How To Design Embedded Computers For Kiosk Machines

Enabling Immersive And Responsive Self-Service Experiences With Interactive Kiosk Machines

As consumers demand greater convenience not only in their online shopping experience but in the real world as well, "if the last 20 years were about the growth of online shopping, the next 20 will be about the growth of automated stores. Interactive kiosks provide a great way for businesses to cater to this rising need. In a nutshell, interactive kiosks are machines that are designed to interface with customers for a wide variety of functions: self-service, information, wayfinding, and advertisement/ digital signages are just some key examples. Kiosks are fast becoming more prevalent in our world and their presence can be felt in many venues. Hospitals, movie theaters, government buildings, and theme parks are just some examples of environments where kiosks have been deployed. In 2018, the global kiosk market was valued at around USD $24 billion, and is expected to register a CAGR of 8.9% from 2019 to 2025.

There are many benefits to employing kiosks for both consumers and businesses. Since kiosks are self-service tools that are always on and available, they can offer services and information in environments where a traditional human employee presence may not be practical or cost effective. For example, a commuter who needs to buy food in an empty airport terminal at 3am would welcome the presence of a food kiosk. College and company campuses is another example. Rather than displacing human workers, kiosks can be a supplement to traditional business services to boost consumer experience.

Businesses that utilize kiosk benefit as well. The most obvious way is that by offering an additional method of spending money, retail kiosks can add to a company's revenue stream. Kiosks can also provide analytical data on user behavior, user information (gender/age/etc.), and effectiveness of the kiosk's contents. Over the long term, kiosks can also save a company money as an effective ROI due to obviating the need for hiring and training labor, even when considering the initial capital and maintenance cost. There are intangible benefits as well; by providing consumers an enhanced user experience, companies can elevate brand image and impression in the eyes of their target customers.

Premio Embedded Computer Benefits

Industrial-grade embedded computers are scalable solutions for kiosk machines:

- Maximized USB ports connecting all the necessary peripherals for a kiosk.
- Wide temperature, dust control chassis design allow use in environments that are outdoors or have less airflow.
- IoT enabled system with wireless connectivity allowing OTA (over-the-air) kiosk remote management and real time data analytics.
- Built-in system hardware/firmware security functions in compliance with PCI and HIPAA regulations
- ODM Industrial Computer Customization, Purpose-built for Kiosk Machines

Designing An Embedded Computer For A Kiosk Machine

Although kiosks come in all shapes and sizes, at the heart of each one is some type of computer that can drive its information technology, touch screen display, industrial controls, data collecting equipment, and wireless connectivity. A kiosk may seem like a simple machine at first glance, but there are a few key engineering challenges to consider when choosing a industrial-grade computer that can serve its needs.

1. USB I/O Ports

Almost all kiosks will contain at least one touch screen to display/exchange information, but some kiosks also come with a variety of peripherals to enable its purpose. Examples of add-on peripherals are:

- Barcode scanner
- Credit card reader
- Keyboard
- Fingerprint readers
- Label printer
- Webcam

Each add-on provides a kiosk with additional functionality, but they all need to be connected to the main computer, most likely via a USB connection. Therefore, a computer that is designed to power a kiosk would likely need more USB ports than the average computer provides. Premio's computers are designed to meet this need with our signature expansion slots which allows for multiple USB ports, up to 12-14 physical ports.

2. Data Security

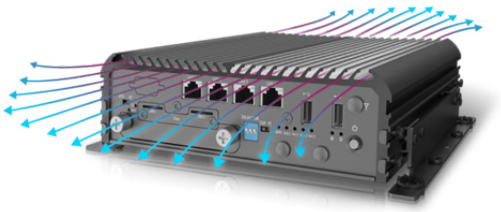
Due to the public access nature of kiosk placement, security is a must to protect user data and prevent outside tampering. Some kiosks require PCI compliance to protect consumer privacy and to meet this requirement, Premio's embedded and edge computers for kiosk machines have been designed in a multilayer hardware/ firmware security features to serve industrial security needs.

- Support for the latest UEFI Secure Boot functions with custom private key management. This feature provides a tamper proof system boot environment for data security.
- Support for trusted platform with the latest TPM (Trusted Platform Module) 2.0 built in. TPM operates on the hardware level to ensure hardware integrity between drives and the motherboard.
- Extensive system management policy to block all necessary hardware I/O ports and interactive keyboard from unauthorized users.
- Built-in GPIO, Watch Dog Timer , LTE connectivity, etc. allows for full scale remote management capability of kiosk computer anywhere 24/7 around the world.

The sum of all these features is to allow Premio's embedded and edge computers to meet PCI and HIPAA data protection regulations which ensures the security of all the data that passes through a kiosk and retain the integrity of its data.

3. Thermal Performance and Resilient in Harsh Environments

Kiosks operate in environments which demand a wider range of temperature tolerance. For example, a kiosk may be placed outdoors which means the computer inside would be required to function during the cold of winter or blazing hot summer months. In most instances, it is the upper end of the temperature range that would pose a challenge as most components are not designed for extremely hot environments. To counter this, a kiosk may employ an additional A/C unit in the design to cool down the electronics, but these units are costly, heavy, and are a potential point of failure. As part of our key features, Premio's embedded and edge computers for kiosk machines use passive cooling technology without the need for fans or additional A/C units and are tested to survive in harsh temperature environments. Premio offers embedded and edge computers that can operate in environments up to -40 °C to 70 °C . This allows cost savings by forgoing the need for any active cooling mechanism and the cost such equipment requires. It also enhances the longevity of the kiosk machine. Premio understands that kiosks are mission critical machines that must function 24/7, and our embedded and edge computers are designed to keep up with this requirement.



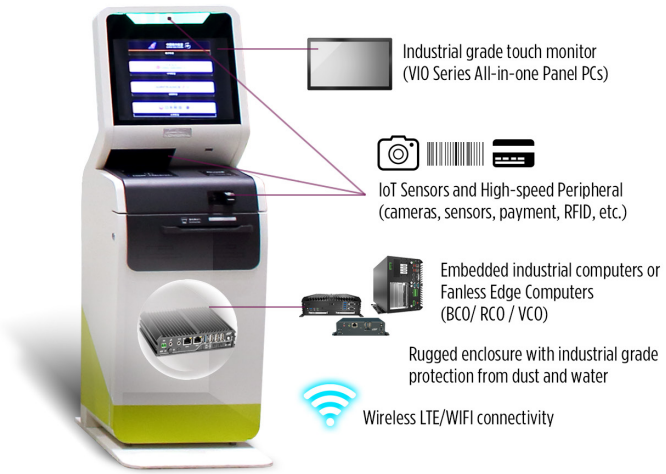
ODM Industrial Computer Customization, Purpose-Built For Kiosk Machines

In addition to our standard, commercial off the shelf (COTS) portfolio of embedded and edge computers, Premio also provides extensive design and engineering services for industrial-grade computers. Kiosk machine manufactures work extremely close with embedded computing experts to design reliable industrial-grade computers at massive scale. This process provides a completely custom design that ensures mission-critical kiosk applications can be deployed in rugged and outdoor environments. The design collaboration between both engineering teams solve and address key challenges

often experienced in kiosk machines. Two great examples of ODM designs specifically made for kiosk machines is the swappable I/O module and the washable dust filter cartridge:

- Swappable I/O Modules for Maximum I/O Ports: Easy to Service, Scalable for Upgrades, and Lower Total Cost of Ownership for interactive kiosk machines.

A key challenge for kiosk designs is the ability to support a wide range of I/O connections and peripheral IoT sensors. These type of I/O connections are extremely important in kiosk machines because they manage a wide variety of critical functions for a kiosk in both serial analog and high-speed digital connections. For example, interactive kiosks now feature IoT sensors like cameras, scanners, RFID reader, and payment reader to name a few, but rely on high-speed USB protocols to transmit important kiosk data from the machine. A major benefit from the swappable I/O module for kiosks is its ability to maximize the USB ports from the motherboard's chipset. Premio's ODM kiosk computer can support up to x12 USB ports, which are directly pulled from the motherboard; even more USB ports can be added through standard PCIe expansion cards. Another key benefit of the industrial computer is placement of the I/O's at the front. Kiosk designers and manufactures factor in heavily the level of serviceability and maintenance since downtime for a kiosk machine can affect a loss in transactions.



The I/O module also provides additional analog serial (RS-232/422/485) ports that are often used to manage specific mechanical and robotic tasks. Overall, these type of ODM industrial computer designs provide kiosk manufacturers easy serviceability and in-field upgrades for scale. Since most kiosk machines are deployed in rugged outdoor environments, this modular I/O design makes it easier to scale and maintain interactive kiosks.

- Washable and Replaceable Dust filter Cartridge

Another challenge in kiosk machines is to control dust intrusion. Ambient dusts in certain kiosk locations, especially outdoor pose challenges to system thermal performance which could cause component damages. Dust can enter the system and the subsequent build up would cause temperature to increase beyond the operating range. Depending on the mounting orientation of kiosk computer, the dust filter design in Premio industrial kiosk computer has an "omni-directional" removing/ snap-in mechanism to accommodate field serviceability in both horizontal as well as vertical chassis mountings. With a "tool-less" thumb screw, service technician can easily remove the dust filter cartridge and wash it for reuse.

Premio's industrial kiosk computers are designed with key features that directly solve challenges in kiosk machines and is purpose-built for today's growing kiosk industry:

- Industrial-grade components for 24/7 operations
- Robust thermal performance
- Ultra-compact SFF supporting mATX and mITX motherboards
- Support UEFI secure boot and TPM
- Support latest wireless technology and remote management
- Additional rear/front I/O ports and half height extension slots
- Single-sided I/O and PSW/RST LED & control
- Supports internal AC or external DC powers
- Tool-less chassis access
- Washable dust filter
- Universal mounting kit

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