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CHOOSING A SWITCHING SYSTEM PLATFORM

David Owen
Shaun Fuller

Pickering Interfaces manufactures a large range of switching products on a variety of operating platforms. Because of the large choice of products available confusion often arises when products on more than one operating platform meet the user's requirements. This application note can help you decide what is the most appropriate format for you. It could be the first step in selecting the product you need to use, and tells you what you need to get the basic system working.

PLATFORMS FOR SWITCHING PRODUCTS

Pickering Interfaces offers switching products in a variety of platforms:

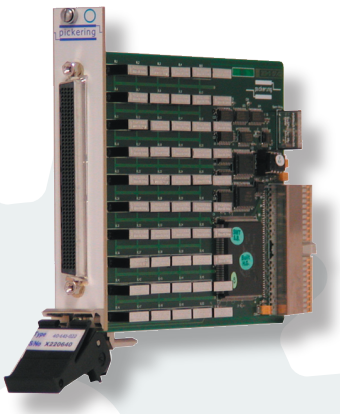
- PXI (Compact PCI compliant)
- System 10 and System 20 (IEEE-488, RS 232 or ETHERNET control)
- VXI
- PCI
- Specialised switching card formats

Each format has its own advantages and limitations that can influence a decision on the most suitable platform for a given application.

PXI SYSTEMS AND CPCI



An 8 Slot PXI Chassis
Pickering Interfaces Part Number 40-908



A typical PXI Switching Module
from Pickering Interfaces

PXI systems are a more recent platform design than System 10 and System 20 which use the long established IEEE-488 bus. The chassis system is based on a Compact PCI backplane which, like System 10 and System 20, allows modules to be plugged in. PXI is an open standard that can support products from a number of companies.

Pickering Interfaces modules and components for PXI systems are identified by a part number prefix of 40, 41, or 45 (for 6U).

The PXI chassis are available in a variety of sizes and allow for both rack mounting and bench top operation. The standard supports the use of 3U and 6U modules, though at the time of writing 6U modules are not in common use.

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Chassis most commonly accept 3U modules, but 6U chassis and chassis that accept both 3U and 6U modules are also available.

More information on PXI can be found in the PXI reference book entitled PXImate, available from Pickering Interfaces (details of how to order a copy are provided on the Pickering Interfaces website at www.pickeringtest.com/pximate) and details of the PXI standard can be found on the PXISA website, www.pxisa.org.

Modules are always a multiple of a standard width, so the horizontal space they occupy is specified in terms of module widths or the number of slots they occupy.

Pickering Interfaces encourages users to adopt PXI based solutions for new applications.

Compact PCI systems are very similar to PXI systems mechanically. However, they lack features that are normally considered to be important in instrumentation. PXI modules can be used in Compact PCI chassis and Compact PCI modules can be used in PXI chassis, though there may be some performance or functionality issues for some types of products (switching products are usually not effected).

PXI systems provide a very high speed backplane capable of supporting data exchange rates of 132 Mbytes to 264 Mbytes per second (excluding deductions for software and hardware overheads). For switching systems alone this is not an important factor, but it can become an issue in systems which include data acquisition modules with high data capture bandwidth.

Key Aspects of PXI Systems to Consider

Strong Features	Considerations for your application
Provides platform for switching systems and instruments in one chassis	Cost may be marginally higher than systems only designed for switching, but are significantly lower cost than other modular solutions like VXI
Since it is an open standard products are available from other manufacturers	At present 6U modules and chassis are relatively uncommon
Robust module design with additional functions available	3U modules have limited front panel space
The number of available modules is continuously increasing because of a commitment to continued product development.	
Chassis accepts low cost cPCI cards, and PXI switching modules can be used in a cPCI chassis	
Produces very compact solutions for switching applications	
The chassis can have an embedded controller (Slot1) or an interface to an external controller	
PXI chassis available with UPS support for critical applications	
Simple, transparent expansion via MXI-3	

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Selecting a PXI Chassis

There are a variety of chassis available for PXI applications. The chassis include the power supply needed to operate them from an AC supply. The following factors will effect chassis choice:

- If 6U modules are required the chassis choice is limited, 3U modules can be incorporated in the system.
- The number of module widths that the selected modules require. Choosing a chassis with a small number of slots will reduce its cost and weight.
- The power consumption of the modules may (in exceptional circumstances) effect the choice of chassis
- The chassis may include space to the right of the last module that allows the use of wider modules (such as Pickering Interfaces' BRIC) while only occupying one slot of the chassis. This allows a lower cost chassis to be used than would otherwise be the case. The Pickering Interfaces 40-908 and 40-914 chassis are excellent examples of chassis suitable for use with a BRIC.
- The need for an embedded display system on self contained test systems
- Any requirements for battery operation or uninterruptable power supplies (UPS)

What You Need for a PXI System

- A chassis with the required number of slots
- A PXI controller or an interface to an external controller, such as MXI-3
- The switching and other modules required for your application
- Supporting software for the chassis and modules

SYSTEM 10 AND SYSTEM 20



System 10 Chassis (10-930-001)



System 20 Chassis (20-935-001)

System 10 and 20 are designed to operate from GPIB/IEEE-488, RS-232 or Ethernet interfaces.

They are proprietary systems developed for housing Pickering Interfaces switching modules in a chassis system designed to be mounted in a 19 inch rack or for bench top use.

The System 10 chassis was the first to be developed by Pickering Interfaces and allows switching modules to be plugged into the chassis. The case occupies 3 units (3U) of the standard 1.75 inch (44.4 mm) high 19 inch width rack system. The case width is approximately 17.7 inches (449 mm) so it can be mounted in a standard 19 inch rack.

The chassis has a set of backplane connectors that provide power and control signals to the module. In addition the case system has an analogue backplane that can be used to interconnect modules.

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The System 20 chassis can accept modules with a greater front panel height than the System 10 chassis and the available PCB area is greater. If the modules are orientated vertically the chassis occupies 6 units (6U) of the standard 1.75 inch rack system height. The greater PCB area of System 20 cards allows them to have more complex switching functions at lower cost per relay and permits the modules to have greater self test functions.

Both System 10 and 20 systems use plug in modules that are multiples of a standard horizontal pitch (abbreviated to hp) of 0.2 inches (5.08 mm).

System 10 and System 20 chassis are available in both 3U and 6U high formats. System 10 chassis are in 3U high format for basic systems but are also available in double height chassis, which can support two levels of 3U high modules. The System 20 chassis are available in a 6U height with the modules arranged vertically or in a 3U height with the 6U modules arranged horizontally.

In addition chassis are available which can have both System 10 and System 20 modules incorporated, allowing the user to pick the optimum switching systems for his application.

Each chassis type is also available with the modules plugged into the rear or into the front of the chassis (the power cord is always defined as being the rear of the chassis). This is often important in large switching applications where the cabling complexity should all be kept to the rear.

System 10 and 20 systems can be controlled by a GPIB connection that can operate at up to 1 Mbyte per second. This is significantly in excess of the bandwidths required to control switching systems.

Key Aspects of System 10 and System 20 to Consider

Strong Features	Considerations for your application
Provides a low cost solution for switching systems	Not able to support products other than switching
Interfacing to a controller is simple and straight forward	No third party products are available for the system
Robust module design	Limited development of new modules
Variety of standard module and custom modules available	

Selecting a Chassis

Before selecting a chassis for a System 10 or System 20 switching system it is first essential to asses how complex the switching system required is by checking how many modules are needed and their level of complexity.
The following guidelines should help:

- For low complexity applications System 10 solutions usually occupy less room and provide the most cost effective solution.
- For high complexity applications the System 20 modules usually provide the best solution. This is particularly true for applications requiring large multiplexer (MUX), matrix or RF/Microwave configurations
- For some applications a mix of System 10 and System 20 modules may prove to be best, particularly for applications which need a variety of different types of switching system.
- If the application requires a large variety of different switches of different types (optical, RF, matrix, MUX, power, communications) in the same chassis and the complexity of each is not high then a System 10 solution in a 6U chassis may prove to be best.

In many cases it may be wise to check more than one route to find the most cost effective solution. Pickering Interfaces provides on-line pricing for all its modules on its web site to aid designers in selecting the lowest cost solution.

If there is any doubt over the final test configuration it may be wise to ensure that there is some spare capacity in the chassis for unexpected requirements or design changes.

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What You Need for a System

There are four key parts required:

- The chassis with the capability of accepting the specified System 10 or System 20 modules
- A power supply module which is different for front plug-in or rear plug-in modules
- A controller module which provides a GPIB, RS232 or Ethernet connection to allow the system to be remotely controlled
- The selected switching modules to perform the required switching functions

VXI SYSTEMS



A Typical VXI Chassis

VXI systems are based on a chassis that uses a backplane derived from the VME system. As with other chassis based systems modules, including switching systems and instruments, are plugged into the chassis. The available board area and front panel is larger than PXI based systems and the chassis occupies a much larger volume. Many instruments are message based rather than being register based products.

As with other chassis based systems each module is specified to occupy a number of slots.

VXI is a mature system that has been used for a number of applications, particularly in military test systems. The number of vendors actively supporting VXI has generally declined over the years but smaller manufacturers have entered the market to fill the opportunities left by the larger vendors ceasing development or manufacture.

VXI systems are usually considered to be relatively expensive, especially when applied to switching applications.

Pickering Interfaces recommends using VXI only when there are legacy requirements that demand it on new designs.

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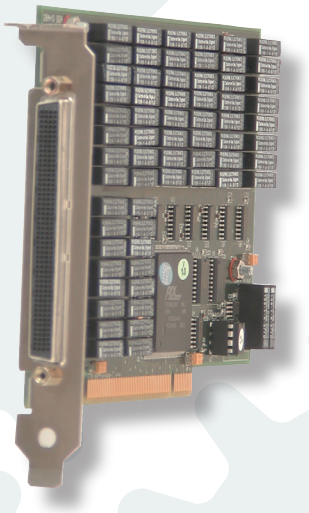
Key Aspects of VXI Systems to Consider

Strong Features	Considerations for your application
Provides for switching systems and instruments in one chassis	Relatively high cost platform for switching applications
Since it is an open standard products are available from other manufacturers	Mature technology generally considered to be past its peak demand
Robust module design with additional functions available, especially sophisticated self test	Number of vendors has declined in recent years and there are few new module designs being introduced
The chassis can have an embedded controller or an interface to an external controller	

What You Need in a VXI System

- A VXI chassis
- A controller or an interface to an external controller
- The switching and other modules for your application

PCI SYSTEMS



A Typical PCI Card

PCI switching systems are based on the use of cards which can be inserted into the PCI slots of a desk top or industrial computer. Unlike the chassis based system there are no dedicated functions to allow the exchange of signals other than the provision of power and control signals. The chassis of the host PC limits the panel space.

The cards use an edge connector which plugs into the PCI connector on the mother board of the PC. The I/O connections are carried on a small panel that is usually at the rear of the computer.

PCI solutions are only recommended when the controller has physical room for the switching system and the switching system is not complex. It is a low cost solution for those applications where the physical and performance limitations are acceptable, typically for testing low cost consumer products found in the Far East.

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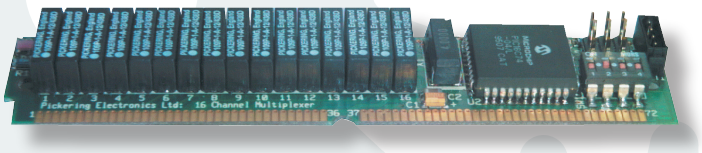
Key Aspects of PCI Systems to Consider

Strong Features	Considerations for your application
Low cost	Small size and limited front panel area make it only suitable for relatively simple applications
Since it is an open standard products are available from other manufacturers	Requires the removal of the PC covers to fit the cards
Same software drivers as PXI equivalent module	The card connectors are not designed to be frequently inserted and removed from the host PC
Popular in very low cost labour areas	Limited amount of power and cooling available to the card (normally not a problem for switching cards)
	Limited number of instrument modules available, particularly ones with high performance, because of the relatively uncontrolled operating conditions
	Limited number of cards can be fitted to the host controller

What You Need for a PCI System

- A PC with available PCI slots
- The selected PCI switching and other modules

SPECIALISED SWITCHING PLATFORMS



A Typical SIM Card

Switching systems can be supplied using more specialised platforms.

A typical example of this is the SIM based solution in the 1000 Series of switching cards. The cards are supplied without a mechanical enclosure and use an edge connector. The cards can be mounted in a standard 72 SIM connector to plug into the user's own PCB system. The cards can be RS-232 or I^2C controlled. Multiple cards can be used by connecting them through an I^2C interface.

Switching systems based on this type of technology are only used in applications where space and cost may be a premium. No other type of card, such as an instrument, is typically available.

The functionality is very limited because the card area available is relatively small compared to chassis based systems.

CUSTOM SOLUTIONS

Pickering Interfaces is able to offer custom switching solutions for any of the platforms listed above.

Further information can be obtained from our web site or by contacting your local sales office.

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