECH iAutomation
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Our premier partner, Advantech, has a global reputation of excellence in manufacturing industrial computing and automation products and peripherals. With a mission of "Enabling an Intelligent Planet," Advantech provides innovative development and manufactures high-quality, high performance computing platforms, all of which are backed by industry-leading office e-business solutions.

> " Our custom applications integrate Advantech hardware to create solutions to solve our customer's challenges while meeting their needs. "
>
> *- RAD DeRose, L-Tron CEO*

"Shared values form the glue that sustains a business relationship through time." (Progressing the Advantech Story). We have been a Premier Partner with Advantech for over 'x' years.

Glossary

Chassis – The physical framework of a computing device.

Embedded PC – A PC that can be added to another system for expansion. Often utilized to control a specific part of a system, such as security, to give the system more computing power.

Human Machine Interface (HMI) – A term used for a flat panel monitor, touch screen, touch panel computer or panel PC utilized by the user to physically interface with an industrial application. These units enable the user to monitor, control software and make changes to their process(s) as required.

Industrial PC – Systems designed to operate functionally 24/7, 365 days/year. They are available in rack mount, wall mount, desktop, touch panel, panel PC and Embedded form factor.
These PCs possess the durability to withstand the harshest of environments. The long product availability of 5-7 years enables the user to standardize with their on-floor systems and develop a "gold standard" image.

Industrial Panel PCs (IPPC) – Rugged panel mount PCs with an aluminum front bezel and stainless steel chassis. These units were designed and intended for the harshest of environments. Some units include a hard anodic coating to prevent panel abrasion and acid corrosion. IPPCs include an IP65 rating and can be configured with a Core i3/i5/i7 CPU and DDR3 RAM. IPPCs also have the ability for more I/O expansion than most Panel PCs or Touch Panel Computers. That has become a determining factor for users requiring one/two PCI/PCIe slots for I/O expansion.

I/O – Abbreviation for Input/Output, which is the communication from one system to another, or from a system to an interface. A keyboard, mouse, or touchscreen are examples of "inputs," whereas a monitor or interface are examples of "outputs."

mSATA (Mini-SATA) – A small-sized interface connector that enable SATA integration.

Operating System (OS) – Is a software program that enables computer hardware to communicate and function with the computer software. The OS is an essential component and without it a computer and its software program would be useless.

Panel PCs (PPC) – Panel mount units designed for industrial automation applications. They include a rigged IP65 front bezel along with Atom single/dual core and i3/i5/i7 CPU options. There are also PCI/PCIe I/O expansion capabilities via a riser card. This unit isn't as rugged or expansive as an IPPC but does offer more external I/O support than a TPC.

PCI (Peripheral Component Interconnect) – Used for high-speed operations, this singular connection between a computer (microprocessor) and its peripherals requires closely spaced expansion slots.

Glossary

PCIe (Peripheral Component Interconnect Express) – Used as a replacement for PCI, this two-way, serial connection between a computer (microprocessor) and its peripherals has two pairs of point-to-point data lanes.

Peripherals – Devices that are attached to computers, such as a mouse, keyboard, scanner, camera, speakers, and more.

RAM (Random Access Memory) – A memory component within a computer where data is stored, specifically, the data pertaining to any open programs or applications.

Redundancy – Ability to store the same data in multiple locations for extra back-up in mission-critical applications.

SATA (Serial Advanced Technology Attachment) – A fast serial interface that only requires a simple circuit on the motherboard.

Single-Board Computer (SBC) – A complete computer built on a single circuit board. SBCs have microprocessors, memory, and I/O all built on the same board. Some are made to be plugged in to a backplane for expansion purposes.

Custom Chassis & Beyond

We have a great reputation for flexibility and adaptability, product knowledge, technical support, and application experience, through which we are able to provide completely customized industrial PC solutions.

We are able to 3rd party source custom chassis, power supplies and peripherals that are outside the scope of our standard product offering, enabling us to pair the best in breed with an Advantech platform to create a solution that goes above and beyond all specification requirements.

Working with several manufacturers and vendors, we can source, assemble and test the most customized PCs available on the market.

"Your Success Is Our Passion!"

[Watch a Video]

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Questions? CONTACT US

Our Team of Tech-Experts are ready to help you!

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