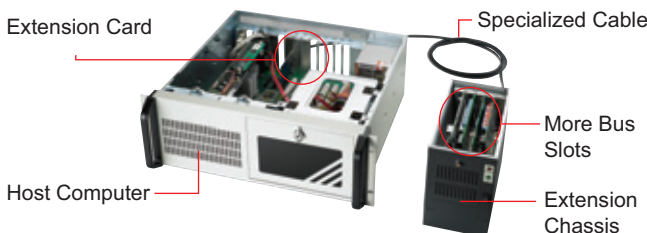


PCI/PCI Express®/ExpressCard™ Extended Anywhere With ADLINK Bus Extension Technology

What is Bus Extension Technology?

Bus extension, or bus expansion, is a technology that increases the number of bus slots of the same or different bus types for a host computer system. It is usually achieved by installing an extension card in the host computer and cabling it to a separate housing that contains a backplane and its own power supply to accommodate peripheral devices.

Typically, a bus extension system is composed of three major parts, an extension card installed in the host computer, an extension chassis to provide more bus slots, and a specialized cable to connect them. The extension card works as a transparent bus bridge. Though the host computer and the extension chassis are physically separated, they are logically the same computer system. All cards installed in the extension chassis are recognized and operated as if they were installed in the host computer, without any additional drivers or software needed.



Benefits of Bus Extension Technology

The manifest benefit of the bus extension system is increased bus slots. A modern desktop computer usually offers few PCI™ or PCI Express® slots. If users need to plug multiple PCI™ cards into a single computer, bus extension technology is the simplest and most efficient way to provide more PCI™ slots for a host computer.

Since the bus extension system has a separate housing to accommodate peripheral devices, the interoperability of different buses also benefits users. For example, with a PCI-to-PXI extension solution, users can take advantage of the superb computing power of a server-grade computer and the accurate synchronization/trigging of PXI™ modules.

There are additional benefits provided by extension technology. For harsh environments, it's a good idea to separate the computer and I/O cards so that users can place the computer in a safe place and place I/O cards near their sensors or actuators to be measured or controlled. The bus extension system connects the host computer and extension chassis via a cable, which gives great flexibility of system deployment. And, by separating the computer and extension chassis, the measurement accuracy may be improved since all the I/O cards installed in extension chassis can be kept from high-frequency interference from the CPU, chipset, memory, etc. The extension chassis contains I/O cards that can be modularized for easy replacement to reduce the MTTR (Mean Time To Recovery.)

And remember, most bus extension solutions provide complete hardware and software transparency. This means, you can easily setup a bus extension system without any additional drivers or software.

Types of Bus Extension Solutions

Depending on the bus type in a host computer and an extension chassis, we can create many combinations of bus extension solutions. The following are several existing bus extension solutions ADLINK provides:

- PCI-to-PCI extension
- PCI-to-PXI extension
- PCI Express-to-PCI extension
- PCI Express-to-PXI extension
- ExpressCard-to-PCI extension
- ExpressCard-to-PXI extension

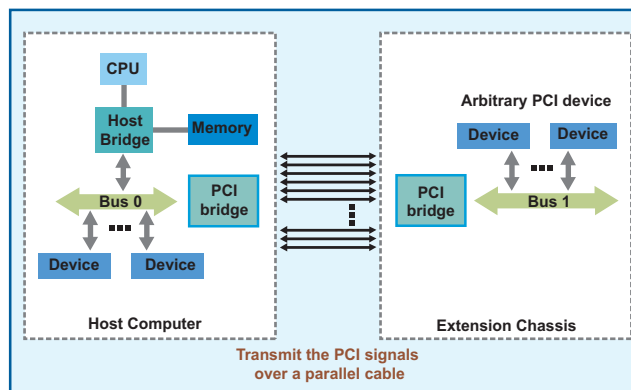


ADLINK Bus Extension Technology

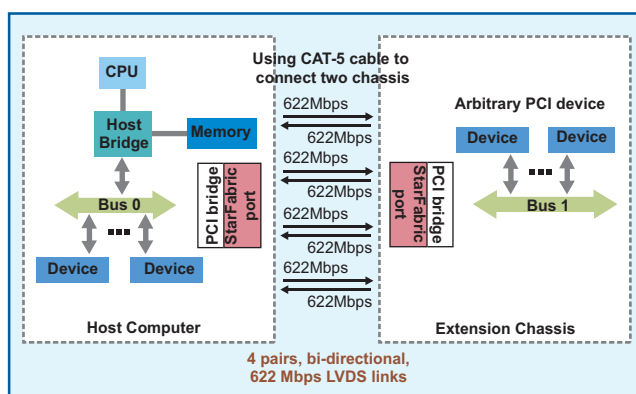
ADLINK is dedicated in the fields of PCI™, PXI™ and PCI Express® extension technology. PCI™ bus is a parallel bus which contains 32 data lines (32-bit PCI™) or 64 data lines (64-bit PCI™), while PCI Express® bus is a high-speed serialized bus which uses 2.5 Gbps LVDS signal pairs to transmit/receive data. Distinct extension technologies are used for different bus types. In this section, we'll illustrate the technologies we use for ADLINK bus extension solutions.

PCI-based extension technology (PCI-to-PCI, PCI-to-PXI, PXI-to-PXI)

PCI™ bus is a 32-bit bus running at 33 MHz. By bridging the PCI bus signals directly to the extension chassis via a cable, the host computer can control the extended PCI™ bus. This was a typical way to provide PCI-based extension solutions in the past. This solution, however, has some signification drawbacks. First, when transmitting 33 MHz clock signals over cables, the signals decay dramatically with an increase of cable length. The extension length of this solution is limited to 1.5 m. Second, the clock signals transmitted over the cable are highly susceptible to interference with no way to correct signal errors. This may cause system crashes due to severe interference.

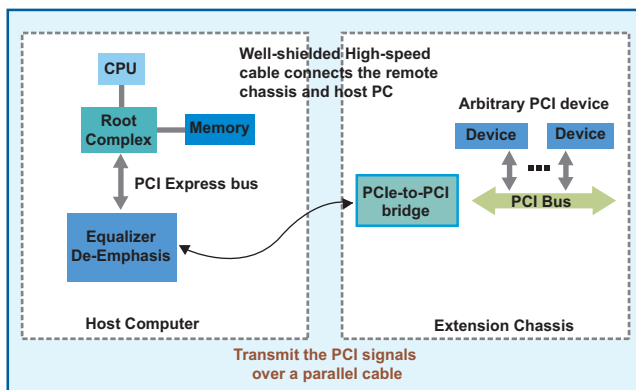


In ADLINK, we leverage a state-of-art StarFabric™ technology to design our PCI-based extension solution. StarFabric™ is a standard of data exchange using high-speed serialized signals. The ADLINK PCI-based extension solution works as a transparent PCI™ bridge and converts PCI™ bus signals to serialized StarFabric™ data format and transmits the data using LVDS signal pairs. Automatic error detection and correction are performed during the transmission to guarantee data accuracy. This new extension solution provides up to 10 meters of extension distance and extremely reliable operation.



PCI Express-based extension technology (PCIe-to-PCI, PCIe-to-PXI, ExpressCard-to-PCI, ExpressCard-to-PXI)

PCI Express® bus is inherently a serialized bus. Data between devices is transferred in the form of serialized data packets and over 2.5 Gbps LVDS PHY. Designing PCI Express-based extension solutions is relatively easier than designing a PCI-based extension solution. A major concern is maintaining signal integrity while transmitting signals over cables. The key is to place a repeater, or equalizer, to enhance signal intensity. ADLINK PCI Express-based solutions provide up to 7 meters of extension and over 100 MB/s sustained data transfer rate. For ADLINK ExpressCard-to-PCI or ExpressCard-to-PXI extension, an interesting feature is presented. With a proper compatible laptop and OS, the ExpressCard™ extension systems provide hot-swap capability. That is, you can just plug in the ExpressCard™ extension modules while your laptop is running, and all cards in the extension chassis can be recognized and operated automatically.



Selecting ADLINK Bus Extension Solutions

According to the bus types in the host computer and the extension chassis, various bus extension solutions are marketed. Here are few simple steps to help you correctly choose the bus extension solution you need.

Step 2 Select the bus and chassis to extend to

Step 1 Select a bus for your host computer	More PCI Slots		PXI Chassis
	 PCES-8581-4S/PCES-8581-13S [P.5-4]		 PCIe-8560/PXI-8565 [P.5-8]
	 ECS-8582-4S [P.5-2]		 EC-8560/PXI-8565 [P.5-7]
	 PCIS-8580-4S/PCIS-8580-13S [P.5-6]		 PCI-8570/PXI-8570 [P.5-9]
		N/A	 PXI-8570 [P.5-9]

1. Select the bus in your host computer system

For desktop or Industrial computers, there are PCI™ or PCI Express® slots inside computers. For laptop computers, you may have an ExpressCard™ slot. For PXI™ systems, PXI™ slots are available. You should first select the bus you want to extend from.

2. Select the bus and chassis to extend to

You can extend the bus in your host computer system to either PCI™ or PXI™ bus. If the target of extension is PXI™ bus, you should select a corresponding PXI™ module to connect to a host computer. If the target of the extension is PCI™ bus, the extension system usually comes with a chassis that contains a backplane and power supply. You should select the capacity of PCI™ slots within the extension chassis.

3. Select the extension cable according to your expected extension distance

Bus extension systems usually come with different options of extension cable lengths. For example, ADLINK PCI-based extension solutions provide cable options of 2, 5 and 10 meters and ADLINK PCI Express-based extension solutions provide cable options of 1, 3 and 7 meters. You should select the cable according to your extension system configuration.