Advance e620 Accelerator Card

User Guide

60-UG-1443 3.20

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1 Preface

The guide describes the features of the Advance™ e620 accelerator card and gives you information on diagnostics, troubleshooting, and updating the firmware.

This guide also assumes that you have experience configuring Microsoft Windows XP, Red Hat Enterprise Linux, or SUSE Linux.

1.1 How the book is organized

This book is organized as follows:

- Chapter 2 provides pre-installation advice and guidance.
- Chapter 3 describes the features of the card.
- Chapter 4 provides some information on troubleshooting.
- Chapter 5 provides detailed specifications of the card.

1.2 Accessing documentation online

You can view or download the documentation related to the Advance e620 accelerator card and associated software at:

http://support.clearspeed.com/documentation/

1.3 Contacting technical support

If you have technical questions about this product that are not answered in this documentation, check the solutions knowledgebase or contact ClearSpeed support at:

http://support.clearspeed.com/

2 Before you start

This chapter gives you an outline on what to do before you install your Advance e620 accelerator card. We recommend that you read the steps outlined in *Figure 1*.

Note: *You are installing preproduction software. Before you install, please check the release notes for any known limitations.*

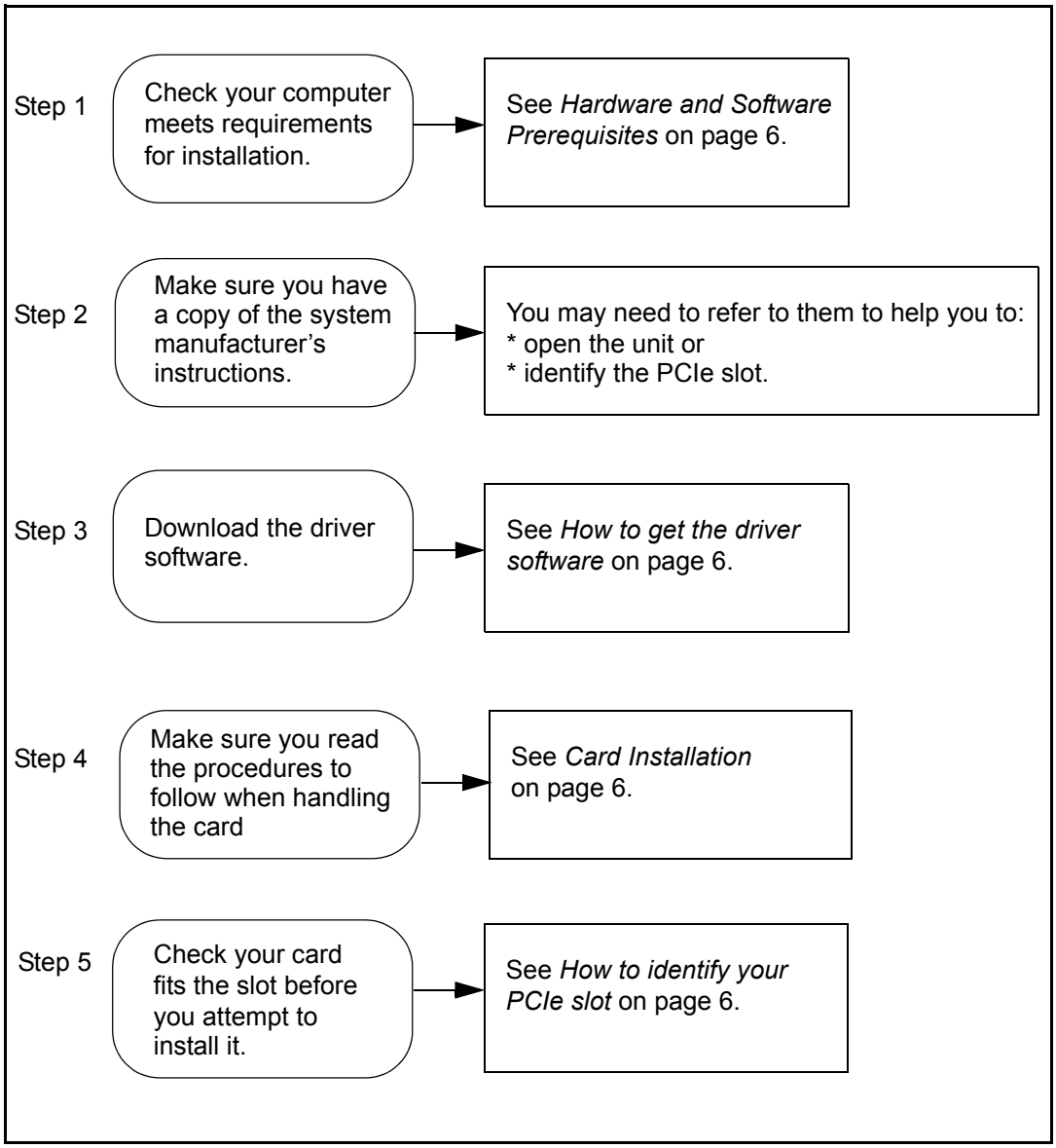

Figure 1. Guidelines to follow before you install

2.1 Hardware prerequisites

To install the Advance e620 accelerator card, you will need a 32 or 64 bit x86-based system with:

- An Intel or AMD x86 processor (or compatible).
- A free non hot-swap PCIe x8 slot. See section 2.4, *How to identify your PCIe slot*.
- Minimum airflow around the card of 500 LFM (Linear Feet per Minute) or 2.5 meters per second.

2.2 How to get the driver software

Before you can use the Advance e620 accelerator card, you must install the runtime package and the driver software. The latest versions of the software and installation instructions can be found on the ClearSpeed support website:

http://support.clearspeed.com/

This website also provides the latest list of supported operating systems.

2.3 Card installation

The *Advance Accelerator Board Installation Guide* [1] provides detailed installation instructions for the Advance e620 accelerator card. This document is delivered with the Advance e620 accelerator card and it can also be found on the support website:

http://support.clearspeed.com/

2.4 How to identify your PCIe slot

The Advance e620 accelerator card is mechanically compatible with x8 and x16 PCIe slots. Not all x8 and x16 mechanical slots provide x8 electrical support. Usually the slot type and speed are printed next to the slot, for example, PCIe x8. If you are unsure about which is the PCIe slot, consult the motherboard manual to help you identify it. *Figure 2* identifies the valid mechanical and electrical combinations.

Mechanicals	Electricals
x8	x8, x4, x2. x1
x16	x16, x8, x4, x2, x1

Figure 2. Mechanical combinations for the Advance e620 card

All other combinations are invalid and will not allow the correct installation or operation.

If the card fails to configure in PCIe x8 mode, the PCIe link will negotiate the next highest available connection speed, either x4, x2 or x1 mode. Operation in x4, x2 or x1 mode will allow access and use of the product. It will severely compromise data transfer performance to and from the accelerator card.

Note: The Advance e620 accelerator card is not designed to work in hot-swap PCI slots.

Caution: It is very important when inserting the card into the PCIe slot to observe the following:

- Always follow the precautions for handling electrostatic sensitive devices by using the antistatic wrist strap provided. Further details on the card-handling procedures are provided in the [1], *Advance Accelerator Card Installation Guide*.
- Do not use excessive force when inserting the Advance e620 accelerator card into the slot—this can damage the motherboard.
- Do not select a slot that would require you to bend the Advance e620 accelerator card, either during or after insertion.
- Do not use a slot where the motherboard or system has components that interfere with the location of the Advance e620 accelerator card.

3 Features and general description

The Advance e620 accelerator card (shown in *Figure 3*)is a dual CSX600 double-precision, floating-point accelerator card. It is designed for use in server-style PC systems.

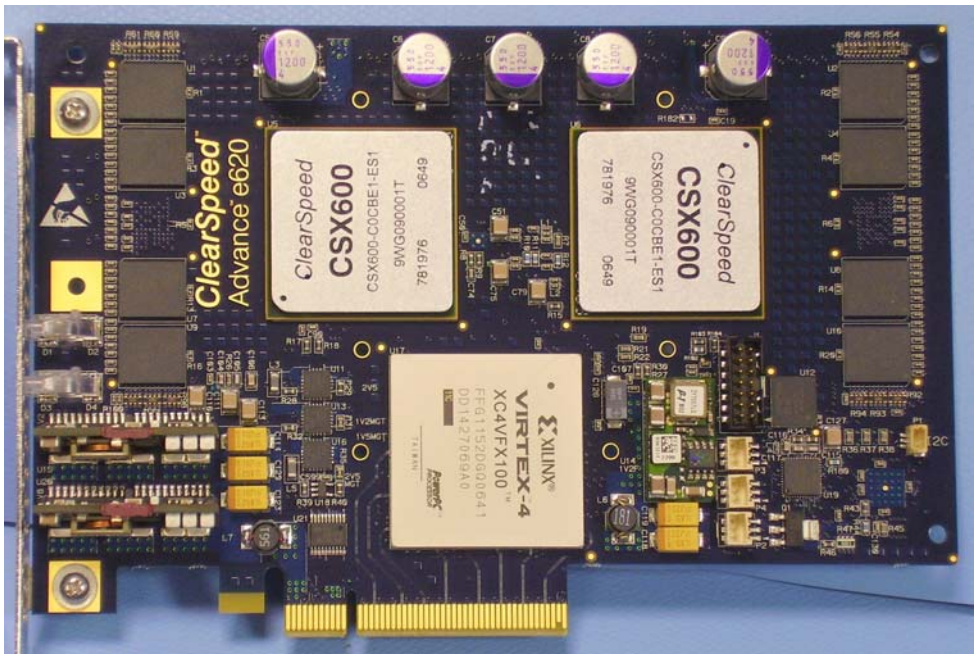

Figure 3. Advance dual CSX600 PCIe accelerator card

The hardware consists of a single-slot half-length PCIe card.

The Advance e620 accelerator card has two processors connected by the ClearConnect bus bridge ports. One end of the bus is connected to a Field Programmable Gate Array (FPGA) which implements the host interface. The firmware represents the FPGA design image and can be upgraded, as described in the [5], *Firmware Update Release Notes*.

The Advance e620 accelerator card uses bus-mastering DMA to achieve a high peak bandwidth to the host system. Each card has 1 GByte of local card memory with error correction. It includes onboard temperature monitoring of both processors.

The Advance e620 accelerator card features a pair of CSX600 data-parallel floating-point coprocessors. Each processor can sustain 25 GFLOPS of single- or double-precision performance and supports a 32-bit or 64-bit address space. The two processors are fully interconnected through a common address map, including access to the 512 MBytes of local DDR2 SDRAM attached to each processor.

3.1 Memory and memory map

Each processor has 512 MBytes of DDR2-400 DRAM directly connected. The DRAM is 72 bits wide, including 8 bits of error correcting code (ECC). This allows correction of single-bit errors and detection of most multiple-bit errors.

3.2 Firmware

All host interface functionality is implemented in an FPGA. At power-on, the FPGA logic configuration is loaded from a flash memory device. The contents of the flash device can be re-programmed to upgrade functionality or performance using a software utility supplied by ClearSpeed. This utility runs on the host system and reprograms the flash device through the Advance e620 accelerator card's register space.

For more detailed information, see [5], *Firmware Update Release Notes*.

4 Troubleshooting

This chapter helps you identify basic troubleshooting problems that can arise during installation and operation. If you have problems, check the troubleshooting tips listed in this chapter for a possible solution.

The card diagnostics package (available for download from the ClearSpeed support web site) can be used to test the correct installation and function of the drivers and Advance e620 accelerator card. See the [4], *CSX600 Runtime Software User Guide* for details on how to use the diagnostic software.

4.1 General guidelines

If you encounter an error when using the Advance e620 accelerator card, you need to isolate the cause of the problem.

When installing multiple cards and software in a system, install each in turn and restart the system each time. Similarly, if you have already installed the Advance e620 accelerator card and software and you experience problems, remove or uninstall each in turn to establish which one is causing the problem.

4.2 Solving the problem

4.2.1 Finding the cause of the problem

To find out what is causing the problem, we recommend that you check the following:

- Check your Advance e620 accelerator card is installed correctly. See the [1], *Advance Accelerator Card Installation Guide*.
- Check you installed the drivers correctly. See also *Interpreting the LEDs*, on page 12.

Whenever you fix a problem and reboot, run the tests again.

4.2.2 Contacting ClearSpeed Support

If none of the above helps solve your problem, refer to the ClearSpeed solutions knowledgebase or you can report your problem by submitting an online report via the ClearSpeed support website at:

http://support.clearspeed.com.

4.2.3 Interpreting the LEDs

The Advance e620 accelerator card has four LEDs (shown in *Figure 4*) which indicate the status of the card:

- LED A can be either red to indicate that an error has occurred or yellow to indicate a warning.
- LED B indicates the status of the PCIe link.
- LEDs C and D indicate hardware errors.

In normal operation, LED B will be illuminated green to indicate a PCIe link has been established.

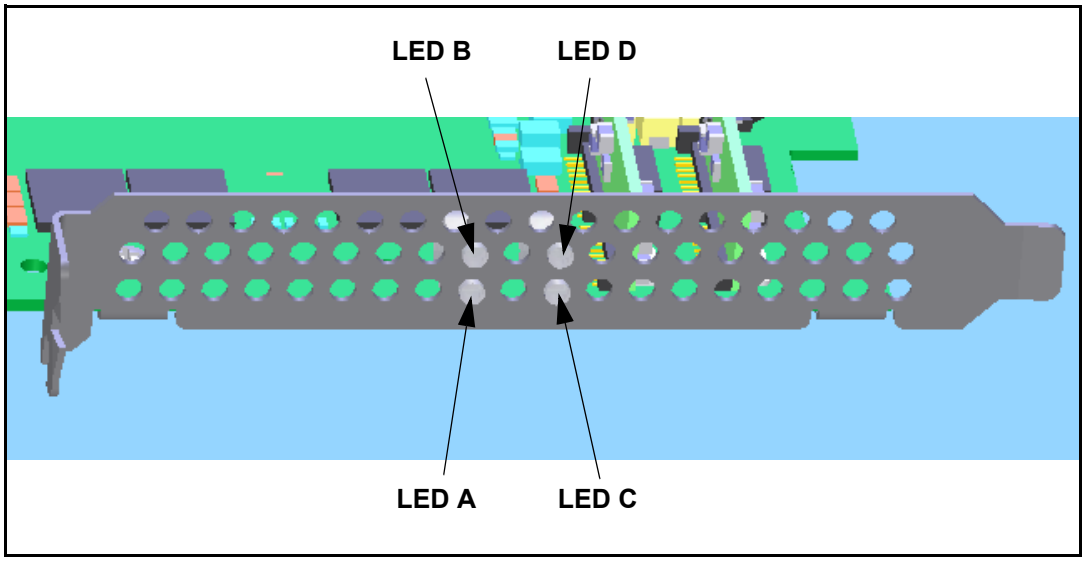

Figure 4. End plate and position of LEDs

Use *Table 1*, *Table 2* and *Table 3* to help you interpret the meanings of the LEDs and the appropriate action to take.

LED A	Possible cause	Action
Illuminated red	Card is held in reset.	Contact ClearSpeed Support.
Flashing red	Data corruption has been detected on an inter-chip control bus (an HDP error).	Try recovering the card using `csreset` as described in [4], *CSX600 Runtime Software User Guide*. If the LED persists flashing, contact ClearSpeed Support.
Flashing yellow	This indicates that one or both of the coprocessors are overheating.	Lower the temperature of the card by improving the system cooling and checking the ambient operating temperature. See also *Temperature monitoring* 5.3.1.

Table 1. LED A meanings

LED B	Possible cause	Action
Illuminated red	PCIe link is not established.	Contact ClearSpeed Support.
Illuminated green	PCIe link is established.	Indicates normal operation.

Table 2. LED B meanings

LED		Possible cause	Action
C	D		
Illuminated red	Illuminated red	There is a power fault.	Contact ClearSpeed Support.
Illuminated yellow	Illuminated yellow	The FPGA is not configured.	Contact ClearSpeed Support.
Off	Illuminated red	The temperature is critical causing a shutdown.	Check the system cooling, improve if necessary and power cycle the card to reset the error condition. See also *Temperature monitoring*, on page 16.
Off	Illuminated yellow	Backup of the FPGA has been loaded.	Retry the firmware upgrade procedure as detailed on the ClearSpeed Support website: http://support.clearspeed.com/downloads/firmware/:

Table 3. LED C and D meanings

If none of the troubleshooting tips in this chapter help you solve your problem, please contact ClearSpeed technical support via the support web site at:

http://support.clearspeed.com.

5 Specifications

This chapter lists the specifications for the Advance e620 accelerator card.

5.1 Mechanical

The Advance e620 accelerator card is compliant with PCI Express Specification Revision 1.1.

Table 4 shows the physical dimensions of the card.

Dimension	Measurement	Metric Measurement
Length	6.57 inches	167 mm
Width	4.37 inches	111 mm

Table 4. Physical dimensions of the card including edge fingers

5.2 Electrical

The power requirements for the Advance e620 accelerator card are outlined in *Table 5*.

Feature	Specification
Current	2.6A @ 3.3 V 4.0A @ 12 V
Maximum power consumption	Monte Carlo European Option Pricing Model: 36 W DGEMM 50GFLOPS: 45W
Thermal design power	55 W

Table 5. Power requirements

5.3 Thermal

To keep the CSX600s and the FPGA cool, the Advance e620 accelerator card is fitted with passive heatsinks. The passive heatsinks are made of an aluminum-finned radiator that dissipates heat through convection. For the passive heatsinks to work, they require airflow moving across the fins.

The Advance e620 accelerator card requires that the minimum airflow is 500 LFM (linear feet per minute) or 2.5 meters per second.

To ensure that the Advance e620 accelerator card is operating within the published limits, the card's ambient operating temperature should be as specified in *Table 6*.

Condition	Operating Specification	Storage Specification
Temperature	10°C to 50°C (50°F to 122°F)	-10°C to 70°C (14°F to 158°F)
Relative humidity	up to 80% noncondensing	up to 80% noncondensing

Table 6. Specifications for ambient conditions

5.3.1 Temperature monitoring

The two CSX600s and the FPGA contain on-die temperature-sensing diodes which are connected to temperature-monitoring devices. Each device measures the remote temperature (temperature of the measured die) and the local temperature (temperature of the monitor chip itself). The temperature monitors signal warnings if the temperatures rise above the thresholds shown in *Table 7*.

Measurement	Temperature Thresholds	
	Alert	Critical
Local temperatures	70°C (158°F)	90°C (194°F)
Remote (die) temperatures	90°C (194°F)	110°C (230°F)

Table 7. Temperature warning thresholds

There are two warnings:

- Temperature alert. This warns the user of a device becoming too hot. LED A flashes yellow.
- Critical temperature. This turns off the device before it gets hot enough to cause permanent damage. LED D illuminates red.

For more information on the LEDs and their meanings, see *Interpreting the LEDs*, on page 12.

5.3.2 Temperature shutdown

When a critical temperature is reached on the CSX600s, the CSX600s are immediately held in reset so that they can cool and do not get damaged. When the CSX600s have cooled more than 25°C from the critical threshold, they are brought out of reset.

5.4 Patents

This product is protected by the following UK patents: 2341770, 2348980, 2348984, 2348974, 2348973, 2348971, 2391093, 2394815, 2390506 or international equivalents. Other patents pending.

6 Bibliography

[1] *Advance Accelerator Card Installation Guide*
Document Number: 06-UG-1301
ClearSpeed Technology

[2] *Software Installation Instructions for Linux*
Document Numbers: 06-UG-1328
ClearSpeed Technology

[3] *Software Installation Instructions for Windows XP*
Document Numbers: 06-UG-1329
ClearSpeed Technology

[4] *CSX600 Runtime Software User Guide*
Document Number: 06-UG-1345
ClearSpeed Technology

[5] *Firmware Update Release Notes*
http://support.clearspeed.com/resources/documentation/firmware_upgrade.htm
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Linpack: This product includes software developed at the University of Tennessee, Knoxville, Innovative Computing Laboratories

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