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# PCIS-8580-4S
# PCIS-8580-13S
## User's Manual

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# 1 Introduction

The ADLINK PCIS-8580 is the PCI-to-PCI expansion systems for extending your PCI buses of the host computers. With the state-of-art StarFabric high-speed serial link technology, you can extend your PCI bus of the host computer to an external chassis, which accommodates 4 (PCIS-8580-4S) or 13 (PCIS-8580-13S) additional PCI slots. This advanced technology provides full 32-bit/33MHz PCI bandwidth (132MB/s) and maximal 10m distance between host computer and expansion chassis. In addition, ADLINK PCI-to-PCI expansion system utilizes the concept of “serialized bridge” to provide complete hardware and software transparency to your host system. Any hardware installed in the expansion chassis works as it’s inside the host system without any driver/software effort.

The ADLINK PCIS-8580 PCI-to-PCI expansion system is composed of three major components: a PCI expansion card (LPCI-8575), an expansion chassis (RK-8005 for PCIS-8580-4S or RK-8014 for PCIS-8580-13S), and a cable (ACL-PCIEXT-2). The PCI expansion card is the core of this system. It acts as a PCI bridge with the capability to serialize the PCI signals and maintain a 5Gbps serial link between the host system and the expansion chassis. The expansion chassis, which is a 4-slot wall-mount chassis (RK-8005) or a 13-slot rack-mount chassis (RK-8014), is the platform to accommodate PCI slots. It contains a backplane, a power supply, and a pre-installed PCI expansion card. The cable, which consists of DVI-D connector and shielding twisted pairs, provides robust connectivity and satisfying signal quality between the host computer and the expansion chassis.



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## 1.1 Features

### PCIS-8580-4S

- PCI local bus specification Rev 2.2 compliant
- PCI bridge architecture specification Rev 1.2 compliant
- Provides 4 extended half-size PCI slots
- Full 32-bit/33MHz PCI bandwidth expansion (132MB/s)
- Maximal 10m expansion distance
- Complete hardware and software transparency
- 24-pin DVI-D connector for robust connectivity
- Shoebox size wall-mount chassis with built-in 200W power supply

### PCIS-8580-13S

- PCI local bus specification Rev 2.2 compliant
- PCI bridge architecture specification Rev 1.2 compliant
- Provides 13 extended full-size PCI slots
- Full 32-bit/33MHz PCI bandwidth expansion (132MB/s)
- Maximum 10m expansion distance
- Complete hardware and software transparency
- 24-pin DVI-D connector for robust connectivity
- 19” rack-mound chassis with built-in 400W power supply

## 1.2 Applications

- Industrial automation/control
- Electronics manufacturing test
- Military/aerospace
- Video capture
- Remote test and measurement



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## 1.3 Specifications

### LPCI-8575 PCI-PCI Expansion Card

- PCI local bus specification Rev 2.2 compliant
- PCI bridge architecture specification Rev 1.2 compliant
- Supports both 5V and 3.3V PCI bus
- Data throughput: full 32-bit/33MHz PCI bandwidth (132MB/s)
- I/O connector: DVI-D 24-pin connector
- Link indicator (Green LED)
  - Off: Expansion or host computer does not power on
  - On: Link status is good
  - Blink: Link status is failed. Check your cable or power-on sequence.
- Maximum extended distance: 10m
- Power requirements

| +5V | +3.3V |
|---|---|
| 190mA | 250mA |

**Table 1-1: Power requirements**



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## RK-8005 Expansion chassis

- Dimensions: 122mm(W) x 195mm(H) x 260mm(D)
- Weight: 3.2 Kg (7.04lb)
- Backplane: 5x 32-bit/33MHz half-size PCI slots
  - 1 slot for expansion card
  - 4 slots available for PCI cards
- Front-panel indicators
  - Power indicator (Red LED)
  - Link indicator (Green LED)

    Off: Expansion or host computer does not power on

    On: Link status is good

    Blink: Link status is failed. Check your cable or power-on sequence.
- Power supply
  - Input voltage: 85VAC to 265VAC, auto-switching
  - Output: 200W
- Cooling: One 37.5 CFM ball bearing fan (80mm)



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## RK-8014 Expansion chassis

- Dimensions: 438.5mm(W) x 177mm(H) x 448.5mm(D)
- Weight: 12 kg (26.4lb)
- Backplane: 14x 32-bit/33MHz full-size PCI slots
  - 1 slot for expansion card
  - 13 slots available for PCI cards
- Front-panel indicators
  - Power indicator (Red LED)
  - Link indicator (Green LED)

    Off: Expansion or host computer does not power on

    On: Link status is good

    Blink: Link status is failed. Check your cable or power-on sequence.
- Power supply
  - Input voltage: 85VAC to 265VAC, auto-switching
  - Output: 400W
- Cooling: Two 88 CFM ball bearing fan (120mm)

## ACL-PCIEXT-2 Cable

- Length: 2m
- Construction: 8 pairs of shielding twisted copper wires
- Connector: DVI-D 24-pin
- Other cable options
  - ACL-PCIEXT-5: 5m
  - ACL-PCIEXT-10: 10m

## General

- Operating temperature: 0°C to 50°C
- Storage temperature : -20°C to 80°C
- Relative humidity: 10 to 90%, non-condensing



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# 2 Installation

This chapter outlines the contents of package, describes unpacking information, and describes how to set up the PCIS-8580 PCI-to-PCI expansion system and install your PCI cards.

## 2.1 Content of package

PCIS-8580-4S package includes the following items:

- One LPCI-8575 in a individual carton
- One wall-mount chassis, which contains the following components pre-installed:
  - One LPCI-8575
  - One 5-slot backplane
  - One 200W AC power supply
- One ACL-PCIEXT-2 cable
- One AC power cord
- Wall-mount kit for chassis
- This User's Manual

PCIS-8580-13S package includes the following items:

- One LPCI-8575 in a individual carton
- One rack-mount chassis, which contains the following components pre-installed:
  - One LPCI-8575
  - One 14-slot backplane
  - One 400W AC power supply
- One ACL-PCIEXT-2 cable
- One AC power cord
- This User's Manual

If any of these items are missing or damaged, contact your ADLINK dealer. Save the shipping materials and carton in to ship or store the product in the future.



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## 2.2 Unpacking

The ADLINK PCIS-8580 system contains some electro-static sensitive components that can be easily be damaged by static electricity. For this reason, the card and chassis should be handled on a grounded anti-static mat and the operator should wear an anti-static wristband during the unpacking and installation procedure.

Please also inspect the components for apparent damage. Improper shipping and handling may cause damage to the components. Be sure there are no shipping and handling damage on the components before continuing.

You are now ready to set up your PCIS-8580 PCI-to-PCI expansion system.

**Note**: DO NOT APPLY POWER TO THE CARD OR CHASSIS IF IT HAS BEEN DAMAGED.

## 2.3 Getting Start

In this section, we'll illustrate the step-by-step instructions to set up your PCIS-8580 PCI-to-PCI expansion system.

### Install PCI Expansion Card into your Host System

The first step is to install the PCI expansion card (LPCI-8575) into your host system. You can find an individual carton in the whole package which contains the PCI expansion card. The steps of installation are:

1. Turn off your host computer.
2. Open the chassis of the host computer.
3. Remove the package of PCI expansion card. (Please wear your anti-static facilities when you handle the card.)
4. Plug the PCI expansion card into an available PCI slot and screw it to the chassis.
5. Close the chassis.



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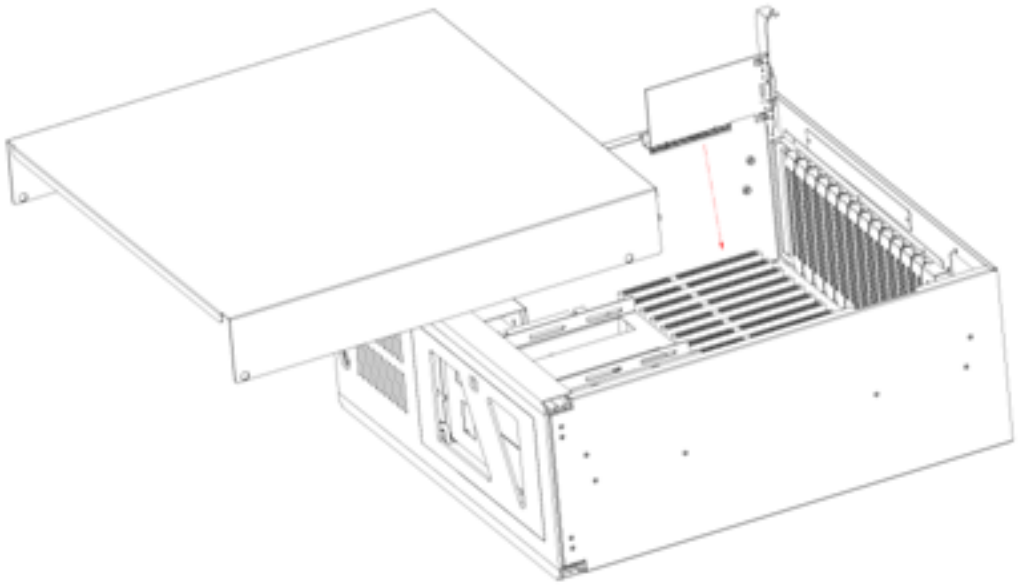


**Figure 2-1: Install the PCI expansion card into your host system**

## Driver Installation

After installing the PCI expansion card into your host computer, now you can turn on your computer and install the driver of PCI expansion card. Please follow the following steps to finish the driver installation.

1. Insert the ADLINK ALL-In-One CD.
2. Execute x:\Driver Installation\PCI Expansion\PCIS_8580_setup.exe to launch the setup program. (x: denotes your CD-ROM drive). A InstallShield® wizard appears to guide you finish the setup procedure.



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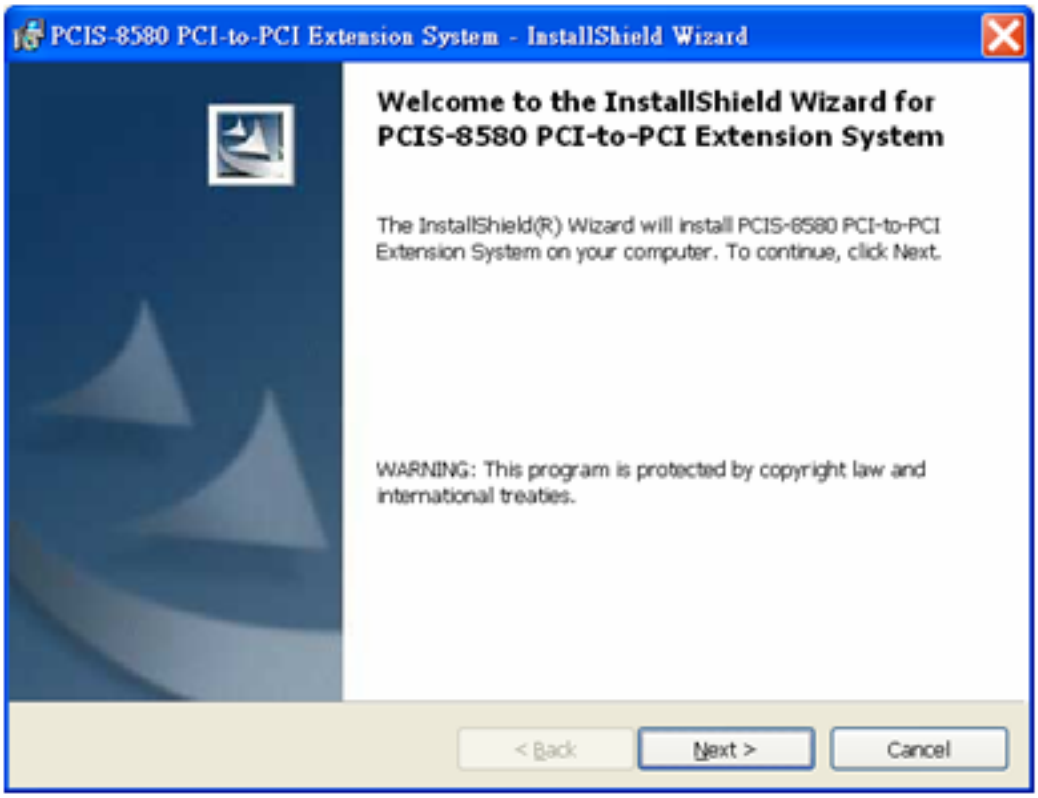



**Figure 2-2: Installing the driver for PCI expansion card**

3. While setup finishes, please reboot your system. (Note: According to different hardware configuration, you may need to reboot your computer for several times to detect the StarFabric serialized bridge and its subsequent PCI devices.)

## Install your PCI Card into the Expansion Chassis

The PCIS-8580 expansion chassis can accommodate 4 additional PCI slots (PCIS-8580-4S) or 13 additional PCI slots (PCIS-8580-13S). This section illustrates the procedures to install your PCI cards into the expansion chassis.

1. Open the expansion chassis by loosen the screws and remove the top cover of the chassis. You'll see a back-plane inside the chassis.



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2. Plug you PCI cards into the expansion chassis and screw them to the chassis.
3. Put the top cover and tighten the screws.

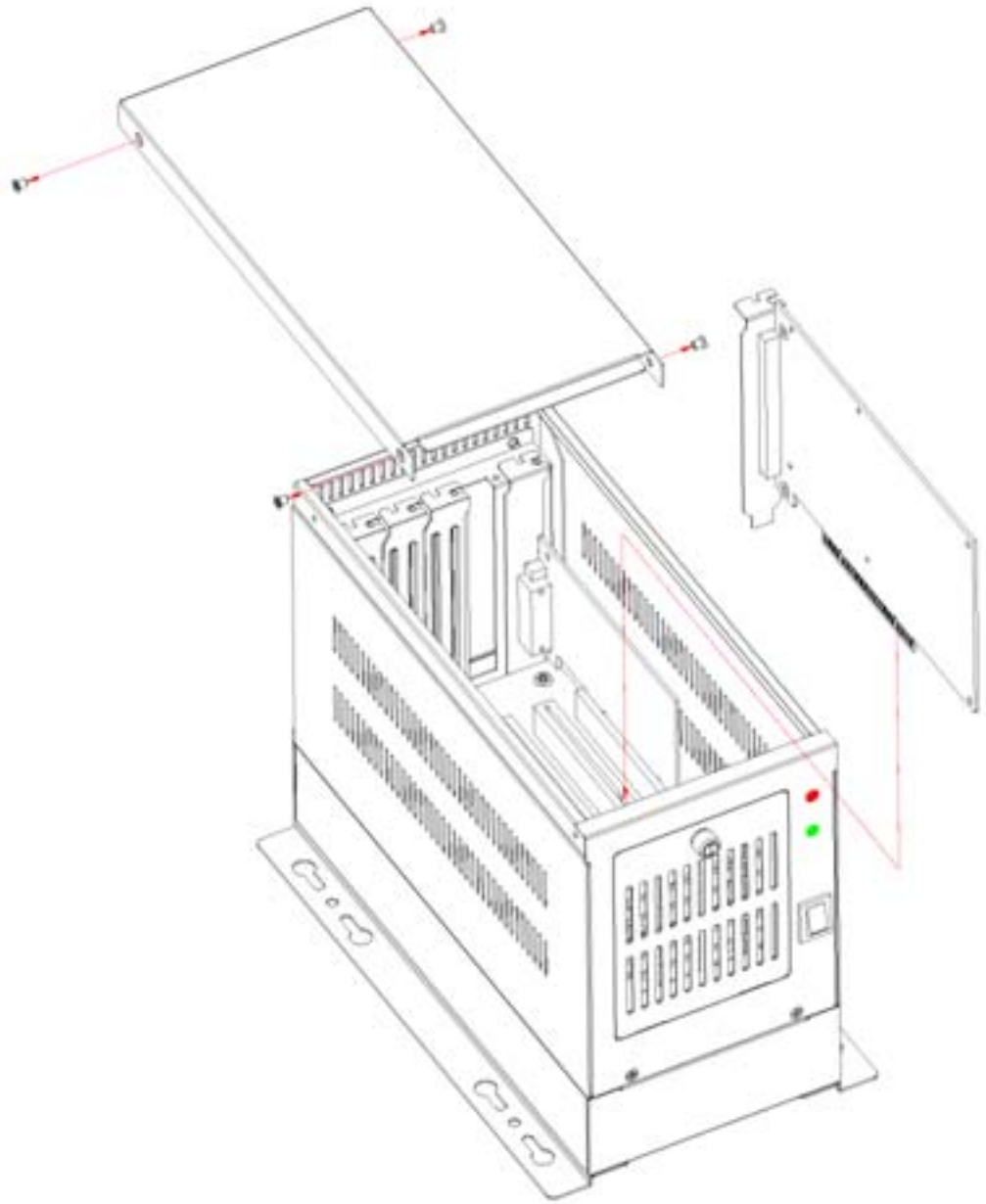


**Figure 2-3: Install your PCI cards into the expansion chassis (using the PCIS-8580-4S as an example)**



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## Connect to Expansion Chassis

Your host computer and the expansion chassis are connected via a cable (ACL-PCIEXT-2). This cable uses the DVI-D connector and customized shielding twisted pairs to make a robust high-speed serial link. Please DO NOT use standard DVI cable to connect your host computer and the expansion chassis.

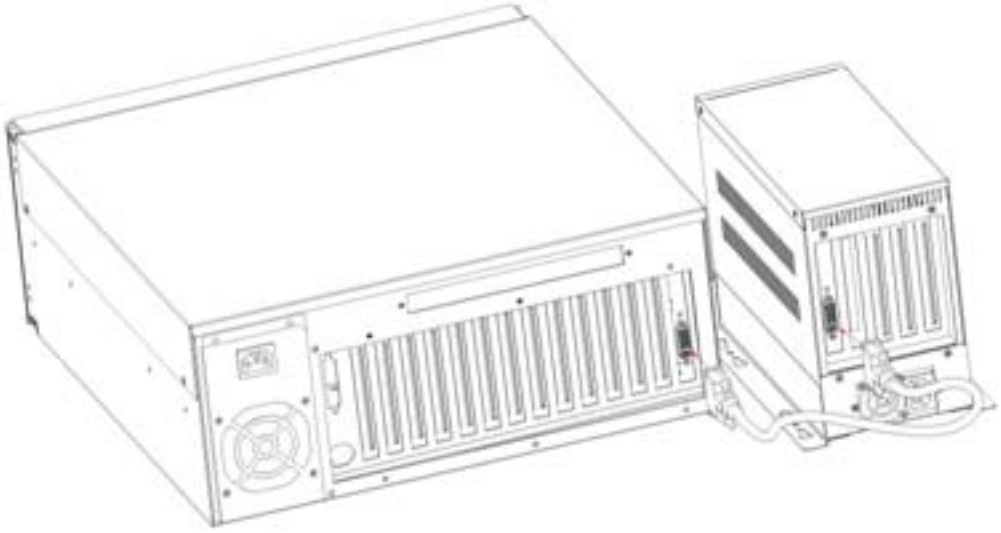


**Figure 2-4: Connect you host computer and expansion chassis (using the PCIS-8580-4S as an example)**

## Power-on Sequence

To make the PCI-to-PCI expansion system works well, you need to follow a correct power-on sequence for both expansion chassis and host computer. The LINK indicators (a green LED) on the front-panel of the expansion chassis and LPCI-8575 indicate the status of serial link between the expansion chassis and the host computer. When the LINK LED is on, the link is good, otherwise when the LINK LED is off or blinking, the link is failed.

1. Make sure the cable is correctly connected and screw the connectos.
2. Turn on the expansion chassis.
3. Turn on the host computer. At this time you'll see the LINK indicators on both sides are on.



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# 3 Hardware Overview

This chapter illustrates the basic hardware architecture of each component in the ADLINK PCIS-8580 PCI-to-PCI expansion system.

## 3.1 System Architecture

This section describes the operation theory and technology of the PCIS-8580 PCI-to-PCI expansion system.

### Operation Theory

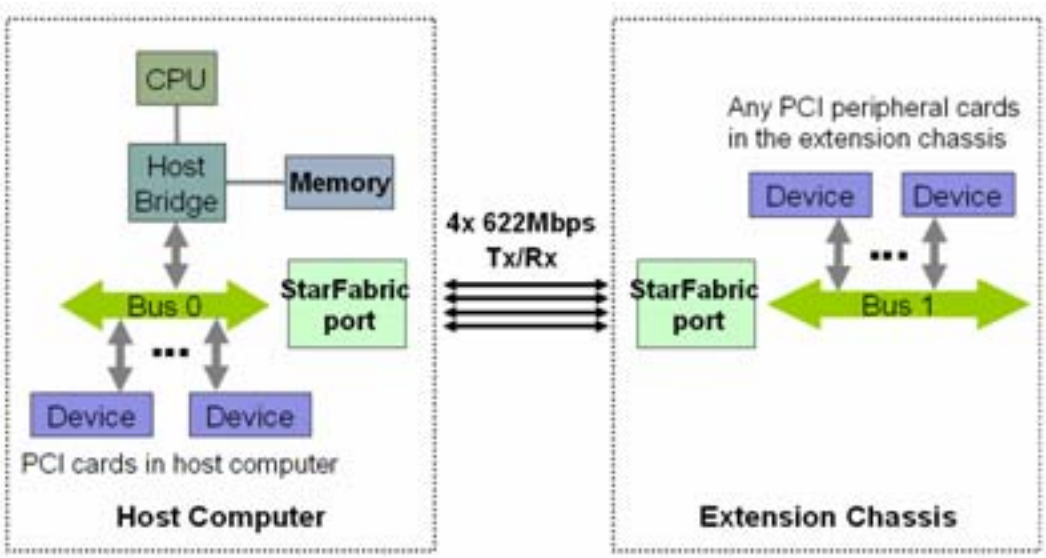



**Figure 3-1: Operation theory of PCIS-8580 PCI-to-PCI expansion system**

The PCIS-8580 PCI-to-PCI expansion system utilizes the state-of-art StarFabric technology as the groundwork for extending the PCI bus. A PCI-StarFabric bridge located on the host computer provides an interface between PCI and StarFabric port, which translates the parallel PCI signals into serial frame format for transmission across StarFabric link. Each StarFabric link contains 4 pairs, 622Mps LVDS signals and provides 2.5Gbps total bandwidth to accommodate complete PCI traffic without any compromise in bandwidth. Error detection and error correction are automatically performed during the StarFabric transmission to guarantee the data integrity.



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## 3.2 LPCI-8575 PCI Expansion Card

This section describes the basic function, bus architecture and jumper settings of the PCI expansion module LPCI-8575.

### Functional Block

The LPCI-8575 expansion module is basically a PCI-to-PCI bridge. The PCI-to-PCI bridge function in the LPCI-8575 supports legacy address routed traffic, which provides 100% capability with PCI drivers, application software, BIOS, O/Ss, etc. These functions allow users to transfer their designs without extra effort.

The LPCI-8575 employs a serial interconnect technology, 622Mbps low voltage differential signaling (LVDS). Each LPCI-8575 expansion module has one link port, the link port is divided into transmit (TX) and receive (RX). Four TX and RX differential pairs in the link are used to provide 2.5Gbps full duplex link bandwidth or 5Gbps of total bandwidth. Incorporated with the high speed serial LVDS, it is easy to extend the transmission up to 10 meters through shielded twisted pair copper cables.

Inside the PCI-to-PCI bridge, a PCI-to-StarFabric/StarFabric-to-PCI converter is used to translate PCI transactions into StarFabric frames and StarFabric frames into PCI transactions. The PCI interface of the LPCI-8575 is capable of 32-bit/66MHz. Thus the maximum data throughput can up to 264Mbytes/s. The PCI interface in LPCI-8575 acts like the primary side of a PCI-to-PCI bridge if LPCI-8575 is plugged into the peripheral slot.

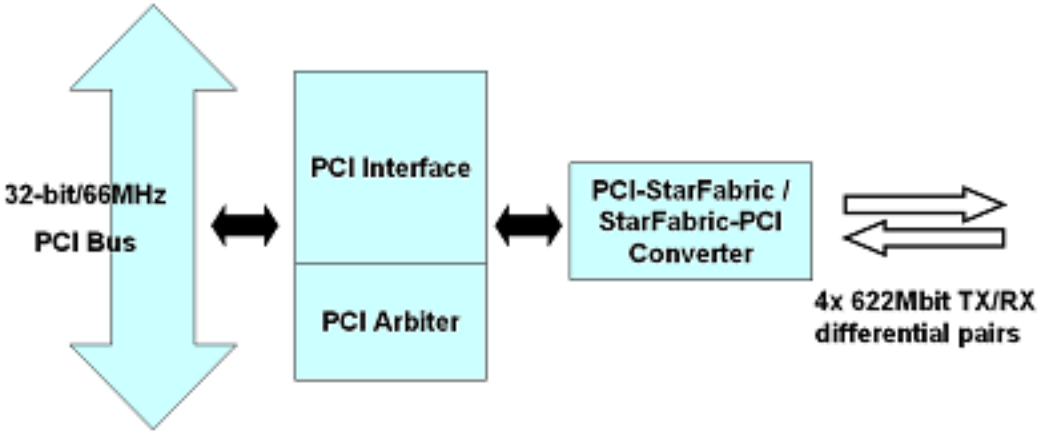



**Figure 3-2: Concept of the serialized PCI bridge**



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## Jumper Settings for LPCI-8575

The following figure shows the locations of jumpers and the connector.

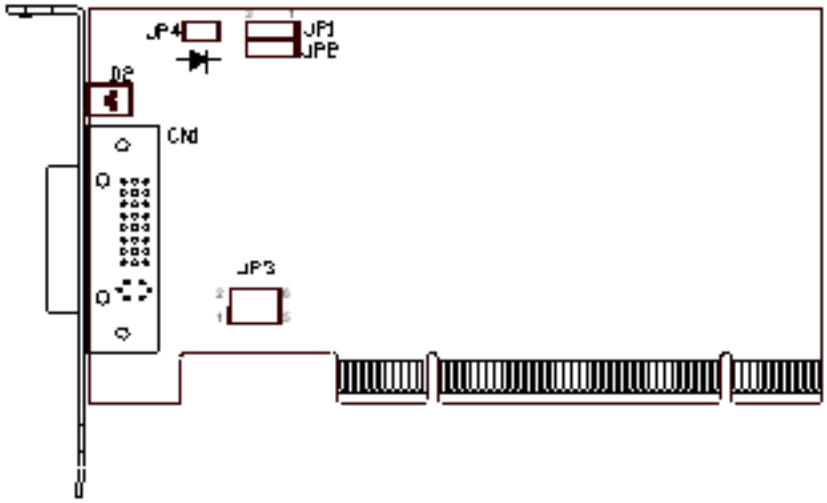



**Figure 3-3: Jumpers and connectors on the LPCI-8575**

| Jumper / Connector / LED | Descriptions |
|---|---|
| CN1 | A DVI-D connector for the serial link for PCI-to-PCI expansion. *Please DO NOT connect CN1 to any monitor or video device.* |
| JP1 | Spread spectrum control. |
| JP2 | M66EN setting. |
| JP3 | Peripheral / System slot selection. |
| JP4 | Serial link status LED connector. |
| D2 | Serial link status LED. |

**Table 3-1: Jumpers and connectors on the LPCI-8575**

### Spread Spectrum Control, JP1

When LPCI-8575 plugged into the expansion chassis, it provides a discrete clock signal to each of the peripheral slot defined as a PCI clock (CLK0, CLK1, CLK2 and CLK3).

An important feature of the LPCI-8575 expansion modules is that it support 33MHz/66MHz clock operating environment. As system clock increase, electromagnetic interference (EMI) becomes a challenge for the system designers. LPCI-8575



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adopts a spread-spectrum clock generator to help user to deal with this difficult task.

Spread spectrum clocking speeds up and slows down the clock within a few percent of its fundamental frequency. By reducing the peak amplitudes, the system will more likely meet EMI emission compliance standards. In other words, spread spectrum clocking distributes the energy that was originally concentrated on one frequency over a wider band. This method dramatically reduces the amount of EMI.

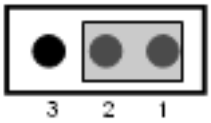
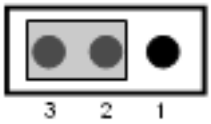
| Spread Spectrum Control | JP1 |
|---|---|
| OFF (default) |  |
| ON |  |

**Table 3-2: JP1 Settings**

### M66EN Setting, JP2

LPCI-8575 supports 32-bit PCI buses operating at 66MHz or 33MHz. A bundled link can support the full bandwidth of 32-bit/ 66MHz PCI bus. You can utilize the following configuration to set the operation frequency of your system.

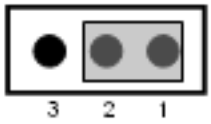
| JP2 | Setting |
|---|---|
|  | Auto detection mode enabled. When LPCI-8575 is plugged into system slot in the extended chassis, it will detect the configuration and operate at 33MHz or 66MHz automatically. If the backplane or any devices in the system do not support 66MHz PCI bus operations, LPCI-8575 will only operate at 33 MHz only. |

**Table 3-3: JP2 Settings**



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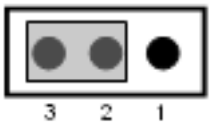
| JP2 | Setting |
|---|---|
|  (Default) | Auto detection mode disabled, force to 33MHz. PCI bus is forced to operate at 33 MHz. If your extended system is 66MHz capable, please switch JP2 to 1-2 contact. |

**Table 3-3: JP2 Settings**

### Peripheral / System Slot Selection, JP3

LPCI-8575 is a dual purpose PCI-to-PCI expansion module. When LPCI-8575 plugged into a peripheral, it becomes a peripheral card. When LPCI-8575 plugged into the expansion chassis system slot, it becomes a system card.

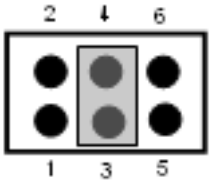
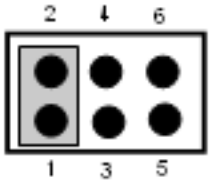
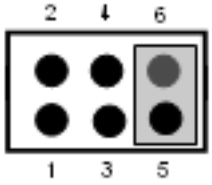
| JP3 Setting | Descriptions |
|---|---|
|  (Default) | Auto selection. LPCI-8575 will detect the slot configuration automatically. |
|  | Force to Peripheral slot. |
|  | Force to system slot. |

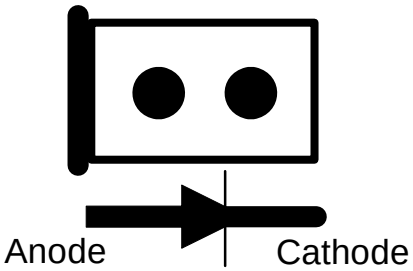
**Table 3-4: JP3 Settings**



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### Serial Link Status LED Connector, JP4

The serial link status is shown on LED D2. LPCI-8575 also provides a LED connector for user's applications. The pin assignment of JP4 is shown in the following figure.




### Serial Link Status LED, D2

The LED D2 shows the serial link status. The following table shows the possible status of the LED when you turn on the expansion chassis power and main system power.

| LED status | Descriptions | How to solve? |
|---|---|---|
| ON | The serial link is synchronous. The power on sequence is correct. | |
| Twinkling | The serial link is not synchronous. The main system power is turned on before expansion chassis power. | Reset the main system or re-boot the main system power after expansion chassis power is on. |
| OFF | The serial link connection is not correct. | Check if the serial link cable is ok or not. |

**Table 3-5: D2 Display**



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## 3.3 BP-8005

This section describes the architecture and jumper settings of the BP-8005 backplane. The BP-8005 is for PCIS-8580-4S and is pre-installed in the RK-8005 chassis.

### Backplane Architecture

The BP-8005 backplane provides 1 system slot and 4 available PCI peripheral slots. The system slot is occupied by a pre-installed



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LPCI-8575 PCI expansion card. The rest PCI slots are available for any 5V PCI peripheral cards.

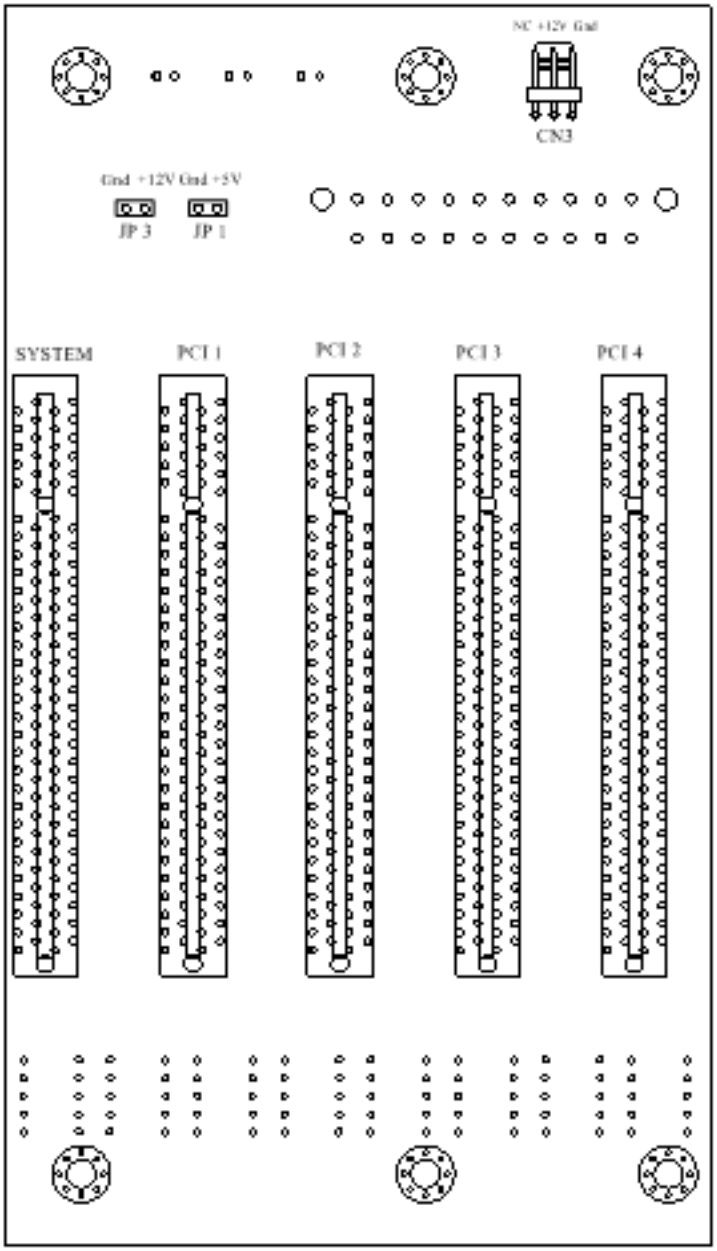



**Figure 3-4: Top view of BP-8005 backplane**



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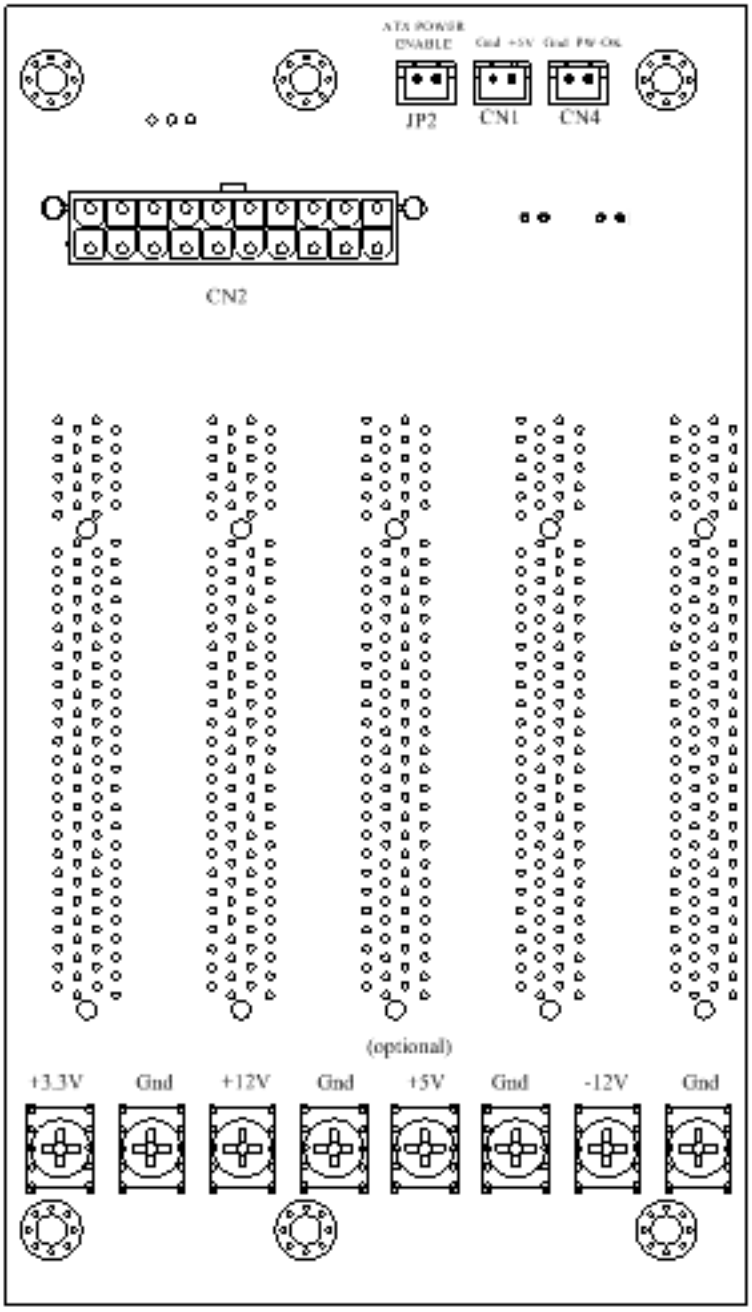



**Figure 3-5: Bottom view of BP-8005 backplane**



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## Jumpers and Connectors

Jumpers and connectors on the top side

| JP/CN | Ended | Voltage Out | Description |
|---|---|---|---|
| CN3 | 3 | +12V, GND | Fan connector for 12V fan |
| JP1 | 2 | +5V, GND | LED connector |
| JP3 | 2 | +12V, GND | Fan connector for 12V fan |

**Table 3-6: Top side jumpers and connectors**

## Jumpers and connectors on the bottom side

| JP/CN | Ended | Voltage Out | Description |
|---|---|---|---|
| CN1 | 2 | 5V, GND | LED connector |
| CN2 | 20 | 3.3V, ±12V, 5V | ATX POWER connector |
| CN4 | 2 | 5V, GND | POWER-OK status connector |
| JP2 | 2 | N/A | ATX POWER ENABLE |

**Table 3-7: Bottom side jumpers and connectors**



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## 3.4 RK-8005

RK-8005 is a robust industrial chassis for accommodating the BP-8005 backplane. The RK-8005 is a small, compact chassis (122mm x 195mm x 260mm) with a built-in 200W universal AC power supply. The RK-8005 is provided with a wall-mount kit so you can place it in many different environments.

### Mechanical Drawing of RK-8005

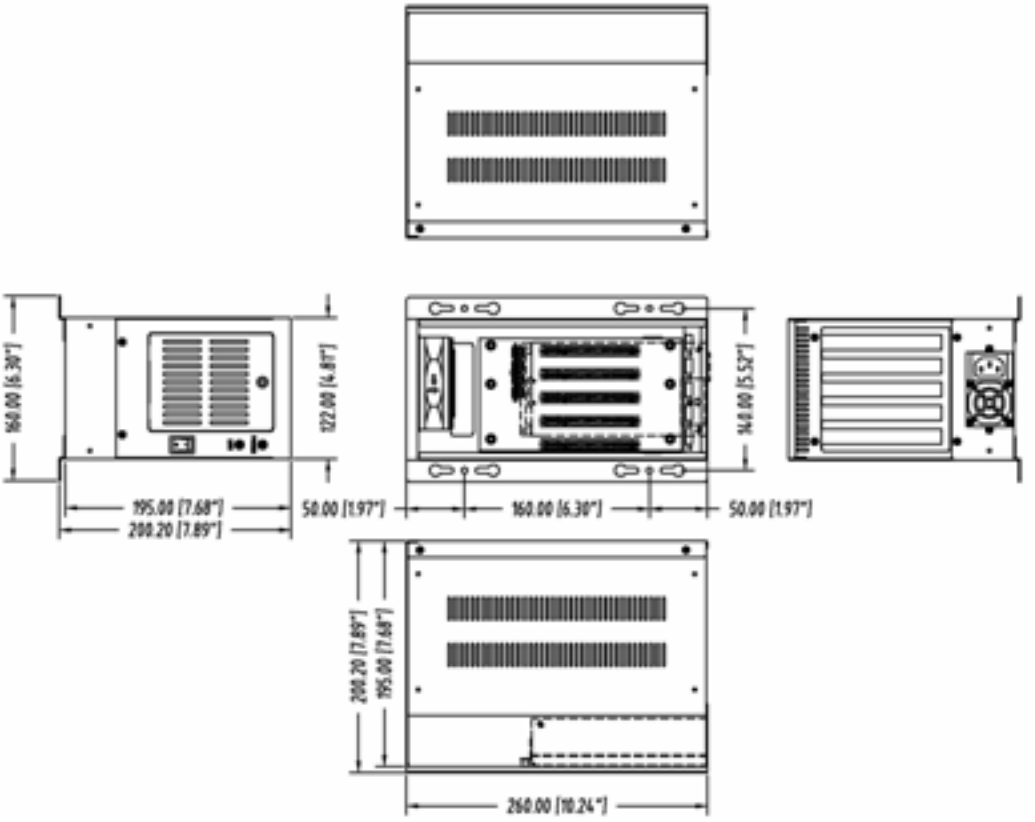



**Figure 3-6: Mechanical drawing of RK-8005**



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## 3.5 BP-8014

This section describes the architecture and jumper settings of the BP-8014 backplane. The BP-8014 is for PCIS-8580-13S and is pre-installed in the RK-8014 chassis.

### Backplane Architecture

The BP-8014 backplane provides 1 system slot and 13 available PCI peripheral slots. The system slot is occupied by a pre-installed LPCI-8575 PCI expansion card. The rest PCI slots are available for any 5V PCI peripheral cards.

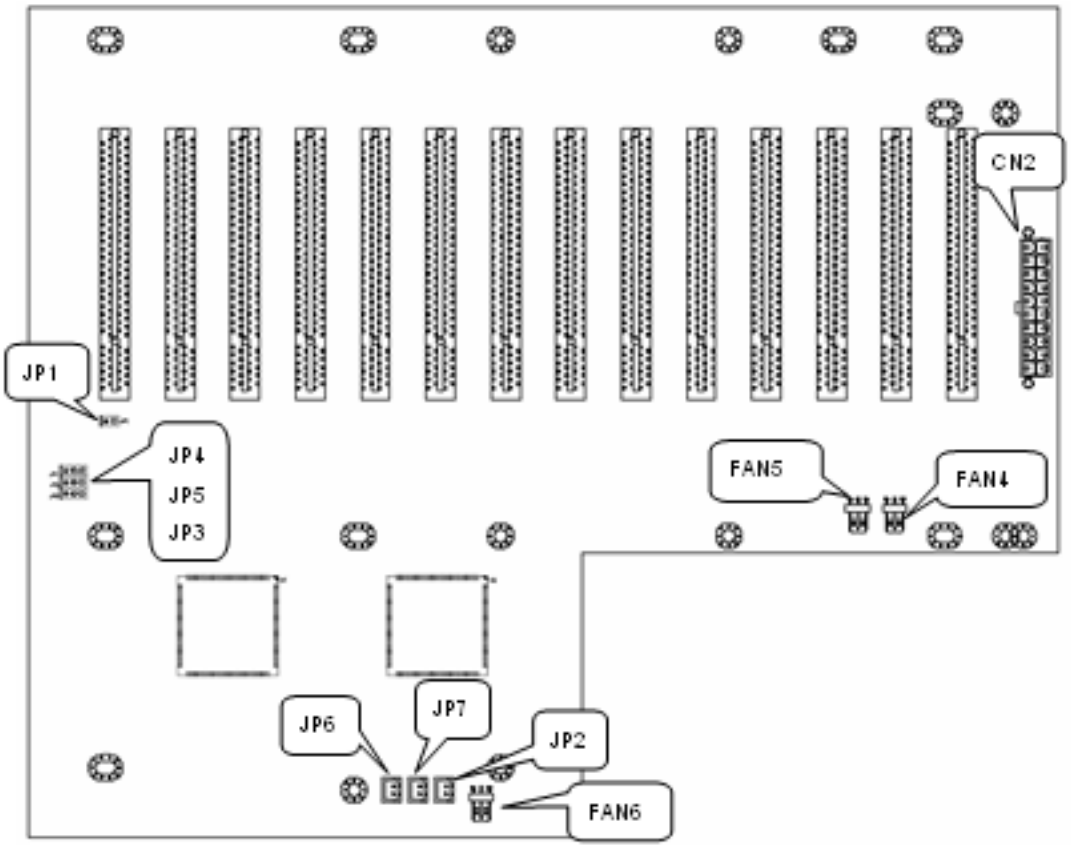



**Figure 3-7: Top view of BP-8014 backplane**



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## Jumpers and Connectors

| JP/CN | Ended | Voltage Out | Description |
|---|---|---|---|
| CN2 | 20 | 3.3V,±12V,5V | ATX POWER connector |
| FAN4 | 3 | 12V, GND | Fan connector for 12V fan |
| FAN5 | 3 | 12V, GND | Fan connector for 12V fan |
| FAN6 | 3 | 12V, GND | Fan connector for 12V fan |
| JP2 | 2 | N/A | ATX POWER ENABLE |
| JP6 | 2 | 5V, GND | POWER-OK status connector |
| JP7 | 2 | 5V, GND | LED connector |

**Table 3-8: BP-8014 jumpers and connectors**



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## 3.6 RK-8014

RK-8014 is a robust industrial chassis for accommodating the BP-8014 backplane. The RK-8014 is a 19” rack-mount chassis with a built-in 400W universal AC power supply.

### Mechanical Drawing of RK-8014

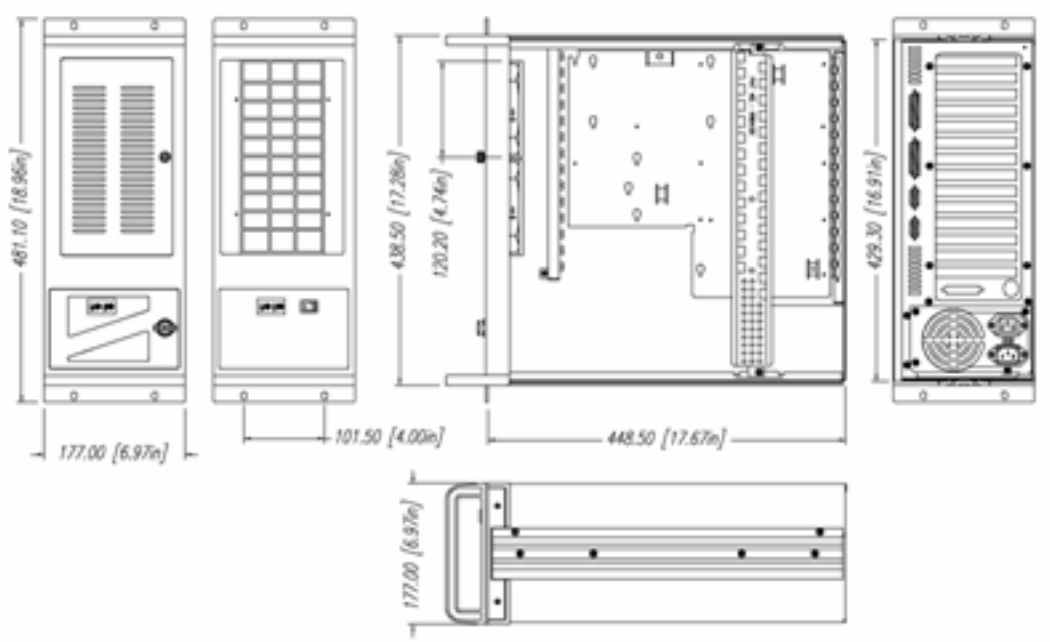



**Figure 3-8: Mechanical drawing of RK-8014**



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## 3.7 ACL-PCIEXT-2

ACL-PCIEXT-2 is the cable connecting the host computer and the expansion chassis. It is carefully designed to transmit 622Mbps LVDS signals. ACL-PCI-EXT-2 contains 8 pairs of shielding twisted copper wires and 2 DVI-D 24-pin connectors. For users who need longer expansion distance, optional ACL-PCIEXT-5 (5m) and ACL-PCIEXT-10 (10m) are provided.

**Note**: THE ACL-PCIEXT-2 CABLE IS USED FOR PCIS-8680 ONLY. DO NOT APPLY ACL-PCIEXT-2 TO ANY OTHER DEVICES TO AVOID UNEXPECTED DAMAGES.

### Pin Assignment of ACL-PCIEXT-2

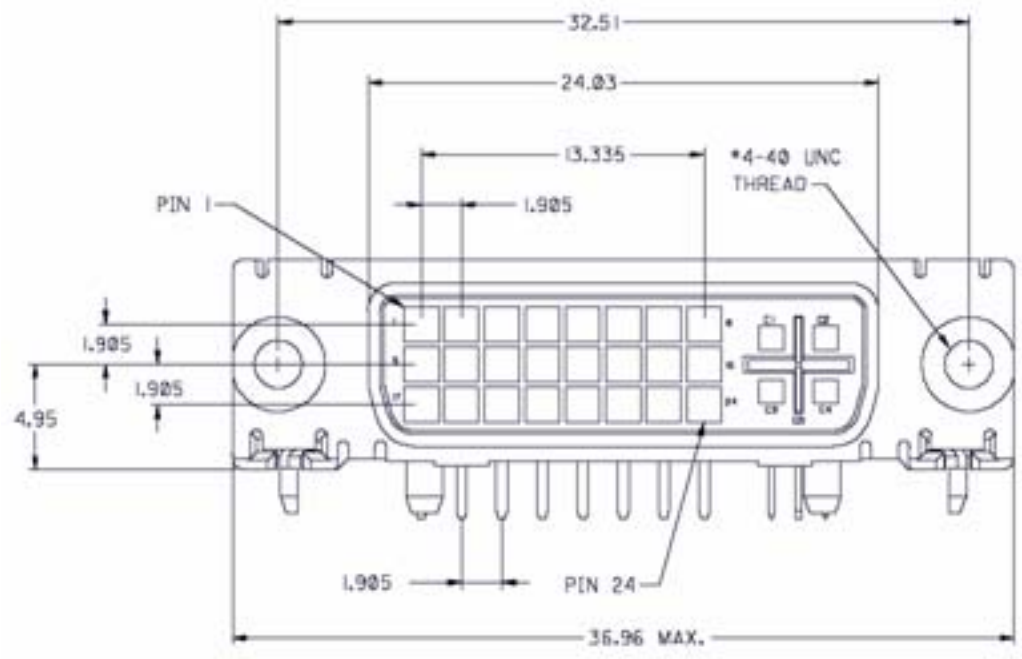



**Figure 3-9: DVI Connector pins and dimensions**

| #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 |
|---|---|---|---|---|---|---|---|
| RX3+ | RX3- | Shield | TX0+ | TX0- | Shield | TX1+ | TX1- |
| **#9** | **#10** | **#11** | **#12** | **#13** | **#14** | **#15** | **#16** |
| RX2+ | RX2- | Shield | Shield | Shield | Shield | TX2+ | TX2- |
| **#17** | **#18** | **#19** | **#20** | **#21** | **#22** | **#23** | **#24** |
| RX1+ | RX1- | Shield | RX0+ | RX0- | Shield | TX3+ | TX3- |

**Table 3-9: Pin Assignment of ACL-PCIEXT-2**



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