

# *ClearSpeed*<sup>™</sup>

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## Advance e710 Accelerator Card

### User Guide

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## Preface

The guide describes the features of the Advance™ e710 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.

## Accessing documentation online

You can view or download the documentation related to the Advance e710 Accelerator card and associated software at:

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

## 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/>

# 1 Before you start

This chapter gives you an outline on what to do before you install your Advance e710 Accelerator card. We recommend that you read the steps outlined in [Figure 1](#).

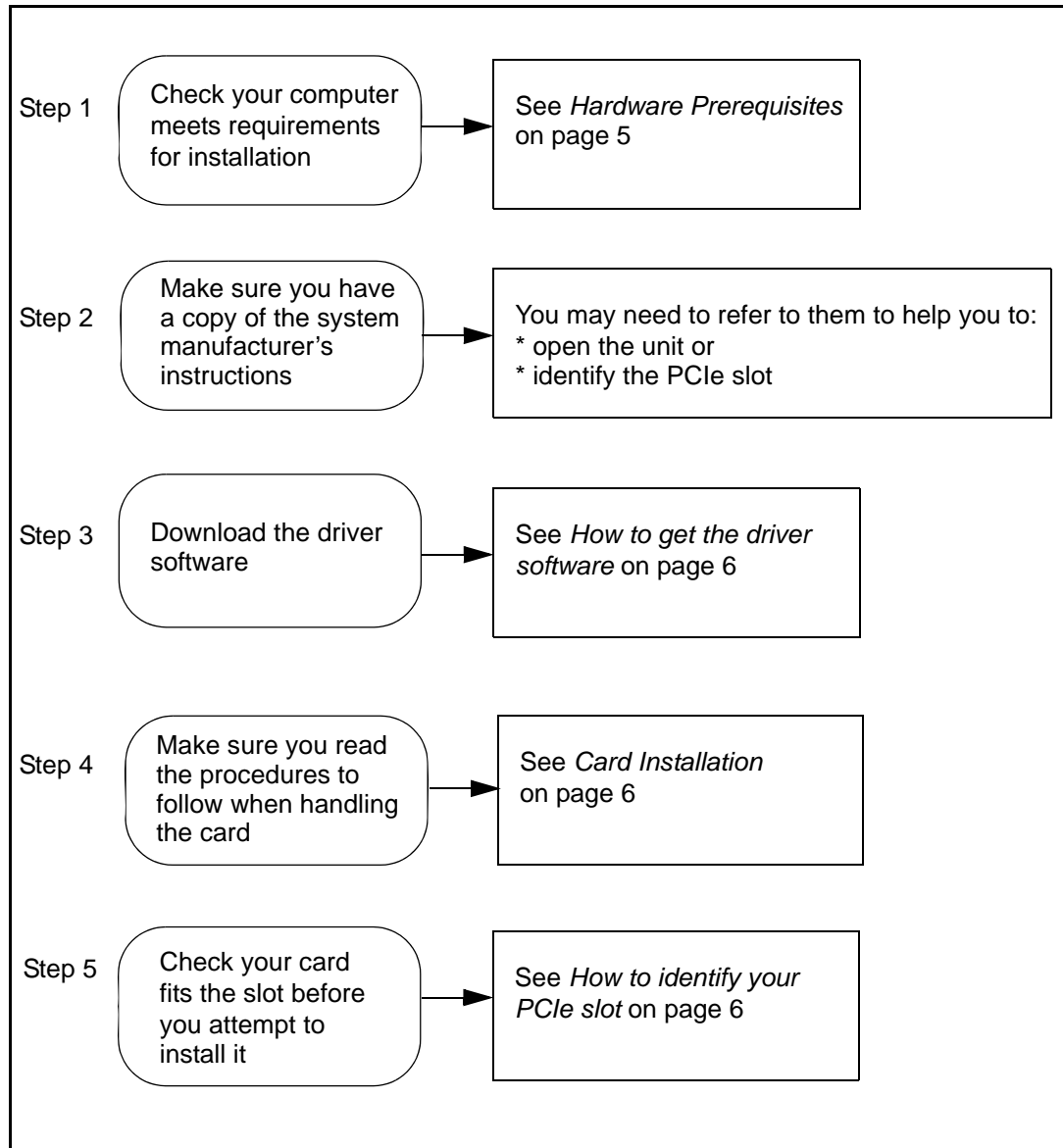


Figure 1. Guidelines to follow before you install

## 1.1 Hardware prerequisites

To install the Advance e710 Accelerator card, you will need a 64 bit x86-based system with:

- An Intel or AMD x86 processor (or compatible).
- A free non hot-swap PCIe x8 slot. See [Section 1.4: How to identify your PCIe slot](#).
- Minimum airflow around the card of 300 LFM (Linear Feet per Minute) or 1.5 meters per second.

## 1.2 How to get the driver software

Before you can use the Advance e710 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.

## 1.3 Card installation

The [Advance Accelerator Card Installation Guide](#) provides detailed installation instructions for the Advance e710 Accelerator card. This document is delivered with the Advance e710 Accelerator card and it can also be found on the support website:

<http://support.clearspeed.com/>

## 1.4 How to identify your PCIe slot

The Advance e710 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. [Table 1](#) identifies the valid mechanical and electrical combinations.

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

**Table 1. Mechanical combinations for the Advance e710 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 e710 Accelerator card is not designed to work in hot-swap PCIe 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 [Advance Accelerator Card Installation Guide](#).
  - Always follow the instructions provided by your system manufacturer when installing new hardware.
  - Do not use excessive force when inserting the Advance e710 Accelerator card into the slot, this can damage the motherboard and/or Advance card.
  - Do not select a slot that would require you to bend the Advance e710 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 e710 Accelerator card.

## 2 Features and general description

The Advance e710 Accelerator card (shown in [Figure 2](#)) is based on the CSX700 double-precision, floating-point accelerator. It is designed for use in workstation and server-style PC systems.



**Figure 2. Advance CSX700 PCIe accelerator card**

The hardware consists of a single-slot low profile PCIe card.

The Advance e710 Accelerator card uses a single CSX700 processor. The processor implements the PCI Express host interface, permitting high data transfer rates directly with the processor. To manage the e710, an FPGA device is used. The firmware represents the FPGA design image and can be upgraded, as described in the [5], Firmware Update Release Notes.

The Advance e710 Accelerator card provides dual channel bus-mastering DMA to enable a high peak bandwidth to the host system. Each card has 2 GBytes of local card memory with error correction. It includes on card temperature monitoring of the processor and card.

The Advance e710 Accelerator card features the CSX700 data-parallel floating-point coprocessor. The processor is energy efficient providing 3.84 GFLOPS per watt (96 GFLOPS/25 watts). Each processor consists of two computation arrays, each are fully interconnected through a common address map, including access to the 1GByte of local DDR2 SDRAM attached to each array processor, giving a total of 2 GBytes for the card. The DRAM is 72 bits wide, including 8 bits of error correcting code (ECC). This allows correction of single-bit errors and detection of multiple-bit errors.

### 2.1 Firmware

Card level management 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 e710 Accelerator card's register space.

For more detailed information, see [\[4\]: Firmware Installation Guide](#).

## 3 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.

### 3.1 General guidelines

If you encounter an error when using the Advance e710 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 e710 Accelerator card and software and you experience problems, remove or uninstall each in turn to establish which one is causing the problem.

### 3.2 Solving the problem

#### 3.2.1 Finding the cause of the problem

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

- Check your Advance e710 Accelerator card is installed correctly. See the [Advance Accelerator Card Installation Guide](#).
- Check you installed the drivers correctly. See [Interpreting the LEDs](#), on page 8.

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

#### 3.2.2 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/support/solutions/>

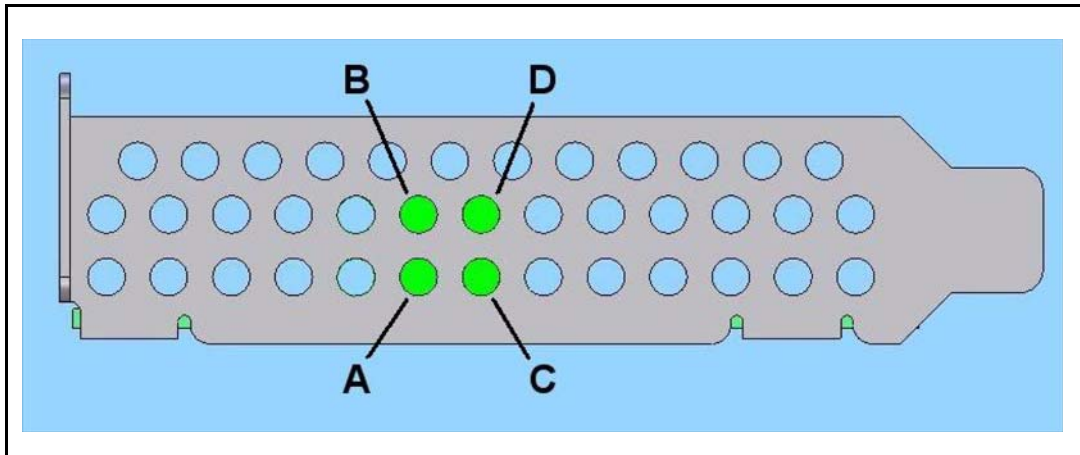
#### 3.2.3 Interpreting the LEDs

The Advance e710 Accelerator card has four LEDs (shown in [Figure 3](#)).

The LEDs A, B, C and D indicate the status of the card, with each LED being capable of displaying three colours: red, yellow or green.

- LED A indicates system level events/warnings/errors.
- LED B is used to indicate the status of the PCIe link.
- LEDs C and D indicate hardware (card level) warnings/errors.

In normal operation, LED B will be illuminated (either green solid or green flashing) to indicate a PCIe link has been established.



**Figure 3. End plate and position of LEDs**

Use [Table 2](#), [Table 3](#) and [Table 4](#) 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 <i>Runtime User Manual</i> . 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 <a href="#">Section 4.4.1: Temperature monitoring</a> .

**Table 2. 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.
Flashing green	PCIe link is established at a link width other than x8	Indicates operation at reduced PCIe connectivity; If you have installed the e710 in a PCIe x8 slot, check that your system firmware is up to date.

**Table 3. 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 <a href="#">Temperature monitoring</a> , on page 12.
Off	Illuminated yellow	Backup of the FPGA has been loaded.	Retry the firmware upgrade procedure as detailed on the ClearSpeed Support website: <a href="http://support.clearspeed.com/downloads/firmware/">http://support.clearspeed.com/downloads/firmware/</a>

**Table 4. 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>.

## 4 Specifications

This chapter lists the specifications for the Advance e710 Accelerator card.

### 4.1 PCI configuration space

[Table 5](#) shows the register values for the Type 00h PCI configuration space header.

Vendor ID =	0x1942
Device ID =	0xE711
Classcode ID =	0x0B4000 (Co-processor)
Subsystem Vendor ID =	0x1942
Subsystem ID =	0xE711

**Table 5. Register values for PCI configuration space**

### 4.2 Mechanical

The Advance e710 Accelerator card is compliant with *PCI Express Specification Revision 1.1*.

[Table 6](#) shows the physical dimensions of the card.

Dimension	Measurement	Metric measurement
Length	6.6 inches	167.7 mm
Width	2.73 inches	68.9 mm

**Table 6. Physical dimensions of the card including edge fingers**

### 4.3 Electrical

The power requirements for the Advance e710 Accelerator card are outlined in [Table 7](#).

Feature	Specification
Current	0.5A @ 3.3 V 2.1A @ 12 V
Maximum power consumption	25 W (25 W dissipation is application dependant)
Thermal design power	25 W

**Table 7. Power requirements**

## 4.4 Thermal

To keep the CSX700 cool, the Advance e710 Accelerator card is fitted with a passive heatsink. The passive heatsink is an aluminium finned radiator that dissipates heat through convection. For the passive heatsinks to work, they require airflow moving across the fins.

The Advance e710 Accelerator card requires that the minimum airflow is 300 LFM (linear feet per minute) or 1.5 meters per second.

To ensure that the Advance e710 Accelerator card is operating within the published limits, the card's ambient operating temperature should be as specified in [Table 8](#).

Condition	Operating specification	Storage specification
Temperature	10°C to 40°C (50°F to 104°F)	-10°C to 70°C (14°F to 158°F)
Relative humidity	up to 80% noncondensing	up to 80% noncondensing

**Table 8. Specifications for ambient conditions**

### 4.4.1 Temperature monitoring

The CSX700 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 9](#).

Measurement	Temperature thresholds	
	Alert	Critical
Local temperatures	85°C (185°F)	N/A
Remote (die) temperatures	90°C (194°F)	110°C (230°F)

**Table 9. 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 [Section 3.2.3: Interpreting the LEDs on page 8](#).

### 4.4.2 Temperature shutdown

When the CSX700 reaches a critical temperature it is immediately held in reset so that it can cool and avoid being damaged. When the CSX700 has cooled by more than 25°C from the critical threshold, it is brought out of reset.

Following a critical temperature reset your server may require a reboot to reconnect to the ClearSpeed e710 card.

## 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] *Firmware Installation Guide*  
<http://support.clearspeed.com/downloads/firmware/>  
Document Number: 02-XX-1510  
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