

# **GPU-Oriented PCIe Expansion Cluster**

## **Hardware Manual**

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# 1      About this Document

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## 1.1     Purpose

This document describes hardware installation, features, specification and operation of Amfeltec's GPU-Oriented PCIe Expansion Cluster.

## 1.2     Feedback

Amfeltec Corporation makes every effort to ensure that the information contained in this document is accurate and complete at time of release. Please contact Amfeltec Corporation if you find any errors, inconsistency or have trouble understanding any part of this document.

To provide your feedback, please send an email to [support@amfeltec.com](mailto:support@amfeltec.com)

Your comments or corrections are greatly valued in our effort for excellence and continued improvement.

## 1.3     Revision History

Rev. No.	Description	Rev. Date
1.0	Initial Release.	July 3, 2014
1.1	Additional air-cooling notes	June 3, 2015

## **2 General Description**

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### **2.1 Introduction**

The “GPU-Oriented PCIe Cluster” (cluster) allows a user to connect up to four Graphics Processing Units to one PCIe slot of a host computer; the GPUs can be located/placed up to 10 feet away from the host computer. The product mainly consists of a four-slot x16 PCI Express backplane (each connector has one PCI Express lane) placed on a specially-designed chassis. The cluster connects to the upstream host computer via two cables (standard CAT6 and 10-wire flat cables) and an host board. The PCIe host board should be connected to the host computer.

### **2.2 Package Contents**

GPU-Oriented PCIe Expansion Cluster package includes:

1. Backplane
2. Chassis
3. PCIe host board (Single/dual/quad versions)  
(Single version may also be in  
ExpressCard(R) or MiniPCIe format)
4. PCIe cables & power control flat cables (length: 5 feet; 10 feet - optional)



Figure 1: GPU-Oriented PCIe Cluster (assembled)



Figure 2: PCIe host board, single version



Figure 3: PCIe host board, dual version



Figure 4: PCIe host board, quad version

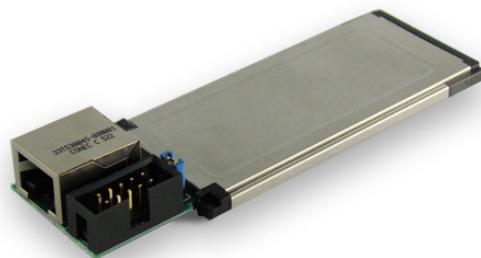


Figure 5: ExpressCard(R) host option  
(for single version)



Figure 6: MiniPCIe host board option  
(for single version)



Figure 7: Backplane

## 3 Features

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- Easy ‘Plug-and-Play’ installation.
- Expands host desktop computer with four additional x16 PCIe slots.
- Mounted on special custom chassis, allowing simple, external ventilation.
- Powered by any standard ATX psu.
- Connects to host computer via 5 ft PCIe cable (10 ft - optional).
- Meets PCIe bus specification 2.0 (Gen2) with 5Gbit/sec bandwidth.
- RoHS-compliant.

## 4      **Hardware Description**

### 4.1    **Board Layout**

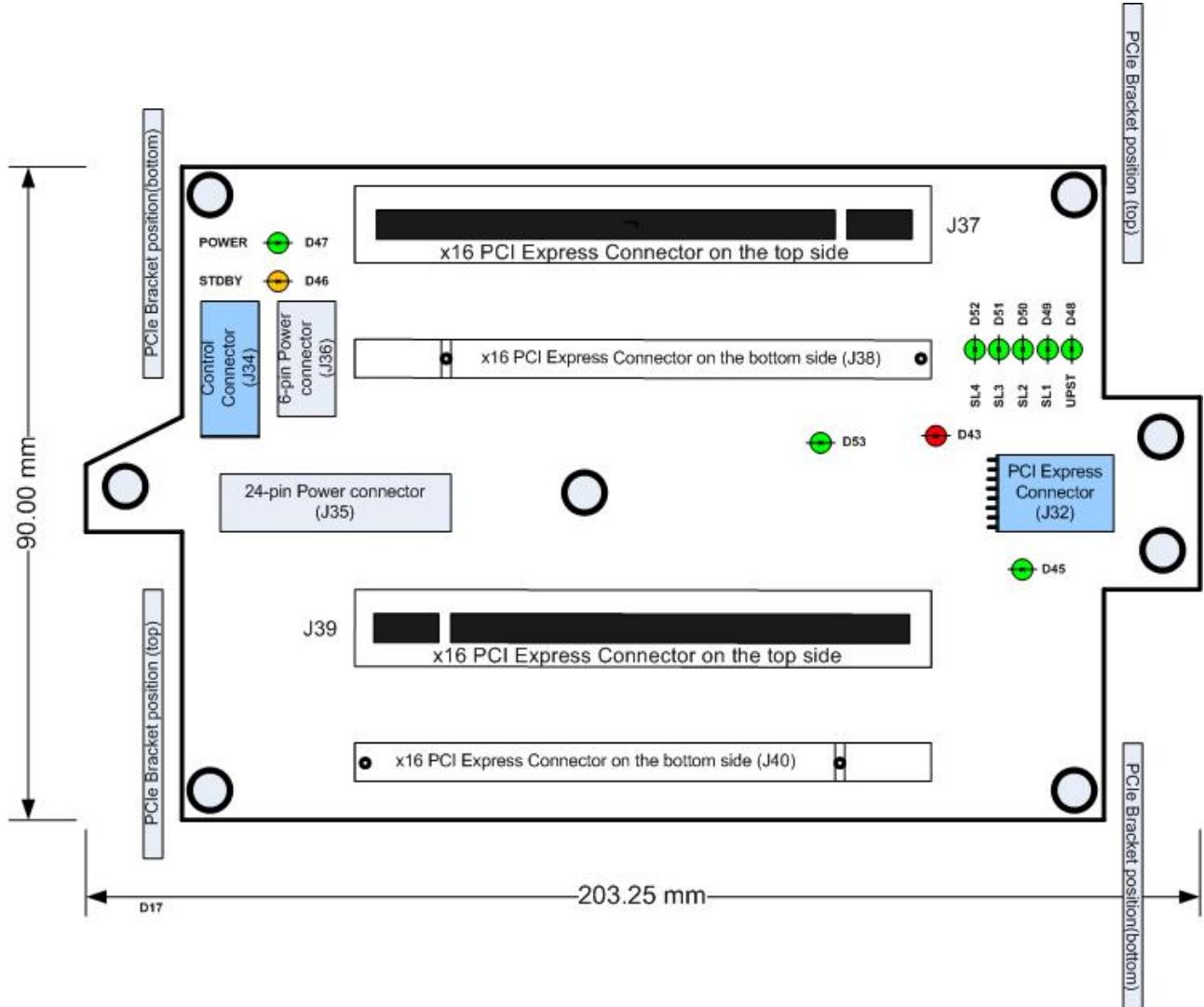


Figure 8: Cluster's Backplane - board layout

## 4.2 Control Cabling

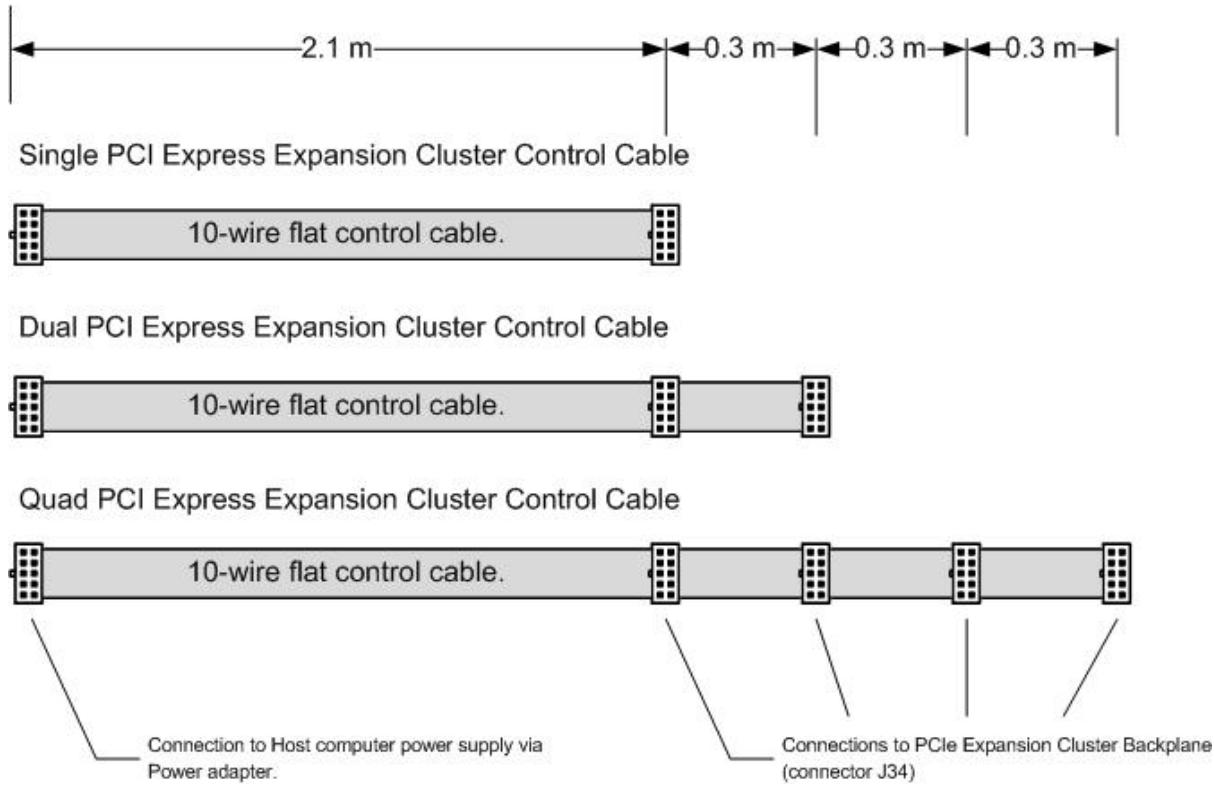


Figure 9: 10-wire power control cable variants

## 4.3 System Cable Connections

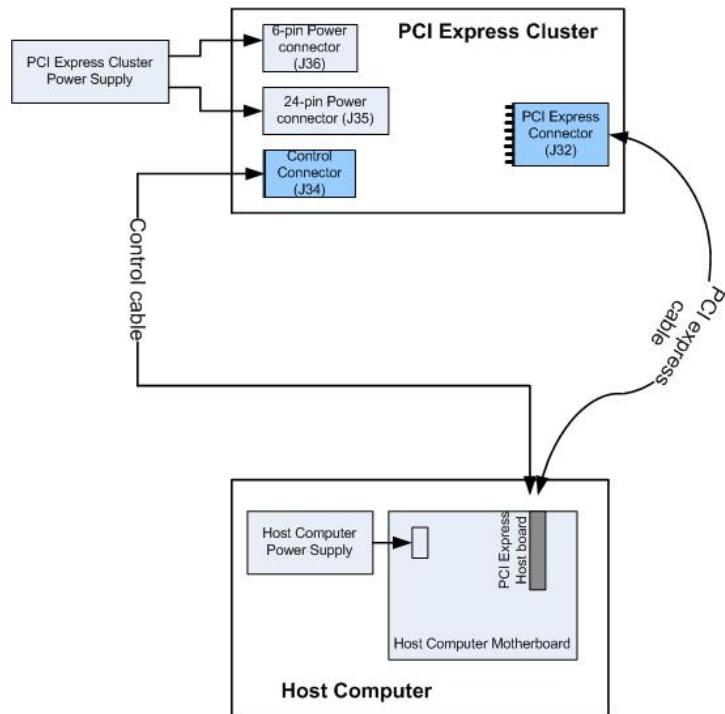


Figure 10: Single-Cluster System Cable Connection block diagram

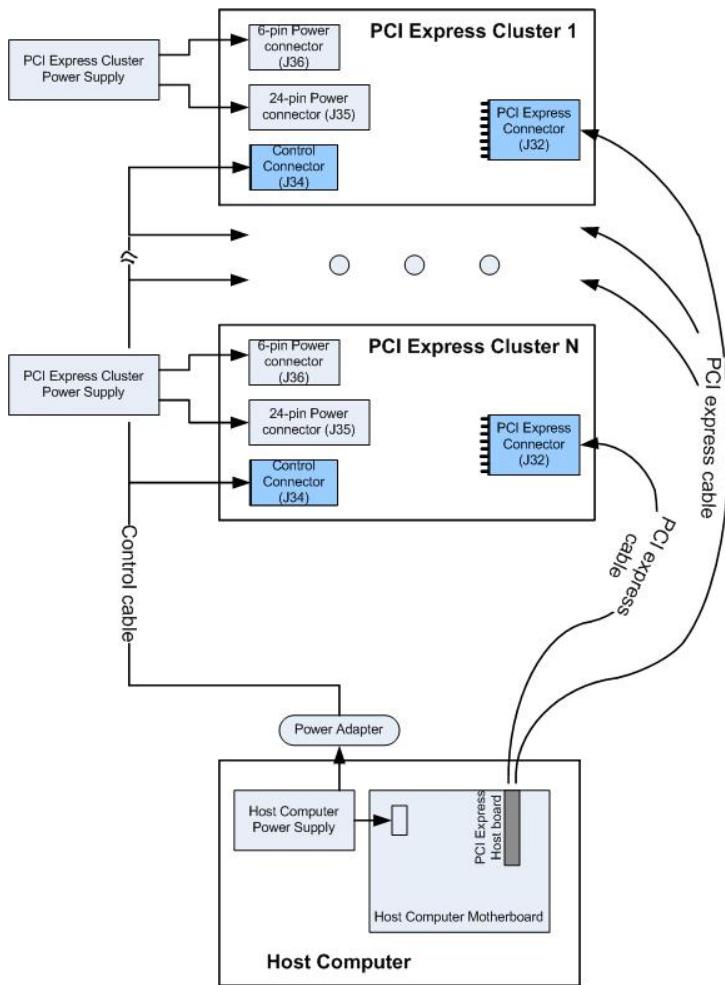


Figure 11: Multi-Cluster System Cable Connection block diagram

## 4.4 LEDs

Name	Ref. Des.	Color	Usage
RST	D43	RED	RESET from host computer
STDBY	D46	YELLOW	Cluster ATX psu stand by power indication
POWER	D47	GREEN	Power status indicator
UPST	D48	GREEN	Upstream PCIe link status indicator
	D45	GREEN	Backplane initialization status indicator
SL1	D49	GREEN	First PCIe slot PCIe link status
SL2	D50	GREEN	Second PCIe slot PCIe link status
SL3	D51	GREEN	Third PCIe slot PCIe link status
SL4	D52	GREEN	Fourth PCIe slot PCIe link status

Table 1: Backplane LEDs

## 4.5 Connectors

Ref. Des.	Type	Usage
J32	RJ45 connector for the PCI express cable connection	Connector for CAT6 cable between PCIe Expansion Cluster and host computer.
J34	5x2 (2.5 mm) header	Connector for control cable between PCIe Expansion Cluster and host computer power supply.
J35	Standard ATX power supply 24 pin connector	Connector for ATX power supply. (Supplies power for Cluster backplane and for all PCIe boards).
J36	Standard ATX power supply 6 pin connector	Connector for ATX power supply. (Supplies power for Cluster backplane and for all PCIe boards).
J37, J38, J39, J40	PCI Express connectors	Four x16 PCIe connectors.

Table 2: Backplane Connectors

# 5 Operation

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## 5.1 Power Requirements: ATX PSU

The cluster backplane must be installed on the custom chassis; **Amfeltec's "Assembly Instructions"** **should be followed**, to ensure a smooth installation process.

**NOTE: For ATX psu selection, the user must refer to the maximum power requirements of their respective GPU boards.**

## 5.2 Assembly

Please read Amfeltec's "Assembly Instructions" guide, to ensure a smooth installation process. (PDF download available on product page.)

## 5.3 Physical Placement

The cluster may be placed on any suitable flat surface up to 5ft or 10ft away from the host computer (depending on cable length). Multiple clusters may be connected together (see "Assembly Instructions").

**NOTE: upon completion of the physical setup, remember to provide the cluster with adequate air cooling.**

## 5.4 Power ON/OFF Procedure

Before Power-ON please verify the following:

1. All auxilliary power connections for the GPUs are done correctly.
2. All GPUs are sitting properly (vertically) on the respective PCIe connectors.
3. Please provide appropriate air cooling (ex: a simple fan) for the PCIe Cluster Backplane, when using any high-power GPU (consumption greater than 200W per GPU).

The cluster's ON/OFF state, and the cluster ATX psu's ON/OFF state are controlled by the host computer.

When the host computer is turned "ON", all connected clusters and power supply units will turn "ON".

When the host computer is turned "OFF", all connected clusters and power supply units will turn "OFF".

### Proper setup and ON/OFF procedure:

1. Ensure your ATX psu(s), GPU(s) and cluster backplane(s) **cable connections** are correct.
2. Turn cluster's ATX psu to "ON".
3. Cluster's backplane STBY LED should be be "ON" (on the backplane's top side).
4. Turn host computer "ON". Cluster will turn on automatically.

## 6

# Appendix A: Limited warranty

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Amfeltec Corporation does not warrant that the operation of the hardware, software or firmware products will be uninterrupted or error free. Amfeltec products are not intended to be used as critical components in life support systems, aircraft, military systems or other systems whose failure to perform can reasonably be expected to cause significant injury to humans. Amfeltec expressly disclaims liability for loss of profits and other consequential damages caused by the failure of any product which would cause interruption of work or loss of profits, such as shipboard or military attachment.

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