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Will Acromag's VPX4810 work in my System?

Checking VPX Compatibility in 7 Simple Steps

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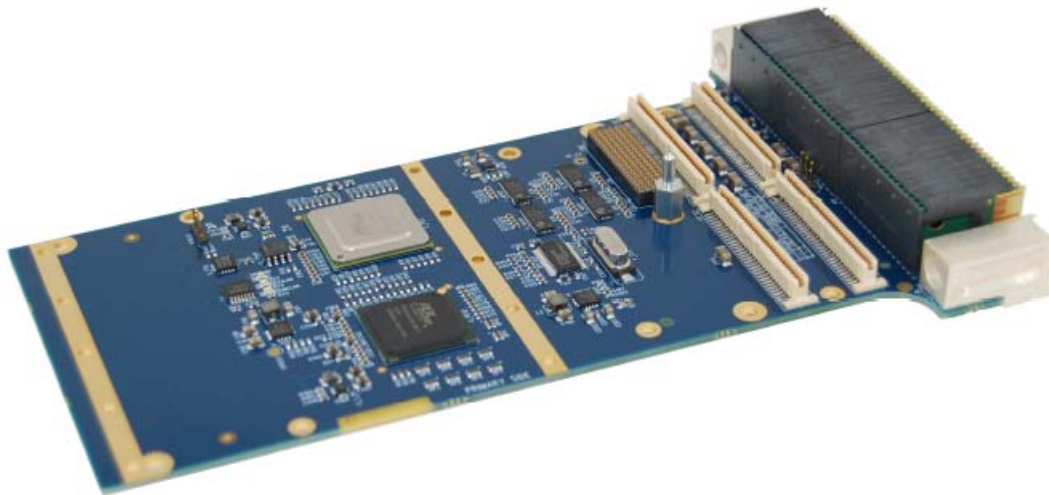
Will Acromag's VPX4810 VPX XMC/PMC Carrier work in your VPX system?

With the advent of the multiple new high speed serial bus protocols, the VPX standard is wrought with variations and deviations that complicate compatibility of boards within the system. This guide attempts to simplify this process. Before continuing with this guide, Acromag recommends that you read our White Paper *Introduction to VPX*. This will familiarize you with the basic flow and terminology in VPX systems.

To determine if Acromag's VPX4810 family of products is compatible with your system, simply go through the series of questions below. Be sure to read the answers thoroughly to avoid any missteps. VITA 65's "Open VPX" profile information is listed towards the end of this document.

Gather System Information

The following non-Acromag system information is required to determine compatibility. This guide assumes that you have selected a chassis, backplane and processor board (SBC) for your system. Please gather this information before proceeding.

- VPX backplane Datasheet
- Processor Board (SBC) Datasheet.
- Chassis Information including power supply, cooling method, and supported board pitch.

Determining VPX4810 Compatibility in 7 Steps

1. **Do you have a 3U system?**

   The VPX4810 family of carriers is only compatible with 3U systems. Unfortunately, 6U slots and 3U slots are not compatible due to differences in power supply voltages. *Plugging the VPX4810 in to a 6U system will destroy the board.*

2. **What type of cooling and what pitch board (thickness) does the chassis support?**

   The required board pitch is determined by two factors. First, the cooling method supported by the chassis must be determined. The second factor is the pitch supported by the backplane. Most VPX backplanes support up to 1" pitch, and are universally compatible. However, if your backplane only supports 0.8" or 0.85" products then be sure to order the matching Acromag product. The remaining factor to determine is what pitch and cooling method is supported by the chassis. Refer to the chart below to verify that the Acromag carrier is supported by the cooling method/pitch of the chassis and backplane.

Cooling Method	Pitch	Acromag Part Number	Description
Air	0.80″	VPX4810	Standard VITA 46 compliant board. Supports Front I/O. Fits in all VPX chassis.
Conduction Cooled	0.85″	VPX4810-CC	Top Conduction Cooling plate added to VITA 46. Only supports Rear I/O. Fits in most chassis.
Conduction Cooled-REDI	1.00″	VPX4810-REDI	REDI Conduction Cooled with level 2 maintenance support. This type of module has cover plates on both sides with no exposed components for ESD protection. Rear I/O only. Fits only in VITA 48.2 compliant chassis.

3. Does the system provide enough power?

One of the simplest (and often overlooked) requirements is power. Do you have enough power for all the system components? The VPX4810 requires 2.4A from the 5V supply and 1.8A from the 3.3V supply. Don't forget to add the XMC or PMC "daughter board" power requirements. Furthermore, if you have a PMC module that requires -12V verify that the system power supply and backplane support this optional voltage.

4. Does the processor board (SBC) support PCIe on the data plane? If so how many lanes does it have? Is the processor board VITA-46.4 compliant?

VPX technology supports an array of serial bus protocols including Gigabit Ethernet, Rapid I/O, and PCIe. Acromag's VPX4810 requires at least four lanes of PCI Express that is VITA 46.4 compliant. At this time, note the number of PCI Express lanes on the data plane available on the SBC. If you do not have PCIe on the data plane, it is theoretically possible to add a bridge that can convert from one type of serial bus to another. However, this adds another layer of complication that is beyond the scope of this document.

5. Are you using a VPX switch to expand your bus capabilities?

The point to point nature of the high speed serial buses means that a VPX switch will be required in systems with a higher slot count due to limitations of most processors. If you plan on using multiple plug-in modules, then a switch will more than likely be necessary.

6. Is the backplane VITA 46.9 P2w1-P64s compliant?

The VPX4810 routes the PMC Rear I/O P4 to the VPX backplane P2 Connector. All of the differential I/O are used in the P2 connector for the Rear I/O. If your attached PMC/XMC module supports Rear I/O, then the backplane must be 46.9 P2w1-P64s compliant. Failure to meet compliance means that the backplane could route some of the I/O between slots instead of to the Rear Transition Module, which could have disastrous effects on other modules in the system.

If your backplane is not compliant, be sure to either use a PMC/XMC module without any Rear I/O or verify that any possible connections on P2 to any other slot are left unconnected across all modules.

7. Map out your Data Plane (PCIe) lanes on your backplane to determine if there is a connection between your processor board and Acromag's VPX4810 plug-in module.

This is done using pen and paper. First, find the interconnection diagram of your VPX backplane. They come in many different variations, but you need a representation of how the data plane (P1) is routed on the backplane. A fabricated 3U 4 slot example is given below.

			Slot 1	Slot 2	Slot 3	Slot 4
P1	Port A	1 2 3 4	1-2 ⟷ 2-1		3-1	4-1
	Port B	5 6 7 8	1-3	2-3	3-2	4-2
	Port C	9 10 11 12	1-4	2-4	3-4	4-3
	Port D	13 14 15 16	Rear I/O	Rear I/O	Rear I/O	Rear I/O
P2	Port A	1 2 3 4	Rear I/O	Rear I/O	Rear I/O	Rear I/O
	Port B	5 6 7 8				
	Port C	9 10 11 12				
	Port D	13 14 15 16				

Fat Pipe

(x4 PCIe)

This is a full mesh backplane. *The term mesh refers to a network in which each slot is connected to all others.* Note that P1, which contains the data plane, is labeled via four separate ports. Each of these ports consists of a Fat Pipe (4 lanes) connection from one slot to another. *A Fat Pipe is equivalent to a 4 lane PCIe connection.* Taking a closer look at the Slot 1 connection, you will see that there is connection from the first fat pipe of Slot 1 to the first fat pipe on Slot 2. The arrows show the RX/TX crossover connection typical in any full duplex serial bus.

|			Slot 1	Slot 2	S
	Port A	1 2 3 4	1-2 ⟷ 2-1		

Moving on to Port B of Slot 1, you can see that it is connected to the Port A Fat Pipe of Slot 3.
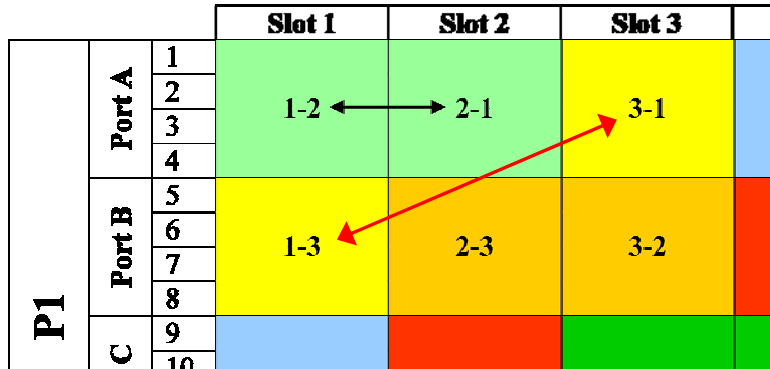

It is important to understand that per the VITA "dot" specification, a plug-in module always uses the lowest numerical pipes on P1 for the data plane. For example, if your board supports 8 lanes of PCIe, they will also be in the same position on the backplane connector. In the backplane diagram the pipe number (or PCIe lane) is referenced from 1 to 16 for P0.

Assume that you have selected a processor module that supports 8 lanes of PCI Express. Furthermore, let's assume that you place the processor module in Slot 1.

The VPX4810 has either four or eight lanes of PCI express (jumper selectable). The diagram below gives the slot profile for the VPX4810 assuming one Fat Pipe is used.
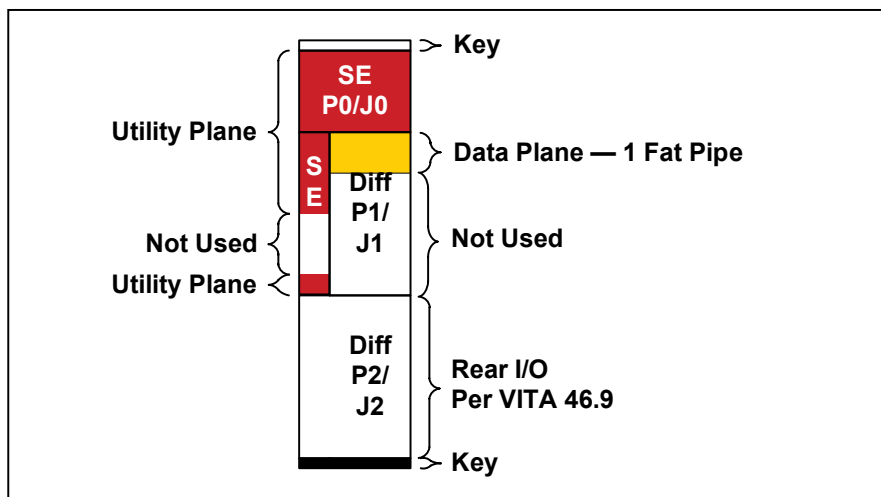
When this information is combined with the backplane interconnect diagram, there is a definite connection when the VPX4810 is placed in either Slot 2 or 3. The diagram below shows the PCIe connection when the Single Board Computer is in Slot 1 and Acromag's VPX-4810 is in Slot 3.
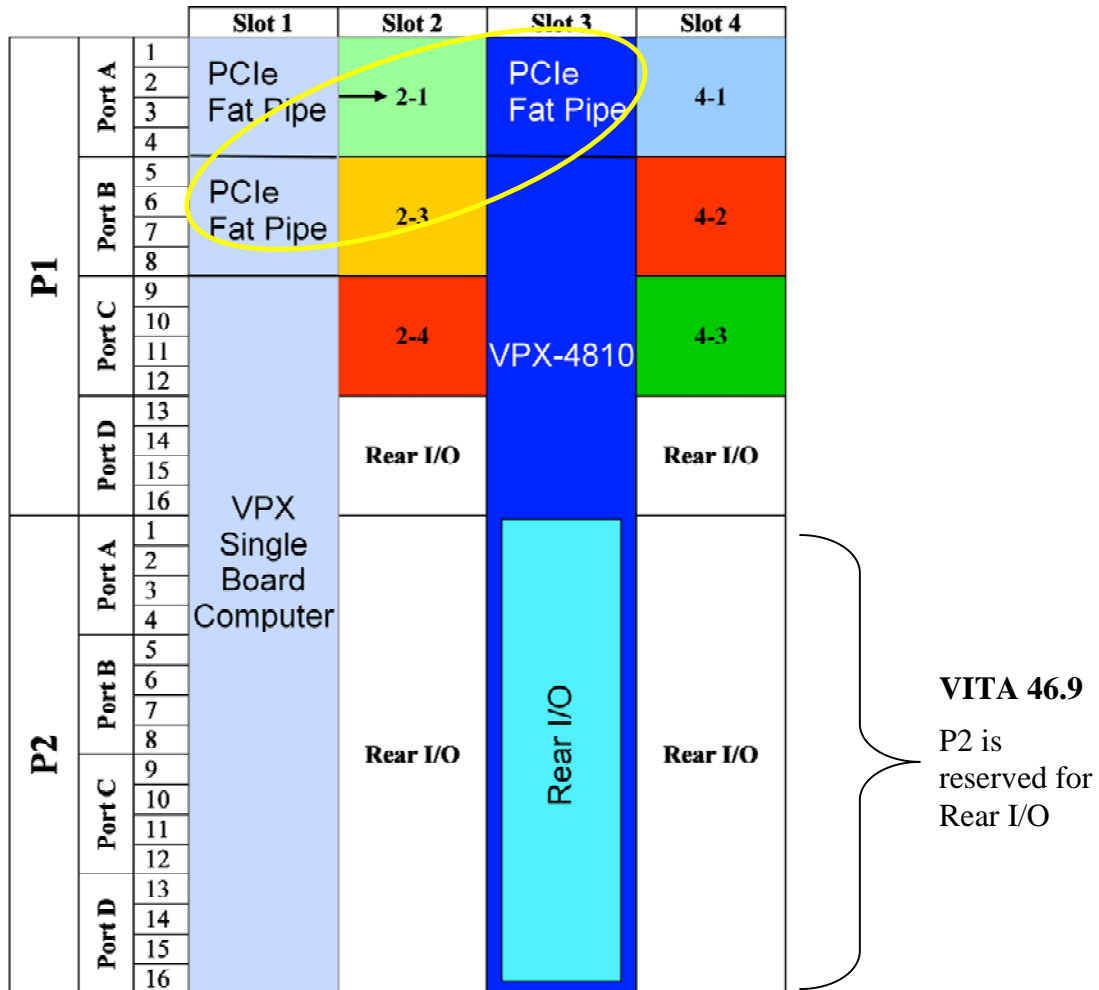
Also note that this backplane is VITA 46.9 P2w1-P64s complaint. This means that all P2 signals are reserved for Rear I/O and are not used for data connections to the remaining slots.

This example backplane does have the ability to provide a connection between a processor board and Acromag's 3U VPX product line without any Rear I/O conflict when using the described configuration.

VPX4810 OPEN VPX Profiles

For those of you who have a copy of the VITA 65 specification, Acromag VPX-4810 lines of products are compatible with the following Module and Slot Profiles.

Module Profile	Slot Profile	Notes
MOD3-PER-2F-16.3.1-3	SLT3-PER-2F-14.3.1	3U PCIe x8
MOD3-PER-1F-16.3.2-2	SLT3-PER-1F-14.3.2	3U PCIe x4
MOD3-PAY-1D-16.2.6-1[1]	SLT3-PAY-1D-14.2.6	3U PCIe x4
MOD3-PAY-2F-16.2.7-1[1]	SLT3-PAY-2F-14.2.7	3U PCIe x8

1. Board is compatible with payload profiles, though it has no hosting capabilities.

This information must be compared with the chassis, backplane, and available slot profiles to determine compatibility. Refer to the VITA 65 specification for further information.

Need more Help?

VPX still have you tied in a knot? Acromag's experienced and trained staff of application engineers are here to help. Simply contact us at Tel: (248) 295-0310 or e-mail: sales@acromag.com. Our web site address is www.acromag.com.

About the Author:

Acromag is an international corporation that has been manufacturing and developing measurement and control products for more than 60 years. Acromag offers a complete line of industrial I/O products including process control instruments, distributed I/O systems, embedded I/O modules, and data acquisition boards.