MC1600 Extreme Edge Server

Installation and Use

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SMART Embedded Computing, Inc.

2900 S. Diablo Way, Suite 190

Tempe, Arizona 85282

USA

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About this Manual

Overview of Contents

This manual is divided into the following sections.

Safety Notes on page 15 provides the safety information that should be observed while operating the product.

Notice de Sécurité on page 25 provides a French translation of the safety notes section.

Sicherheitshinweise on page 37 provides a German translation of the safety notes section.

Chapter 1, System Overview on page 49 describes the MC1600 Extreme Edge Server's features and functionality. This chapter includes detail on front panel interfaces, cooling, grounding, and the server's base board. There is also information about the Baseboard Management Controller (BMC) and ordering information.

Chapter 2, Site Preparation on page 83 provides information on unpacking the MC1600 Extreme Edge Server, safety precautions, and requirements for the product. Included are the environmental and power requirements, mounting options, cooling considerations, acoustic noise control, and dimensions and weight of the product.

Chapter 3, FRU Installation on page 89 describes the installation and removal of PCIe cards and details of the SFP/SFP+ modules.

Chapter 4, System Installation on page 91 provides instructions for installing and removing the MC1600 Extreme Edge Server in a rack or cabinet. It also gives information and procedures for grounding, powering up and down, and disconnecting the server from the power feed.

Chapter 5, Software Configuration on page 97 details about the preinstalled software and firmware are presented in this chapter. CPU boot information and information on the Basic Blade Services (BBS) which includes utilities for updating firmware and configuring switches are described. System management and monitoring is discussed via the BMC along with the standard IPMI implementation as well as some custom OEM commands.

Appendix A, Related Documentation on page 123 provides information on documentation related to this product.

Abbreviations

This document uses the following abbreviations:

Abbreviation	Definition
BBS	Basic Blade Services
BMC	Baseboard Management Controller
BIOS	Basic Input Output System
CPLD	Complex Programmable Logic Device
CPU	Central Processing Unit
EHCI	Enhanced Host Controller Interface
ESD	Electro-static Discharge
IIO	Integrated IO
IPMI	Intelligent Platform Management Interface
MISO	Master Data In
MOSI	Master Data Out
OEM	Original Equipment Manufacturer
PCIe	PCI Express
PEM	Power Entry Module
SFP	Small Form-factor Pluggable
SKU	Stock Keeping Unit (Intel SKU Numeric Digits)
SPD	Serial Presence Detection
SPI	Serial Peripheral Interface
TPM	Trusted Platform Module
xHCI	eXtensible Host Controller Interface

Conventions

The following table describes the conventions used throughout this manual.

Notation	Description
0x00000000	Typical notation for hexadecimal numbers (digits are 0 through F), for example used for addresses and offsets
0b0000	Same for binary numbers (digits are 0 and 1)
bold	Used to emphasize a word
`Screen`	Used for on-screen output and code related elements or commands. `Sample of Programming used in a table (9pt)`
`Courier + Bold`	Used to characterize user input and to separate it from system output
Reference	Used for references and for table and figure descriptions
File > Exit	Notation for selecting a submenu
<text>	Notation for variables and keys
[text]	Notation for software buttons to click on the screen and parameter description
...	Repeated item for example node 1, node 2, ..., node 12
. . .	Omission of information from example/command that is not necessary at the time
..	Ranges, for example: 0..4 means one of the integers 0,1,2,3, and 4 (used in registers)
|	Logical OR
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury
	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury

Notation	Description
	Indicates a property damage message
	Indicates a hot surface that could result in moderate or serious injury
	Indicates an electrical situation that could result in moderate injury or death
	Indicates that when working in an ESD environment care should be taken to use proper ESD practices
	No danger encountered, pay attention to important information

Summary of Changes

This manual has been revised and replaces all prior editions.

Part Number	Publication Date	Description
6806870A02B	January 2020	Rebrand to SMART Embedded Computing template. Updated Safety Notes in English and German; added French Safety Notes.
6806870A02A	April 2019	Initial Release

Safety Notes

This section provides warnings that precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed during all phases of operation, service, and repair of this equipment. You should also employ all other safety precautions necessary for the operation of the equipment in your operating environment. Failure to comply with these precautions or with specific warnings elsewhere in this manual could result in personal injury or damage to the equipment.

SMART Embedded Computing intends to provide all necessary information to install and handle the product in this manual. Because of the complexity of this product and its various uses, we do not guarantee that the given information is complete. If you need additional information, ask your SMART EC representative.

The product has been designed to meet the standard industrial safety requirements. It must not be used in safety critical components, life supporting devices, or on aircraft.

Only personnel trained by SMART EC or persons qualified in electronics or electrical engineering are authorized to install, remove or maintain the product. The information given in this manual is meant to complete the knowledge of a specialist and must not be used as replacement for qualified personnel.

Keep away from live circuits inside the equipment. Operating personnel must not remove equipment covers. Only factory authorized service personnel or other qualified service personnel may remove equipment covers for internal subassembly or component replacement or any internal adjustment.

Do not install substitute parts or perform any unauthorized modification of the equipment or the warranty may be voided. Contact your local SMART EC representative for service and repair to make sure that all safety features are maintained.

EMC

The product has been tested and found to comply with the limits for a Class A digital device in this system, pursuant to part 15 of the FCC Rules, EN 55032 Class A respectively. These limits are designed to provide reasonable protection against harmful interference when the product is operated in a commercial, business or industrial environment.

The product conducts, radiates and uses radio frequency energy and, if not installed properly and used in accordance with this user documentation, may cause harmful interference to radio communications. Operating the product in a residential area is likely to cause harmful interference. If this occurs, the user will be required to correct the interference at the user's expense.

Changes or modifications not expressly approved by SMART EC could void the user's regulatory compliance. Board products are tested in a representative system to show compliance with the above mentioned requirements. A proper installation in a compliant system will maintain the required performance.

Use only shielded cables when connecting peripherals to help assure that appropriate radio frequency emissions compliance is maintained. For proper EMC shielding, only operate the system with face plates installed and all vacant slots covered or populated with filler cards.

Grounding

If the product is not properly grounded, it may be damaged by electrostatic discharge.

The system contains EMI gaskets at the shelf and module level. Make sure that each of the system's parts contact the EMI gasket.

The shelf is also fitted with an ESD jack/snap for use with conductive wrist straps. Make sure the operator uses proper ESD protection.

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Interference (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

The equipment is suitable for installation in a Common Bonding Network (CBN) or Isolated Bonding Network (IBN).

System Installation

System Damage

To avoid system damage verify that the system environment meets the environmental and power requirements given in this manual before installing the system. Before you set up and cable your new system, consider these guidelines:

- Restricted access location: Intended for installation in a restricted access location with access by trained personnel only.
- Detachable power supply cord set: The detachable power supply cord set is not included in shipment. The detachable power supply cord set shall be an approved type, acceptable to the authorities in the country where the equipment is installed.
- Installation codes: Where applicable, this unit shall be installed in accordance with the National Electrical Code (NEC).
- Overcurrent protection: A readily accessible listed branch circuit overcurrent protective device must be incorporated into the building wiring. For appropriate AWG rating of the overcurrent protection device, see NEC Table 310.16 and other national regulations.
- The protective bonding conductor depends on your power distribution topology. Make sure that you use an appropriate protective bonding conductor regarding the rating of the branch circuit protection.

- Install the system safely. Make sure that cables and cords are out of the way.
- Make sure that the set-up is comfortable for users.

System Damage

WARNING: The intra-building port (s) of the equipment or subassembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port (s) of the equipment or subassembly MUST NOT be metalically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection in order to connect these interfaces metalically to OSP wiring.

System Damage

All interconnected equipment to this equipment (or to added subassemblies) is intended to be within the same building. If this equipment (including any added subassemblies) is used in inter-building connection, the connection shall be adequately protected against over-voltage/transient. And further Electrical Safety evaluation would be required.

System Damage

Environmental contamination can impair system operation.

Locate the system in a stable area free of excess movement and jarring and free of dust, smoke, and electrostatic discharge (ESD). Make sure that the temperature does not exceed the operating temperature given in the environmental requirements in this manual and allow room for proper air flow for cooling.

Personal Injury or System Damage

A top-heavy rack can tip, causing damage to equipment and injury to personnel.

If your system is the only one in the rack, make sure to mount the system in the lowest part of the rack. If several systems are installed in one rack, start with the heaviest component at the bottom. If the rack is equipped with stabilizing devices, make sure that they are installed and extended so that the rack is secure. Then proceed to mount or service the system.

Personal Injury or System Damage

Use caution when pulling the system out of the rack, as it could fall and cause personal injury.

Personal Injury

The system is heavy and improper handling may lead to muscle strain or back injury.

System Damage

During handling, shipping, and assembly, it is possible that pins, mounting screws, fans, and other items became loose or damaged.

Do not operate a damaged system, as it may damage the devices that interface with the system.

Personal Injury

High leakage current can be hazardous and cause injury.

Make an earth ground connection before connecting power to the system.

System Damage

Wrong jumper settings can make the system inoperable. Never change the settings of the jumpers.

Card Installation

Damage of Circuits

Electrostatic discharge and incorrect product installation and removal can damage circuits or shorten their life.

Before touching the product make sure that you are working in an ESD-safe environment. Hold the product by its edges and do not touch any components or circuits.

Product Damage

Install PCI Express (PCIe) cards in the designated slots. Installing a card in the wrong slot may cause card or system damage.

Installing or removing the card from the system while the system is powered up may damage the card and the system.

When installing or removing the card from the system, power down the system first.

Data Loss

The MaxCore system does not support hot swap of PCIe cards. Before opening the top cover of the system or before installing or removing any PCIe card, make sure the system is powered off.

Disconnect the system from any AC or DC power or turn the system board power (payload power) off through the Board Management Controller (BMC).

For more information, refer to the *MC1600 Extreme Edge Server* Installation and Use manual.

Card Malfunctioning

Incorrect card installation and removal may result in card malfunction or damage the PCIe slot. Ensure PCIe cards are properly seated.

Operation

System Overheating–Cooling Vents

Improper cooling can lead to card and system damage and may void the manufacturer's warranty.

To allow for proper cooling and undisturbed airflow through the system, always operate the system in a horizontal position. Do not obstruct the ventilation openings at the front, rear, or sides of the system. Keep the fresh air intake of the chassis completely clear. Make sure that the fresh air supply is not mixed with hot exhaust from other devices.

Product Damage

High humidity and condensation on product surfaces causes short circuits.

Do not operate the system outside the specified environmental limits. Make sure the system is completely dry and there is no moisture on any surface before applying power. Do not start the system below 0°C unless it is an extended-temperature model.

Injury

Caution: The system may be equipped with multiple power feeds. All power connection feeds must be disconnected to de-energize the system. To reduce the risk of personal injury, disconnect the feeds when removing power from the system.

System Damage – Air Filters

Air contamination can pollute the air filter and obstruct the air intake of the system which may cause system overheating and component damage.

To guarantee proper airflow through the system, replace the air filters (if equipped) at least every six months. Artesyn recommends the air filters be replaced every 90 days.

Installations vary in physical location and cleanliness. Filter replacement may be required more often in a dusty environment. Check air filters frequently after system installation to determine how often they must be replaced. Establish a regular replacement schedule and keep a log to record the date of each filter replacement.

Front Panel

The front panel, including the air filter (if equipped), is mounted to the system by alignment pins and holding clips on both sides of the system. When mounting the front panel to the shelf, align it accurately to avoid damage to the frame or front panel.

Earth Ground

This equipment is designed to permit the connection of the earthed conductor of the DC supply circuit to the earthing conductor at the equipment. If this connection is made, all of the following conditions must be met:

- This equipment shall be connected directly to the DC supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the DC supply system earthing electrode conductor is connected.
- This equipment shall be located in the same immediate area (such as adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same DC supply circuit and the earthing conductor, and also the point of earthing of the DC system. The DC system shall not be earthed elsewhere.
- The DC supply source shall be located within the same premises as this equipment.
- Make sure you have an earth ground connection that is free of any disconnecting device, such as a power switch or fuse, between the DC source and the earth ground connector. A disconnecting device could result in the ground being disconnected and the potential of injury from electrical shock.

System Overheating

If you set the fan speed manually through the Board Management Controller (BMC), constantly monitor the system temperature to prevent overheating.

Make sure that the environmental and power requirements are met while operating the system.

Injuries or Short Circuits

To avoid damage or personal injury, always check that no hazardous voltage is present before servicing equipment.

Data Corruption

If power to the unit is removed while a firmware update is in progress to the product's flash memory, the changes will not be saved or the flash memory may be corrupted. In such case, the product is likely to remain in a non-operable state and will require reconditioning by qualified repair services.

System Expansion

System Overload

To avoid an overload of the system, check the total power consumption of all components installed. Make sure that the individual output current of any source stays within its acceptable limits (see the technical specification of the respective source or component).

Loss of Safety Compliance–Using of Additional Plug-in Cards

The system may become noncompliant by the addition of plug-in cards. Regulatory compliance is the responsibility of the system integrator.

Power Feed

Personal Injury

Touching the power feed with metallic objects on your hands, wrists, or hanging from your neck may lead to severe personal injury through electric shock and burning when working at the power feed or power input cables. Be extremely careful when using electrically conductive tools near the PSUs/PEMs.

Short Circuits or Personal Injury

Make sure that the power feeds you plan to remove or attach are powered off and cannot be switched on while you are working.

Make sure that all power feeds to the chassis are not energized. Be careful with the tools used to prevent a short circuit.

Product Damage

Improper cabling damages your product. Take extreme care not to reverse the polarity when connecting the power cable.

Fans

System Damage

Insufficient cooling may damage the system.

When servicing, replace the fan tray (or fan modules) without delay.

Fan Replacement

When a fan is taken out of operation or is removed during a replacement procedure, system management software may compensate for the loss by increasing the speed of any remaining fans.

Running the fans at high speed for a long time may shorten the life of the fans and may exceed allowable acoustic noise limits.

Replace the fan tray (or fan modules) without delay.

Personal Injury–Rotating Fans

Inserting tools or fingers into operational fans may cause personal injury.

Keep clear of the fans as long as they are rotating.

When the fan is removed, extreme care should be taken while handling the fan itself. The centrifugal forces will make the unit difficult to handle.

Cabling

Personal Injury

The cabling should follow existing cable paths using existing or similar cable fastenings. Never change the system's cabling as delivered by SMART EC. Check proper function of the system after cabling extensions. To avoid personal injury, always ensure that cables are securely installed so that no one can trip over them.

Personal Injury through Electric Shock

Touching contacts and cables during system operation can cause personal injury through electric shock.

To avoid electric shock, make sure that contacts and cables of the system cannot be touched while the system is operating. If in doubt concerning cabling, ask your local SMART EC representative.

Cable Damage

Do not fold cables. Folding a fiber cable damages the cable and inhibits the data transmission.

RJ-45 Connector

System Damage

RJ-45 connectors on the system or on PCIe cards are either twisted-pair Ethernet (TPE) or E1/T1/J1 network interfaces. Connecting an E1/T1/J1 line to an Ethernet connector may damage your system.

- Make sure that TPE connectors near your working area are clearly marked as network connectors.
- Verify that the length of an Ethernet cable connected to a RJ-45 TPE connector does not exceed 100 meters or approximately 328 feet.
- Make sure the TPE connector of the system is connected only to Safety Extra Low Voltage (SELV) circuits.
- If in doubt, ask your system administrator.

For more information, see the documentation of the respective product.

Laser

Personal Injury

If a label with the words CLASS 1 LASER PRODUCT is affixed to your system, the unit is equipped with a laser device. These devices contain a laser system that produces visible or invisible laser radiation (or both) and can be harmful to the eyes.

Seek supplemental information (power, wavelength, visibility, pulse duration, applicable standards) prior to servicing equipment. Do not look at laser device with an optical instrument at any time.

Battery

Blade Damage

Incorrect battery installation may result in a hazardous explosion and blade damage.

Always use the same type of lithium battery as is installed and make sure the battery is installed as described in the manual.

Data Loss

Installing another battery type than the one mounted at product delivery may cause data loss.

PCB and Battery Holder Damage

Do not use a screw driver to remove the battery from its holder. Removing the battery with a screw driver may damage the PCB or the battery holder.

Environment

Environmental Damage

Improper disposal of used products may harm the environment.

Always dispose of used products according to your country’s legislation and manufacturer’s instructions.

Notice de Sécurité

Cette section présente, à travers ce manuel, des avertissements qui précèdent les procédures potentiellement dangereuses. Les instructions contenues dans les avertissements doivent être suivies durant toutes les phases d'opération, de service et de réparation de cet équipement. Vous devriez aussi employer toute autre précaution nécessaire pour l'utilisation de l'équipement dans l'environnement d'opération. Le défaut de se conformer à ces précautions ou aux avertissements spécifiques contenus ailleurs dans ce manuel, peut engendrer des lésions corporelles ou dommages à l'équipement.

SMART Embedded Computing prévoit dans ce manuel de fournir toute l'information nécessaire pour installer et manipuler le produit. En raison de la complexité de ce produit et de ses diverses utilisations, nous ne pouvons pas garantir que les informations fournies sont complètes. Si vous avez besoin d'information supplémentaire, contactez votre représentant SMART EC.

Le produit a été conçu pour répondre aux exigences de sécurité standards de l'industrie. Il ne doit pas être utilisé dans des composantes critiques pour la sécurité, des appareils de maintien de vie ou sur un aéronef.

Seul le personnel formé par SMART EC ou les personnes qualifiées dans le domaine de l'électronique ou du génie électrique sont autorisés à installer, retirer ou faire l'entretien du produit. Les informations contenues dans ce manuel sont destinées à compléter les connaissances d'un spécialiste et ne peuvent être utilisées en remplacement de personnel qualifié.

Ne touchez pas les circuits sous tension à l'intérieur de l'équipement. Le personnel d'opération ne doit pas enlever les couvercles de l'équipement. Seul le personnel de maintenance autorisé par l'usine ou autre personnel de maintenance qualifié peut retirer les couvercles des équipements pour le sous-assemblage interne ou pour le remplacement de composantes, ou pour tout réglage interne.

N'installez aucune pièce de remplacement et n'effectuez aucune modification non autorisée de l'équipement, sinon, la garantie pourrait être annulée. Contactez votre représentant SMART EC local pour le service et la réparation, afin de vous assurer que toutes les fonctions de sécurité soient maintenues.

Compatibilité électromagnétique (CEM)

Le produit a été testé et est déclaré conforme aux limites imposées à un appareil numérique de classe A dans ce système, conformément à la section 15 de la Réglementation FCC, EN 55032 classe A, respectivement. Ces limites sont conçues pour offrir une protection raisonnable contre les interférences néfastes lorsque le produit est utilisé dans un environnement commercial ou industriel.

Le produit conduit, émet et utilise de l'énergie à radiofréquence et, s'il n'est pas installé correctement et utilisé conformément à cette documentation de l'utilisateur, il peut causer des interférences néfastes aux communications radio. Opérer ce produit dans une région résidentielle est susceptible de causer des interférences néfastes. Si cela se produit, l'utilisateur devra corriger les interférences à ses frais.

Les changements ou les modifications qui ne sont pas expressément approuvés par SMART EC pourraient annuler la conformité réglementaire de l'utilisateur. Les cartes sont testées dans un système représentatif pour démontrer la conformité aux exigences mentionnées ci-dessus. Une installation adéquate dans un système conforme maintiendra les performances requises.

Utilisez uniquement des câbles blindés lorsque vous connectez des périphériques pour vous assurer que la conformité aux normes d'émission de radiofréquences est respectée. Pour un blindage CEM adéquat, utilisez le système uniquement avec les plaques frontales installées et tous les ports d'extension vacants couverts ou équipés de cartes obturatrices.

Mise à la terre

Si le produit n'est pas adéquatement mis à la terre, il peut être endommagé par une décharge électrostatique.

Le système contient des joints EMI au niveau des étagères et des modules. Assurez-vous que chacune des pièces du système est en contact avec le joint EMI.

L'étagère est également équipée d'une prise/déclic ESD pour une utilisation avec des dragonnes conductrices. Assurez-vous que l'opérateur utilise la protection de décharge électrostatique ESD appropriée.

Ceci est un produit de classe A basé sur la norme du Conseil volontaire de contrôle des interférences (VCCI) par Information Technology Interference (Interférence des technologies de l'information). Si cet équipement est utilisé dans un environnement domestique, des perturbations radio peuvent survenir. Lorsque de tels problèmes surviennent, l'utilisateur peut être amené à prendre des mesures correctrices.

L'équipement peut être installé dans un réseau de liaison équipotentielle (CBN) ou un réseau de liaison isolé (IBN).

Installation du Système

Endommagement du système

Pour éviter tout endommagement du système, vérifiez que l'environnement du système correspond aux exigences de puissance et environnementale fournies dans ce manuel, avant d'installer le système. Afin de commencer l'installation et le câblage de votre nouveau système, tenez compte de ces instructions :

- Lieu à accès restreint : Conçu pour l'installation dans des lieux à accès restreint avec un accès par du personnel compétent uniquement.
- Cordon d'alimentation amovible: le cordon d'alimentation amovible n'est pas inclus dans la livraison. Le cordon d'alimentation détachable doit être d'un type approuvé, accepté par les autorités du pays où l'équipement est installé.
- Codes d'installation: le cas échéant, cette unité doit être installée conformément au Code national de l'électricité (NEC).
- Protection contre la surintensité : Un dispositif de protection contre les surintensités de circuit dérivé facilement accessible, doit être intégré au câblage du bâtiment. Pour connaître le calibre AWG approprié du dispositif de protection contre les surintensités, voir le tableau NEC, tableau 310.16, et les autres réglementations nationales.
- Le conducteur de liaison protecteur dépend de votre topologie de distribution d'alimentation. Assurez-vous d'utiliser un conducteur de liaison protecteur adéquat en ce qui concerne la valeur de la protection du circuit de dérivation.
- Installez le système de façon sûre. Assurez-vous que les câbles et les cordons soient hors de portée.
- Assurez-vous que la configuration soit confortable pour les utilisateurs.

Endommagement du système

AVERTISSEMENT: le port intra-bâtiment de l'équipement ou du sous-ensemble convient uniquement pour la connexion à un câblage intra-bâtiment ou à un filage non exposé uniquement. Le port intra-bâtiment de l'équipement ou du sous-ensemble NE DOIT PAS être relié métalliquement à des interfaces qui se connectent à l'installation extérieure (OSP) ou à son filage. Ces interfaces sont conçues pour être utilisées uniquement comme interfaces intra-bâtiment (ports de type 2 ou de type 4 décrits dans le document GR-1089) et nécessitent une isolation du câblage OSP exposé. L'ajout de protecteurs primaires ne constitue pas une protection suffisante pour connecter ces interfaces de manière métallique au câblage OSP.

Endommagement du système

Tous les équipements interconnectés à cet équipement (ou à des sous-ensembles ajoutés) sont conçus pour être situés dans le même bâtiment. Si cet équipement (y compris tous sous-ensembles ajoutés) est utilisé en connexion inter-bâtiments, la connexion doit être correctement protégée contre les surtensions/transitoires. Une évaluation plus poussée de la sécurité électrique serait requise..

Endommagement du système

La contamination environnementale peut nuire à l'opération du système.

Placez le système dans une zone stable, sans excès de mouvement ni de coups, poussière, fumée ou décharges électrostatiques (ESD).

Assurez-vous que la température ne dépasse pas la température de fonctionnement indiquée dans les exigences environnementales de ce manuel, et laissez suffisamment de place pour un flux d'air adéquat en vue du refroidissement.

Lésions corporelles ou endommagement du système

Un support lourd peut basculer, causant des dommages à l'équipement et des lésions corporelles.

Si votre système est le seul du support, veillez à le monter dans la partie la plus basse du support. Si plusieurs systèmes sont installés dans un seul support, commencez par la composante la plus lourde placée en bas. Si le support est équipé de dispositifs de stabilisation, assurez-vous qu'ils sont installés et déployés de façon à ce que le support soit sécurisé. Ensuite, procédez au montage ou à la maintenance du système.

Lésions corporelles ou endommagement du système

Soyez prudent lorsque vous tirez le système de son support, puisqu'il peut tomber et causer des lésions corporelles.

Lésions corporelles

Le système est lourd et une manipulation non conforme peut mener à une déchirure musculaire ou une blessure dos.

Endommagement du système

Durant la manipulation, la livraison ou l'assemblage, il est possible que les broches, les vis, les ventilateurs ou autres articles puissent se desserrer ou s'endommager.

N'opérez pas un système endommagé, puisqu'il peut endommager l'appareil qui sert d'interface au système.

Lésions corporelles

Une fuite de courant élevé peut être dangereuse et causer des blessures

Effectuez une connexion de mise à la terre avant de connecter le bloc d'alimentation.

Endommagement du système

De mauvais réglages de câbles de démarrage peuvent rendre le système inutilisable. Ne modifiez jamais les paramètres des câbles de démarrage.

Installation de la Carte

Endommagement des circuits

Les décharges électrostatiques, ainsi que l'installation inadéquate et le retrait du produit peuvent endommager les circuits ou réduire leur durée de vie

Avant de toucher au produit, assurez-vous que vous travaillez dans un environnement exempt de décharge électrostatique. Tenez le produit par ses extrémités et ne touchez aucune composante ou circuit.

Endommagement du produit

Installez les cartes PCI Express (PCIe) dans les ports d'extension désignés. Installer une carte dans le mauvais port d'extension peut causer des dommages à la carte ou au système.

L'installation ou le retrait de la carte du système alors que le système est sous tension peut endommager la carte et le système.

Lorsque vous installez ou retirez la carte du système, mettez en premier lieu le système hors tension.

Perte de données

Le système MaxCore ne prend pas en charge le remplacement à chaud des cartes PCIe. Avant d'ouvrir le couvercle supérieur du système ou avant d'installer ou de retirer une carte PCIe, assurez-vous que le système est hors tension.

Déconnectez le système de toute alimentation CA ou CC ou mettez la carte système (alimentation de la charge utile) hors tension via le Contrôleur de gestion de carte (BMC).

Pour plus d'information, référez-vous au manuel *MC1600 Extreme Edge Server Installation and Us*.

Mauvais fonctionnement de la carte

L'installation ou le retrait inadéquat de la carte peut causer un mauvais fonctionnement de la carte ou un dommage au port d'extension PCIe. Assurez-vous que les cartes PCIe sont adéquatement installées.

Opération du Système

Surchauffe du système – Évents de refroidissement

Un refroidissement inadéquat peut endommager la carte et le système et annuler la garantie fabricant.

Pour permettre un refroidissement adéquat et une aération constante, opérez toujours le système dans une position horizontale. N'obstruez pas les ouvertures de ventilation au-devant, derrière ou sur les côtés du système. Gardez l'apport en air frais du châssis complètement dégagé. Assurez-vous que l'apport d'air frais ne se mélange pas avec les émanations de d'autres appareils.

Endommagement du produit

Une humidité élevée et la condensation sur la surface du produit crée des courts-circuits.

N'opérez pas le système en dehors des limites environnementales spécifiées. Assurez-vous que le système soit complètement sec et qu'il n'y ait pas d'humidité sur aucune surface, avant de mettre sous tension. Ne démarrez pas le système en dessous de 0 ° C sauf s'il s'agit d'un modèle à température étendue.

Blessure

Avertissement : Le système peut être équipé de multiples PSUs. Toute source d'alimentation de connexion doit être déconnectée pour mettre le système hors tension. Pour réduire les risques de lésions corporelles, débranchez les sources lorsque vous mettez le système hors tension.

Endommagement du système – Filtres à air

Une contamination de l'air peut polluer le filtre à air et obstruer l'apport en air du système ce qui peut causer une surchauffe du système et endommager ses composantes.

Pour garantir une aération constante à travers le système, remplacez les filtres à air (si équipé) au moins à tous les six mois. Artesyn recommande que les filtres à air soient remplacés tous les 90 jours.

L'installation varie selon le lieu physique et la propreté. Le remplacement des filtres peut être requis plus fréquemment dans un environnement poussiéreux. Vérifiez les filtres à air fréquemment après l'installation du système pour déterminer à quelle fréquence ils doivent être remplacés. Établissez un calendrier régulier de remplacement et gardez un registre de la date de remplacement du filtre.

Panneau avant

Le panneau avant, incluant le filtre à air (si équipé), est monté au système par alignement de broches et de clips de fixation des deux côtés du système. Lors du montage du panneau avant sur l'étagère, alignez-le avec précision pour éviter d'endommager le cadre ou le panneau avant.

Terre

Cet équipement est conçu pour permettre la connexion du conducteur mis à la terre du circuit d'alimentation en CC au conducteur de mise à la terre de l'équipement. Si cette connexion est établie, toutes les conditions suivantes doivent être remplies :

- Cet équipement doit être connecté directement au conducteur de l'électrode de mise à la terre du système d'alimentation en courant continu, ou à un cavalier de mise à la terre d'une barre de terminal de mise à la terre ou d'un bus auquel l'électrode du système d'alimentation en courant continu est connecté.
- Cet équipement doit être situé dans la zone immédiate (telle que les armoires adjacentes) de tout autre équipement ayant une connexion entre le conducteur mis à la terre du même circuit d'alimentation en CC et le conducteur de terre, et également du point de mise à la terre du système CC. Le système CC ne doit être mis à la terre nulle part ailleurs.
- La source d'alimentation en CC doit être située au même endroit que cet équipement.
- Assurez-vous que la connexion de mise à la terre soit exempte de tout dispositif de déconnexion, tel qu'un commutateur d'alimentation ou un fusible, entre la source CC et le connecteur de mise à la terre. Un dispositif de déconnexion pourrait entraîner la déconnexion de la mise à la terre et un risque potentiel de blessure par choc électrique.

Surchauffe du système

Si vous sélectionnez manuellement la vitesse du ventilateur [par le Contrôleur de gestion de carte (BMC), surveillez constamment la température du système pour prévenir toute surchauffe.

Assurez-vous que les exigences environnementales et de puissance sont rencontrés lorsque vous opérez le système.

Blessures ou courts-circuits

Pour éviter tout dommage ou lésions corporelles, vérifiez toujours qu'aucun voltage dangereux ne soit présent avant de réparer l'équipement.

Corruption des données

Si l'appareil est mis hors tension alors qu'une mise à jour du microprogramme est en cours dans la mémoire flash du produit, les modifications ne seront pas enregistrées ou la mémoire flash pourrait être corrompue. Dans un tel cas, le produit restera probablement dans un état inutilisable et nécessitera un reconditionnement par des services de réparation qualifiés.

Expension du Système

Surcharge du système

Pour éviter une surcharge du système, vérifiez la consommation de puissance totale de toutes les composantes installées. Assurez-vous que le courant de sortie individuelle de toute source reste dans les limites acceptables (voir les spécifications techniques de la source ou du composant correspondant).

Conformité de perte de sécurité - Utilisation de cartes enfichables supplémentaires

Le système peut devenir non conforme en ajoutant des cartes enfichables. La conformité réglementaire est de la responsabilité de l'intégrateur de système.

Alimentation Électrique

Lésions corporelles

Toucher la source d'alimentation avec des objets métalliques sur les mains, les poignets ou accrochés au cou peut entraîner des lésions corporelles graves par choc électrique et brûlure lors du travail sur l'alimentation électrique ou les câbles d'alimentation. Soyez extrêmement prudent lorsque vous utilisez des outils électriquement conducteurs à proximité des blocs d'alimentation/module d'entrée d'alimentation.

Courts-circuits ou lésions corporelles

Assurez-vous que l'alimentation électrique que vous prévoyez de retirer ou attacher soit hors tension et qu'elle ne peut pas être activée pendant que vous travaillez.

Assurez-vous que toutes les alimentations du châssis ne sont pas sous tension. Soyez prudent en utilisant les outils utilisés pour prévenir les courts-circuits.

Endommagement du produit

Un calibrage non conforme peut endommager votre produit. Faites extrêmement attention de ne pas renverser la polarité lorsque vous connectez le fil d'alimentation.

Ventilateurs

Endommagement du système

Un refroidissement insuffisant peut endommager le système.

Nehmen Sie deshalb den Austausch ohne Verzögerung vor.

Remplacement de la ventilation

Lorsqu'un ventilateur est mis hors service ou est retiré au cours d'une procédure de remplacement, le logiciel de gestion du système peut compenser cette perte en augmentant la vitesse des ventilateurs restants.

Faire fonctionner les ventilateurs à haute vitesse pendant une longue période peut en réduire la durée de vie et dépasser les limites de bruit admissibles.

Remplacez le plateau de ventilation (ou les modules de ventilation) sans délai.

Lésions corporelles – ventilateurs rotatifs

L'insertion d'outils ou de doigts dans les ventilateurs en marche peut causer des lésions corporelles.

Restez à l'écart des ventilateurs aussi longtemps qu'ils tournent.

Lorsque vous retirez le ventilateur, faites très attention lorsque vous le manipulez. Les forces centrifuges rendront l'unité difficile à manipuler.

Câblage

Lésions corporelles

Le câblage doit suivre les chemins de câbles existants en utilisant des fixations de câbles existantes ou similaires. Ne changez jamais le câblage du système tel que fourni par SMART EC. Vérifiez le bon fonctionnement du système après les extensions de câblage. Pour éviter les lésions corporelles, assurez-vous toujours que les câbles soient correctement installés de manière à ce que personne ne puisse trébucher dessus.

Lésion corporelle par choc électrique

Toucher les contacts et les câbles durant le fonctionnement du système peut provoquer des lésions corporelles par choc électrique.

Pour éviter tout choc électrique, assurez-vous que les contacts et les câbles du système ne peuvent pas être touchés pendant le fonctionnement du système. En cas de doute sur le câblage, contactez votre représentant SMART EC local.

Dommages au câble

Ne pas plier les câbles. Le fait de plier un câble à fibre optique endommage le câble et empêche la transmission des données.

Les Connecteurs RJ-45

Endommagement du système

Les connecteurs RJ-45 du système ou des cartes PCIe sont des interfaces réseau Ethernet à paire torsadée (TPE) ou E1/T1/J1. La connexion d'une ligne E1/T1/J1 à un connecteur Ethernet peut endommager votre système.

- Assurez-vous que les connecteurs TPE situés près de votre zone de travail soient clairement identifiés comme étant des connecteurs réseau.
- Vérifiez que la longueur d'un câble Ethernet connecté à un connecteur TPE ne dépasse pas 100 mètres (environ 328 pieds).
- Assurez-vous que le connecteur TPE du système soit uniquement connecté aux circuits de sécurité très basse tension (SELV).
- En cas de doute, demandez à votre administrateur de système.

Pour plus d'informations, voir la documentation du produit respectif.

Laser

Lésions corporelles

Si une étiquette avec les mots PRODUIT LASER DE CLASSE 1 est apposée sur votre système, l'unité est équipée d'un appareil laser. Ces appareils contiennent un système laser qui produit des rayonnements visibles ou invisibles (ou les deux) et peut être nocif pour les yeux.

Recherchez de l'information supplémentaire (puissance, longueur d'onde, visibilité, durée d'impulsion, normes applicables) avant de faire le maintien de l'équipement. Ne regardez jamais un appareil laser avec un instrument optique.

Batterie

Endommagement de la lame

Une installation inadéquate de la batterie peut causer un risque d'explosion ou d'endommagement de la lame.

Utilisez toujours le même type de batterie au lithium tel qu'installé et assurez-vous que la batterie soit installée tel que décrit dans le manuel.

Perte de données

L'installation d'un autre type de batterie que celle montée à la livraison du produit peut causer une perte de données.

Endommagement du PCB ou du support de batterie

N’utilisez pas de tournevis pour retirer la batterie de son support. Retirer la batterie avec un tournevis peut endommager le PCB ou le support de batterie.

Environnement

Dommage Environnemental

Une disposition impropre des produits usagés peut être nocif pour l’environnement.

Éliminez les produits usagés toujours conformément à la législation de votre pays et aux instructions du fabricant.

Sicherheitshinweise

Dieses Kapitel enthält Hinweise, die potentiell gefährlichen Prozeduren innerhalb dieses Handbuchs vorrangestellt sind. Beachten Sie unbedingt in allen Phasen des Betriebs, der Wartung und der Reparatur des Systems die Anweisungen, die in diesen Hinweisen enthalten sind. Sie sollten außerdem alle anderen Vorsichtsmaßnahmen treffen, die für den Betrieb des Produktes innerhalb Ihrer Betriebsumgebung notwendig sind. Wenn Sie diese Vorsichtsmaßnahmen oder Sicherheitshinweise, die an anderer Stelle diese Handbuchs enthalten sind, nicht beachten, kann das Verletzungen oder Schäden am Produkt zur Folge haben.

SMART Embedded Computing ist darauf bedacht, alle notwendigen Informationen zum Einbau und zum Umgang mit dem Produkt in diesem Handbuch bereit zustellen. Da es sich jedoch um ein komplexes Produkt mit vielfältigen Einsatzmöglichkeiten handelt, können wir die Vollständigkeit der im Handbuch enthaltenen Informationen nicht garantieren. Falls Sie weitere Informationen benötigen sollten, wenden Sie sich bitte an die für Sie zuständige Geschäftsstelle von SMART EC.

Das Produkt wurde so entwickelt, dass es die Anforderungen für die von der Industrie geforderten Sicherheitsvorschriften erfüllt. Es darf nicht in sicherheitskritischen Komponenten, lebenserhaltenden Geräten oder in Flugzeugen verwendet werden.

Einbau, Wartung und Betrieb dürfen nur von durch SMART EC ausgebildetem oder im Bereich Elektronik oder Elektrotechnik qualifiziertem Personal durchgeführt werden. Die in diesem Handbuch enthaltenen Informationen dienen ausschließlich dazu, das Wissen von Fachpersonal zu ergänzen, können dieses jedoch nicht ersetzen.

Halten Sie sich von stromführenden Leitungen innerhalb des Produktes fern. Entfernen Sie auf keinen Fall Abdeckungen am Produkt. Nur werksseitig zugelassenes Wartungspersonal oder anderweitig qualifiziertes Wartungspersonal darf Abdeckungen entfernen, um Komponenten zu ersetzen oder andere Anpassungen vorzunehmen.

Installieren Sie keine Ersatzteile oder führen Sie keine unerlaubten Veränderungen am Produkt durch, sonst verfällt die Garantie. Wenden Sie sich für Wartung oder Reparatur bitte an die für Sie zuständige Geschäftsstelle von SMART EC. So stellen Sie sicher, dass alle sicherheitsrelevanten Aspekte beachtet werden.

EMV

Das Produkt wurde getestet und erfüllt die für digitale Geräte der Klasse A gültigen Grenzwerte gemäß den FCC-Richtlinien Abschnitt 15 bzw. EN 55032 Klasse A.Diese Grenzwerte sollen einen angemessenen Schutz vor Störstrahlung beim Betrieb des Produktes in einer gewerblichen, geschäftlichen oder industriellen Umgebung gewährleisten.

Das Produkt leitet, strahlt und verwendet Hochfrequenzenergie und kann, wenn es nicht ordnungsgemäß installiert und in Übereinstimmung mit dieser Bediehnungsanweisung verwendet wird, schädliche Störungen des Funkverkehrs verursachen. Der Betrieb des Produkts in einem Wohnbereich verursacht wahrscheinlich schädliche Interferenzen. In diesem Fall muss der Benutzer die Störung auf seine Kosten beheben.

Änderungen oder Modifikationen, die nicht ausdrücklich von SMART EC genehmigt wurden, können einzuhaltene Normen oder Vorschriften verletzen. Board Produkte werden in einem repräsentativen System getestet, um die Einhaltung der oben genannten Anfordernungen zu gewährleisten. Um die Leistungsfähigkeit zu erhalten is eine ordungsgemäße Installation in einem konformen System erforderlich.

Um sicherzustellen, dass die entsprechenden Vorschriften für die Funkfrequenzen einghalten werden, verwenden Sie beim Anschließen von Peripheriegeräten nur abgeschirmte Kabel. Zur ordnungsgemäßen EMV-Abschirmung, ist das System nur mit installierten Frontblenden zu betreiben und alle freien Steckplätze sind abzudecken oder mit Steckkarten zu fuellen.

Erdung

Wenn das Produkt nicht richtig geerdet ist, kann es es durch elektrostatische Entladungen beschädigt werden.

Das System enthält EMI-Dichtungen sowohl am System als auch an den einzelnen Modulen. Stellen Sie sicher, dass alle Systemteile die EMV-Dichtung berühren.

Am System befinden sich auch ESD-Kontakte fuer ESD-Bändern. Stellen Sie sicher, dass jede Person, die mit dem System arbeitet, diese als ESD-Schutz benutzt.

Dies ist ein Klasse A Produkt, basierend auf dem Standard des „Voluntary Control Council for Interference" (VCCI) von der „Information Technology Interference". Wenn dieses Gerät in einem häuslichen Umfeld verwendet wird, können Funkstörungen auftreten. Wenn solche Probleme auftreten, muss der Benutzer möglicherweise Korrekturmaßnahmen ergreifen.

Das Produkt ist für den Einsatz in Netzwerken mit gemeinsamem Potentialausgleich oder mit isoliertem Potentialausgleich geeignet.

Systeminstallation

Beschädigung des Systems

Bevor Sie das System installieren, überprüfen Sie, ob die im Handbuch beschriebenen Anforderungen erfüllt werden. Beachten Sie folgende allgemeinen Sicherheitshinweise vor der Installation und Verkabelung des Systems:

- Eingeschraenkter Zugangsbereich: Beabsichtigt für die Installation an einem abgegrenzten Ort mit Zugang nur von geschultem Personal.

- Austauschbarer Netzkabelsatz: Der austauschbare Netzkabelsatz ist nicht im Lieferumfang enthalten. Der austauschbare Netzkabelsatz muss ein zugelassenes Modell sein und von der Behoerde dieses Landes, wo dieses Geraet installiert ist, zugelassen sein.
- Installationsvorschrift: Wo anwendbar, muss diese Einheit in Uebereinstimmung mit der National Electrical Code (NEC) installiert werden.
- Überstrom-Schutzeinrichtung: Eine leicht zugängliche Trennvorrichtung muss in der Gebäudeverkabelung eingebaut sein. Einen angemessenen Wert für den Leitungsquerschnitt können Sie der NEC (National Electrical Code) Tabelle 310.16 oder anderen nationalen Regelwerken entnehmen.
- Der Erdungsleiter ist abhängig von der Spannungsverteilungstopologie innerhalb Ihrer Anlage. Stellen Sie sicher, dass Sie einen angemessenen Erdungsleiter gemäß der Auslegung des Zugangsleitungsschutzes verwenden.
- Bauen Sie das System sicher ein. Stellen Sie sicher, dass Kabel und Leitungen nicht im Weg sind.
- Stellen Sie sicher, dass der Systemaufbau anwenderfreundlich ist.

Beschädigung des Systems

Die Gebäude-internen Schnittstellen ("intra-building ports" per GR-1089-CORE) der Geräte oder Baugruppen sind nur für gebäudeinterne Verkabelung vorgesehen. Die Schnittstellen sind als Typ 2 oder Typ 4 definiert (wie in GR-1089-Core beschrieben) und erfordern eine Isolation zu Leitungen außerhalb des Gebäudes. Die Gebäude-internen Schnittstellen dürfen keine elektrisch leitende Verbindung zu Leitungen außerhalb des Gebäudes haben. Ein "Primary Protector" (wie in GR-1089-CORE beschrieben) ist keine ausreichende Absicherung, um die Gebäude-internen Schnittstellen mit Leitungen außerhalb des Gebäudes zu verbinden.

Beschädigung des Systems

Alle mit diesem Gerät verbundenen Geräte (oder hinzugefügte Unterbaugruppen) sollen sich innerhalb desselben Gebäudes befinden. Wenn dieses Gerät (einschließlich eventuell hinzugefügter Unterbaugruppen) für die Verbindung zwischen Gebäuden verwendet wird, muss die Verbindung angemessen gegen Überspannung geschützt sein. Und eine weitere Ueberpruefung der elektrischen Sicherheit wäre notwendig.

Beschädigung des Systems

Verschmutzungen können das System beschädigen.

Betreiben Sie das System an einem erschütterungsfreien Ort, an dem weder Staub, Rauch noch elektrostatische Entladungen auftreten.

Stellen Sie sicher, dass die Temperatur die Betriebstemperatur nicht überschreitet, die in den Umgebungsbedingungen in diesem Handbuch angegeben ist, und lassen Sie einen ausreichenden Luftstrom zum Kühlen..

Verletzungsgefahr und Beschädigung des Systems

Ein kopflastiger Schaltschrank kann umkippen, wodurch die Einrichtung beschädigt und das Personal verletzt werden kann.

Bauen Sie das System deshalb ganz unten im Schrank ein, wenn es das einzige System im Schrank ist. Wenn mehrere Systeme in einen Schrank eingebaut werden sollen, platzieren Sie das schwerste System ganz unten und die leichteren weiter oben. Falls der Schaltschrank mit Kippsicherungen ausgestattet ist, stellen Sie sicher, dass diese auch installiert und ausgefahren sind, um einen sicheren Stand des Schranks zu gewährleisten. Beginnen Sie erst danach mit dem Einbau oder der Wartung des Systems.

Verletzungsgefahr oder Beschädigung des Systems

Seien Sie vorsichtig, wenn Sie das System aus dem Rack ziehen, da es herunterfallen und Verletzungen verursachen kann.

Verletzungsgefahr

Das System ist schwer, und eine unangemessene Handhabung kann zu Zerrungen oder Rückenschäden führen.

Beschädigung des Systems

Während des Transportes und Zusammenbaus des Systems können sich Teile, wie zum Beispiel Schrauben, Stecker oder Lüfter, lösen oder beschädigt werden.

Nehmen Sie das System nicht in Betrieb, wenn Teile beschädigt sind. Dies könnte zu Beschädigungen an anderen Teilen führen.

Verletzungsgefahr

Hoher Ableitstrom kann gefährlich sein und Verletzungen verursachen.

Stellen Sie vor Anschluss des Systems an den Versorgungsstromkreis unbedingt eine Erdungsverbindung her.

Beschädigung des Systems

Falsche Jumper-Einstellungen können dazu führen, dass das System nicht mehr funktioniert. Ändern Sie deshalb nie die Einstellungen der Jumper.

Karten Installation

Beschaedigung von Schaltkreise

Elektrostatische Entladungen und falsche Installation und Entfernung des Produkts können die Schaltkreise beschädigen oder ihre Lebensdauer verkürzen.

Bevor Sie Karten berühren, vergewissern Sie sich, dass Sie in einem ESD-geschützten Bereich arbeiten. Fassen Sie Karten nur an der Seite an und berühren Sie keine elektronischen Schaltkreise.

Beschädigung der Produkt

Wird ein PCIe-Karte in den falschen Steckplatz im System gesteckt, können sowohl die Karte als auch das System beschädigt werden. Installieren Sie die PCI Express (PCIe) Karten deshalb ausschließlich in dafür vorgesehene Steckplätze.

Das Installieren oder Entfernen der Karte aus dem System während des Systemstarts kann die Karte und das System beschädigen.

Wenn Sie die Karte aus dem System installieren oder entfernen, schalten Sie das System zuerst aus.

Datenverlust

Das MaxCore™ System bietet keine Unterstützung für das Wechseln von PCIe Karten in laufendem Betrieb. Stellen Sie sicher, daß die Stromversorgung der PCIe Steckplätze abgeschalten ist, bevor sie das System öffnen und PCIe Karten entfernt bzw. hinzugefügt werden.

Trennen Sie das System von AC- oder DC-Strom oder schalten Sie die Systemplatine (Nutzlast) mithilfe des Board Management Controllers (BMC) aus.

Weitere Informationen finden Sie im *MC1600 Extreme Edge Server Installation and Use* Handbuch.

Fehlfunktion

Unsachgemaesses Ein- und Ausbau von Karten kann zu einer Fehlfunktion der PCIe Steckplaetze führen. Stellen Sie sicher, dass PCIe-Karten richtig eingesetzt sind.

Systembetrieb

Überhitzung des Systems – Lüftungsschlitze

Unzureichende Lüftung kann Schäden an [Karten/Board] und am System verursachen und den Verlust der Garantie zur Folge haben.

Um eine ausreichende Lüftung zu gewährleisten, stellen Sie sicher, dass das System während des Betriebs stets waagerecht steht. Halten Sie die Lüftungsschlitze an der Vorder- und Rückseite des Systems frei. Halten Sie die Frischluftzufuhröffnung an der Vorderseite des Systems völlig frei und stellen Sie sicher, dass sich die Frischluft nicht mit der Abluft von anderen Systemen vermischt.

Beschädigung des Systems

Durch hohe Luftfeuchtigkeit und Kondensation können Kurzschlüsse entstehen.

Betreiben Sie das System nicht außerhalb der angegebenen Umgebungsbedingungen. Stellen Sie sicher, dass das System vollständig trocken ist und sich keine Feuchtigkeit auf der Oberfläche befindet, bevor Sie die Stromversorgung einschalten. Starten Sie das System nicht unter 0 ° C, es sei denn, es handelt sich um ein Modell mit erweiterter Temperatur.

Stromschlaggefahr

Achtung: Das System kann mehrere Netzteile besitzen. Alle Stromanschlüsse müssen vom System entfernt werden, um das System spannungsfrei zu schalten. Um das Risiko von Verletzungen zu verringern, trennen Sie die Stromzufuhr, bevor Sie das System ausschalten.

Beschädigung des Systems – Luftfilter

Verunreinigungen in der Luft können den Luftfilter verschmutzen und so die Luftzufuhr des Systems beeinträchtigen. Das kann zur Überhitzung des Systems und zu Schäden an Systemteilen führen.

Um einen reibungslosen Luftstrom durch das System zu gewährleisten, sollten Sie die Luftfilter (wenn vorhanden) spätestens alle sechs Monate austauschen. Artesyn empfiehlt, die Filter alle 90 Tage auszutauschen.

Die Installationen variieren in Bezug auf die physische Lage und Sauberkeit. In staubiger Umgebung kann es häufiger erforderlich sein, den Filter auszutauschen. Überprüfen Sie die Luftfilter nach der Installation des Systems regelmäßig, um festzustellen, wie oft sie ausgetauscht werden müssen. Erstellen Sie einen regelmäßigen Austauschzeitplan und führen Sie ein Protokoll, um das Datum jedes Filterwechsels aufzuzeichnen.

Filterrahmen

Die Frontblende einschließlich des Luftfilters (falls vorhanden) wird durch Ausrichtungsstifte und Halteklammern an beiden Seiten des Systems am System befestigt. Richten Sie die Frontblende bei der Montage am Regal genau aus, um eine Beschädigung des Rahmens oder der Frontblende zu vermeiden.

Earth Ground

Dieses Gerät ermöglicht den Anschluss des Schutzleiters des Gleichstromversorgungskreises an den Schutzleiter am Gerät. Wenn diese Verbindung hergestellt wird, müssen alle folgenden Bedingungen erfüllt sein:

- Dieses Gerät muss direkt an den Erdungselektrodenleiter des Gleichstromversorgungssystems oder an eine Potenzialausgleichsleitung von einer Erdungsklemme oder einem Bus angeschlossen werden, an die der Erdungselektrodenleiter des Gleichstromnetzes angeschlossen ist.
- Dieses Gerät muss sich in der gleichen unmittelbaren Umgebung befinden (z. B. benachbarte Schränke) wie jedes andere Gerät, das eine Verbindung zwischen dem geerdeten Leiter desselben Gleichstromversorgungskreises und dem Erdungsleiter hat, sowie der Erdungspunkt des Gleichstroms System. Das Gleichstromsystem darf nicht anderswo geerdet werden.
- Die Gleichstromversorgungsquelle muss sich in denselben Räumlichkeiten wie dieses Gerät befinden.
- Stellen Sie sicher, dass Sie eine Erdungsverbindung haben, die frei von Trennvorrichtungen wie einem Netzschalter oder einer Sicherung zwischen der Gleichstromquelle und dem Erdungsanschluss ist. Eine Trennvorrichtung kann zur Unterbrechung der Erdung und zu Verletzungen durch Stromschlag führen.

Überhitzung des Systems

Wenn Sie die Lüftergeschwindigkeit manuell durch den Verwaltungskontroller einstellen, dann überwachen Sie bitte regelmäßig die Temperaturen des Systems, um eine Überhitzung zu vermeiden.

Stellen Sie sicher, dass die Umgebungs- und Leistungsanforderungen während des Betriebs des Systems erfüllt werden.

Verletzungen oder Kurzschlüsse

Um Schäden oder Verletzungen zu vermeiden, überprüfen Sie vor der Wartung am System immer, dass keine gefährliche Spannung vorhanden ist.

Datenschaden

Wenn die Stromversorgung des Geräts während eines Firmware-Updates des Flash Memory des Geräts unterbrochen wird, werden die Änderungen nicht gespeichert oder der Flash Memory kann beschädigt werden. In diesem Fall bleibt das Produkt wahrscheinlich in einem nicht betriebsbereiten Zustand und muss von qualifizierten Reparaturdiensten überholt werden.

Systemerweiterung

Systemüberlastung

Überprüfen Sie den Gesamtstromverbrauch aller installierten Komponenten, um eine Überlastung des Systems zu vermeiden. Stellen Sie sicher, dass der einzelne Ausgangsstrom einer Quelle innerhalb der zulässigen Grenzen bleibt (siehe technische Daten der jeweiligen Quelle oder Komponente).

Verlust der Sicherheitszulassung – Verwendung zusätzlicher Module

Das System wird möglicherweise durch Hinzufügen von Steckkarten nicht mehr kompatibel. Der Systemintegrator muss die Einhaltung der gültigen Normen sicherstellen..

Stromzufuhr

Verletzungsgefahr

Das Berühren der Stromzufuhr mit metallischen Gegenständen an Ihren Händen, Handgelenken oder an Ihrem Nacken kann zu schweren Verletzungen durch Stromschlag und Verbrennungen führen, wenn Sie an den Stromzufuhr- oder Stromkabel arbeiten. Seien Sie äußerst vorsichtig, wenn Sie elektrisch leitfähige Werkzeuge in der Nähe der Netzteile verwenden.

Kurzschluss und Gefahr durch Stromschlag

Stellen Sie sicher, dass die Stromversorgungen, die Sie entfernen oder anschließen möchten, ausgeschaltet sind und während der Arbeit nicht eingeschaltet werden können.

Stellen Sie sicher, dass alle Stromversorgungsleitungen zum Gehaeuse nicht unter Spannung stehen. Seien Sie vorsichtig mit den verwendeten Werkzeugen, um einen Kurzschluss zu vermeiden.

Beschädigung des Systems

Unsachgemäße Verkabelung beschädigt Ihr Produkt. Achten Sie beim Anschließen des Netzkabels besonders darauf, die Polarität nicht umzukehren.

Fans

Beschädigung des Systems

Unzureichende Kühlung kann das System beschädigen.

Nehmen Sie deshalb den Austausch ohne Verzögerung vor.

Lüfter Ersatz

Wenn ein Lüfter außer Betrieb ist oder während einer Austauschprozedur aus dem System entfernt wird, veranlasst der System-Manager die übrigen Lüfter dazu, mit höherer Geschwindigkeit zu drehen.

Wenn Lüfter über einen längeren Zeitraum mit hoher Geschwindigkeit laufen, kann das ihre Lebenszeit verkürzen und die zulässigen Lärmgrenzwerte übersteigen.

Tauschen Sie den Lueftereinschub (oder das Lüftermodul) ohne Verzögerung aus.

Verletzungsgefahr – Rotierende Lüfterschaufeln

Sie können verletzt werden, wenn Sie Werkzeuge oder Finger in den laufende Lüfter einführen.

Berühren Sie die Lüfterschaufeln nicht, solange sie sich drehen.

Seien Sie vorsichtig nach dem Herausziehen des Lüfters, da die Zentrifugalkräfte noch wirken und somit die Handhabung erschweren können.

Verkabelung/Kabelführung

Verletzungsgefahr

Die Verkabelung sollte vorhandenen Kabelpfaden mit vorhandenen oder ähnlichen Kabelbefestigungen folgen. Ändern Sie niemals die Verkabelung des Systems, wie von SMART EC geliefert. Überprüfen Sie die ordnungsgemäße Funktion des Systems nach der Kabelverlängerung. Reduzieren Sie die Verletzungsgefahr, indem Sie Kabel so verlegen, dass niemand darüber stolpern kann.

Verletzungsgefahr durch Stromschlag

Durch das Berühren von Kontakten und Kabeln während des Betriebs können Sie einen elektrischen Schlag bekommen.

Um einen elektrischen Schlag zu vermeiden, stellen Sie sicher, dass Kontakte und Kabel des Systems während des Betriebs nicht berührt werden können. Falls Sie Fragen bezüglich der Verkabelung haben, wenden Sie sich an die für Sie zuständige Geschäftsstelle von SMART EC.

Beschädigung der Kabel

Kabel nicht falten. Durch das Falten eines Glasfaserkabels wird das Kabel beschädigt und die Datenübertragung wird verhindert.

RJ-45 Stecker

Beschädigung des Systems

Bei den RJ-45 Steckern, die sich Systems oder auf den PCIe-Karten befinden, handelt es sich entweder um Twisted-Pair-Ethernet (TPE) oder um E1/T1/J1-Stecker. Beachten Sie, dass ein versehentliches Anschließen einer E1/T1/J1 Leitung an einen TPE-Stecker Ihr System zerstören kann.

- Kennzeichnen Sie deshalb TPE-Anschlüsse in der Nähe Ihres Arbeitsplatzes deutlich als Netzwerkanschlüsse.
- Stellen Sie sicher, dass die Länge eines Ethernet Kabels, das mit Ihrem System verbundenen ist, 100 m oder 328 feet nicht überschreitet.
- Stellen Sie sicher, dass der TPE-Anschluss des Systems nur mit einem Sicherheits-Kleinspannungs- Stromkreis (SELV - Safety Extra Low Voltage) verbunden werden.
- Bei Fragen wenden Sie sich an Ihren Systemverwalter.

Weitere Informationen finden Sie in der Dokumentation des jeweiligen Produkt.

Laser

Verletzungsgefahr

Wenn ein Etikett mit der Aufschrift CLASS 1 LASER PRODUCT auf Ihrem System angebracht ist, ist das Gerät mit einem Lasergerät ausgestattet. Diese Geräte enthalten ein Lasersystem, das sichtbare oder unsichtbare Laserstrahlung (oder beides) erzeugt und für die Augen schädlich sein kann.

Suchen Sie zusätzliche Informationen (Leistung, Wellenlänge, Sichtbarkeit, Impulsdauer, anwendbare Normen), bevor Sie Geräte warten. Blicken Sie niemals mit einem optischen Gerät auf das Lasergeräte.

Batterie

Beschädigung des Blades

Unsachgemäßer Einbau der Batterie kann gefährliche Explosionen und Beschädigungen des Blades zur Folge haben.

Verwenden Sie deshalb nur den Batterietyp, der auch bereits eingesetzt wurde und befolgen Sie die Installationsanleitung.

Datenverlust

Wenn Sie einen anderen Batterietyp installieren als den, der bei Lieferung des Produkts montiert wurde, kann dies zu Datenverlust führen.

Beschädigung des PCBs und der Batteriehalterung

Benutzen Sie keinesfalls einen Schraubenzieher, um die Batterie aus der Halterung zu nehmen. Wenn Sie die Batterie mit einem Schraubenzieher ausbauen, können das PCB und die Batteriehalterung beschädigt werden.

Umweltschutz

Umweltschäden

Unsachgemäße Entsorgung von gebrauchten Produkten kann die Umwelt schädigen.

Entsorgen Sie gebrauchte Produkte stets gemäß der in Ihrem Land gültigen Gesetzgebung und den Empfehlungen des Herstellers.

System Overview

1.1 Introduction

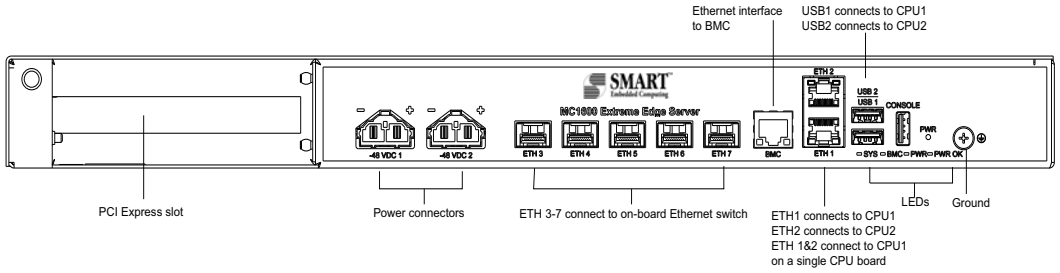
TheMC1600 Extreme Edge Server is a 1U server system and is referred to in this document as the Extreme Edge Server. The Extreme Edge Server base board is a single or dual processor design featuring the Intel® Broadwell-DE CPU with DDR4 memory, M.2 storage devices, and a managed 10Gb Ethernet switch for high-speed internal and external connectivity. The Extreme Edge Server accommodates a single standard PCI Express (PCIe) card that connects to CPU1 or a custom PCIe card with connections to both CPUs for application-specific hardware acceleration. A Baseboard Management Controller (BMC) is present for hardware management and monitoring.

NOTE: For the single CPU design, CPU2 is depopulated.

The Extreme Edge Server is available as an extended temperature product to allow for a broad range of environments and applications.

1.2 Front Panel Interfaces

Figure 1-1 Front Panel Connectors, PCIe Slot, LEDs, and Ground Point



The next figure and table describes the LED location, functions and status.

Figure 1-2 Front Panel LEDs

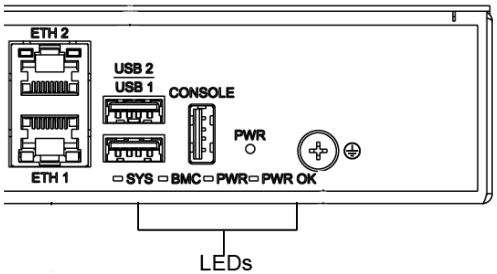
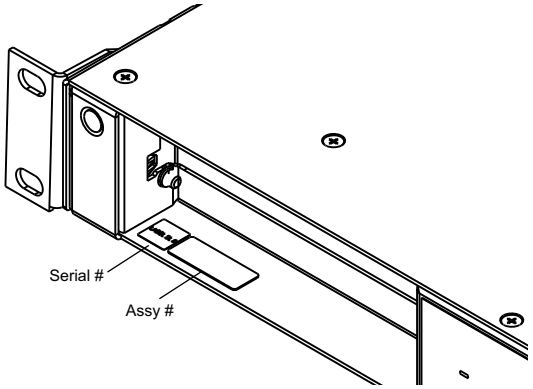


Table 1-1 Front Panel LED Description

LED	LED Color	Status
SYS	Red/Yellow	Customer use (controlled by register 0x11 in Glue CPLD)
BMC	Red/Green	Off: BMC not yet actively controlling LED Red, blinking: BMC is up and initializing Red, solid: Payload power is off Red/Green, solid: Payload power is on, but not all CPUs are in S0 state Red/Green, blinking: CPU2 is in S0 state, but not CPU1 (only for dual-CPU variants) Green, blinking: CPU1 is in S0 state, but not CPU2 (only for dual-CPU variants) Green, solid: Payload power is on, all CPUs are in S0 state
PWR	Green	-48V input power is present
PWR OK	Green	All payload power rails are active and good

See the next figure for the location of the serial and assembly labels for this system.

Figure 1-3 Location of Serial and Assembly # Labels



1.3 Cooling

The Extreme Edge Server has seven identical fans on the inlet (right) side of the system. The BMC monitors all fan tachometer readings, when fans are powered on, and at what speed the fans run.

The BMC sets the fan speed based on sensor data within the system. For more information see *Section 5.2.2.1.4, Aggregated Temperature Sensors on page 116*.

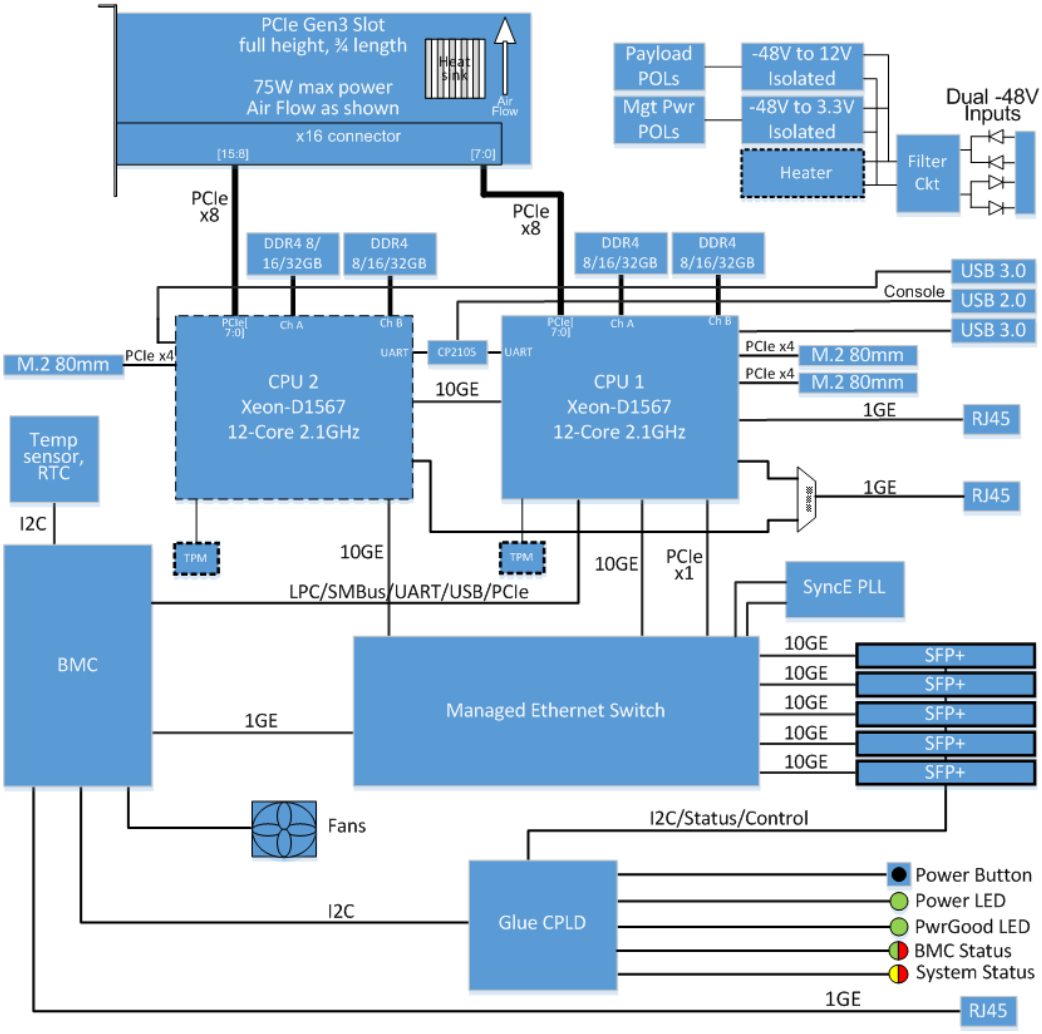
1.4 Grounding

The Extreme Edge Server has a common logic ground as signal reference for the base board, DIMMs, M.2 modules, heater control circuits, and PCIe card. Chassis ground uses the chassis metal and front panel connector shields. Within the system, logic ground and chassis ground are connected at a single point to ensure a common potential while avoiding the possibility of ground loops. The -48V RTN is isolated from logic ground and chassis ground in the system.

1.5 Block Diagram

This following block diagram shows the major functions and interfaces of the MC1600 Extreme Edge Server.

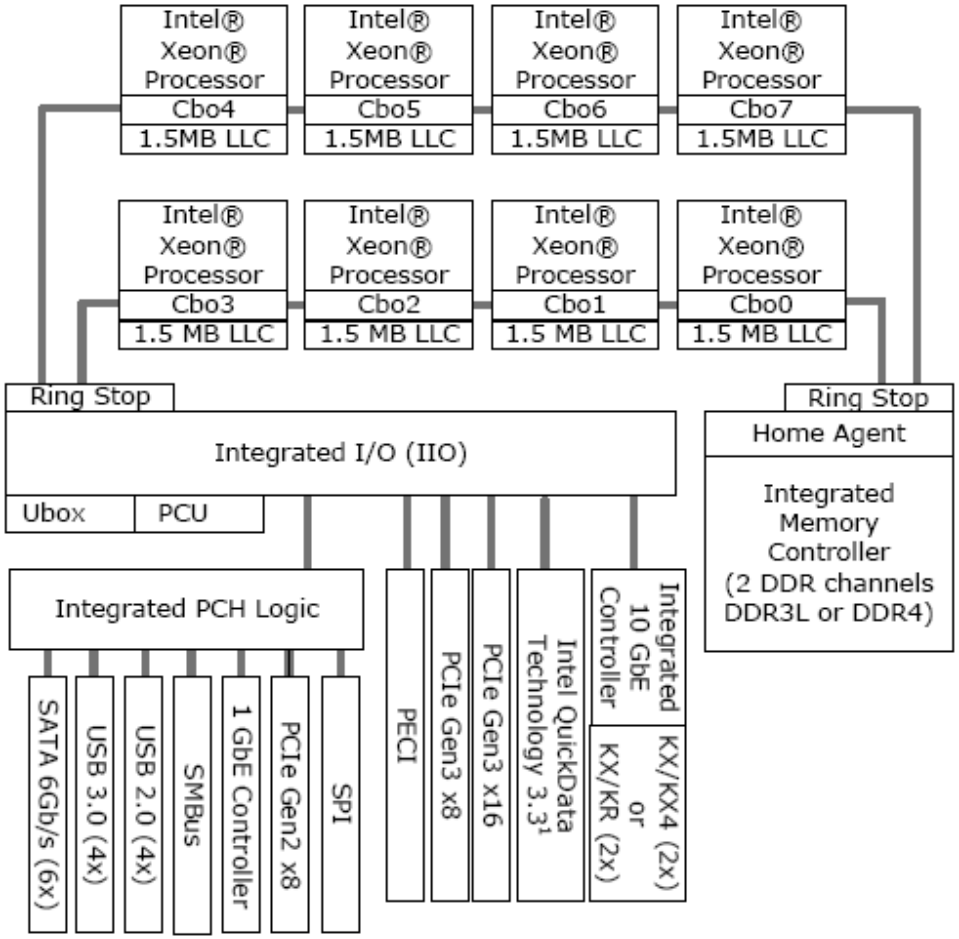
Figure 1-4 MC1600 Extreme Edge Server - Dual CPU Block Diagram



1.6 Extreme Edge Server Base Board

Up to two Broadwell-DE processors are provided on the Extreme Edge Server base board. The Broadwell-DE is a System on Chip (SoC) product manufactured in a BGA package and integrates up to 16 cores, a memory controller, I/O block, and PCH logic. The following figure is a high level block diagram of the Broadwell-DE SoC.

Figure 1-5 High Level Broadwell-DE Block Diagram



The base board includes two nearly identical Broadwell-DE processor blocks. Note that the features listed in the following chapters apply to both processors unless otherwise noted. The minor differences between the two processors blocks are highlighted using keyword **CPU1** for the first processor and **CPU2** for the second processor.

1.6.1 CPU SKU Support

Many different CPU SKUs are available, having various core counts, core frequencies, cache sizes, and performance levels. On the Extreme Edge Server, the following SKU has been qualified in the initial product release.

Table 1-2 CPU SKU Support

CPU Type	Cores	Frequency	Cache	DDR4 Speed	TDP	SMART EC Part #
Xeon D-1567	12	2.1GHz	18MB	DDR4-2133	65W	5106814F44

1.6.2 Memory Controller

The Broadwell-DE processor offers an Integrated Memory Controller (IMC) that has a two-channel memory interface operating in the Independent Channel Mode. Each channel consists of 64 data and 8 ECC bits, plus address, control, and management signals.

On the Extreme Edge Server, a DDR4 memory interface is supported. DDR mode is determined by the DDR3_4_STRAP pin strapping. Signal DDR3_4_STRAP is pulled high to select DDR4 mode.

Dual memory channels are supported with one DIMM per channel at up to 2166 MT/s. Single and dual rank DIMMs are supported. Supported DRAM device densities are 4Gb and 8Gb. Signaling voltage for the DDR4 interface is 1.2V.

The extended temperature-capable DIMMs are required for extended temperature MC1600 Extreme Edge Server SKUs.

Possible DIMM types are shown in *Table 1-3*, they can be ECC or non-ECC modules. The type qualified for the initial product release is highlighted in green. These are x72 (ECC-capable) modules.

Table 1-3 ECC/Non-ECC DIMM Types

DIMM Type	Ranks	8Gb Chips	Qualified Module	SMART EC Part #
RDIMM	1 Rank x8	8GB	X4B08QD8BNTDME-E-AY1 (C-temp) X4B08QD8BNTDMW-E-AY1 (I-temp)	9706802B79 9706802B80
RDIMM	1 Rank x4	16GB		
RDIMM	2 Rank x8	16GB		
RDIMM	2 Rank x4	32GB		

1.6.2.1 Real Time Clock

A real-time clock circuit is implemented for each CPU. This circuit is backed up by an on-board coin cell battery. The CPUs synchronize their system time to the BMC.

1.6.2.2 Trusted Platform Module (TPM)

A TPM 1.2 compliant implementation is used on the Extreme Edge Server.

The TPM is connected to the LPC interface of the processor. The SERIRQ output of the device is connected to the SERIRQ input of the processor.

1.7 Interfaces

1.7.1 PCI Express Interfaces

Each CPU has one x8 PCIe Gen3 interface to the x16 PCIe connector on the base board.

CPU1 has two x4 PCIe Gen3 interfaces to M.2 NVMe sockets on the base board. CPU1 also has an x1 PCIe Gen2 interface to the integrated Ethernet switch, one PCIe lane used to connect to an Ethernet MAC/PHY, and an additional PCIe lane that connects to the BMC.

CPU2 has one x4 PCIe Gen3 interface to a single M.2 NVMe socket.

There is a second Ethernet MAC/PHY device that can connect to CPU1 or CPU2 via a single PCIe lane. These connections are described in more detail below.

1.7.1.1 PCI Express Gen3

The Integrated I/O (IIO) module of Broadwell-DE processor provides 24 lanes of PCIe Gen 3 interface [3], comprising two ports. The first port (PE1) is a x16 PCIe that can be bifurcated to two x8, two x4 and one x8, or four x4 root ports each, and the second port (PE2) is a x8 PCIe that can be bifurcated to two x4 root ports. Refer to *Figure 1-5*, *High Level Broadwell-DE Block Diagram on page 53*.

All PCIe Gen3 interfaces can operate as a standard PCIe root port. The processor supports Gen1 (2.5Gb/s), Gen2 (5Gb/s) and Gen3 (8Gb/s) PCIe speeds. These speeds are supported on all the lanes. Port bifurcation, degraded mode, lane reversal, and polarity inversion is supported for all PCIe ports.

On the Extreme Edge Server, the x16 port (PE1) of each CPU is bifurcated into two x8 ports, of which only the first one is used. Connections to the PCIe connector are according following table.

Table 1-4 PCI Express Gen3 Interfaces to PCIe Connector

CPU	IIO Port	IIO Port Lanes	Bifurcated Port	Bifurcated Port Lanes	Destination (PCIe Connector Signals)
CPU1	PE1	<7:0>	1	<7:0>	PETp/PETn<7:0> and PERp/PERn <7:0>
CPU2	PE1	<7:0>	1	<7:0>	PETp/PETn<15:8> and PERp/PERn <15:8>

On the Extreme Edge Server, the x8 port (PE2) of each CPU is bifurcated into two x4 ports. These ports connect to the M.2 NVMe modules according to the following table.

Table 1-5 PCI Express Gen3 Interfaces to M.2 Modules

CPU	IIO Port	IIO Port Lanes	Bifurcated Port	Bifurcated Port Lanes	Destination
CPU1	PE2	<3:0>	1	<3:0>	M.2 (Primary)
CPU1	PE2	<7:4>	2	<3:0>	M.2 (Secondary)
CPU2	PE2	<3:0>	1	<3:0>	M.2

1.7.1.2 PCI Express Gen2

The Integrated PCH Logic additionally implements eight lanes of PCIe Gen2 that can be split into eight root ports. The ports support Gen1 (2.5Gb/s) and Gen2 (5Gb/s) speeds. Lanes 1-4 and lanes 5-8 can independently be configured as four x1, two x2, one x2 and two x1, or one x4 port(s).

On the Extreme Edge Server, lanes 1-4 of CPU1 and CPU2 are configured as four x1 ports. These ports are connected according to the following table. Default routing of the second MAC/PHY is to CPU2 on dual-CPU variants, and to CPU1 on single-CPU variants.

Table 1-6 PCI Express Gen2 (PCH) Interfaces

CPU	PCH PCIe Port Group	Port (Lane)	Destination	Link Speed
CPU1	Lanes 1-4	1	Ethernet Switch	5.0Gbps (Gen2)
CPU1	Lanes 1-4	2	Ethernet MAC/PHY A	2.5Gbps (Gen1)
CPU1	Lanes 1-4	3	Ethernet MAC/PHY B (option)	2.5Gbps (Gen1)
CPU2	Lanes 1-4	3	Ethernet MAC/PHY B (default)	2.5Gbps (Gen1)
CPU1	Lanes 1-4	4	BMC	2.5Gbps (Gen1)

1.7.2 Ethernet Interface

Each CPU has one 10Gb Ethernet interface to the Ethernet switch. The CPUs also have one 10Gb Ethernet interface directly between them. In addition, CPU1 has one 1Gb Ethernet interface to a front panel RJ-45 connector. There is a second front panel RJ-45 port that can come from CPU1 or CPU2 as a build option. These are described in more detail below.

1.7.2.1 Gigabit Ethernet Controller

The integrated Gigabit Ethernet controller is not used on CPU1 or CPU2.

1.7.2.2 PCIe-Based Gigabit Ethernet

One Ethernet MAC/PHY is connected to CPU1 via PCIe and provides a front panel 10/100/1000Base-T port, denoted ETH1 on the front panel. The second Ethernet MAC/PHY is connected to CPU1 or CPU2 via PCIe and also goes to a front panel 10/100/1000Base-T port, denoted ETH2 on the front panel. By default, this port comes from CPU2 on dual-CPU variants and from CPU1 on single-CPU variants.

1.7.2.3 10 Gigabit Ethernet Controller

Broadwell-DE contains a dual port 10Gb Ethernet controller with two independent 10Gb Ethernet MACs each having PHY device interfaces for KX4 or KR mode. The controller supports 10Gb, 2.5Gb and 1Gb operations on its network data interface.

- Port 0 of the integrated 10Gb Ethernet controller is connected to the Ethernet switch. It uses the integrated KR PHY and is configured for 10GBASE-KR mode (10Gbps, 1 lane).
- Port 1 of the integrated 10Gb Ethernet controller is connected between the Broadwell-DE processors. It uses the integrated KR PHY and is configured for 10GBASE-KR mode (10Gbps, 1 lane).

A single external SPI flash for Ethernet configuration is connected to each CPU.

1.7.3 SPI Interface

The Broadwell-DE processor includes a Serial Peripheral Interface (SPI) consisting of clock (CLK), master data out (MOSI), master data in (MISO) and an active low chip select (CS_L).

Broadwell-DE supports up to two SPI flash devices using two separate chip select pins. The SPI device is 16MB and operates at 50MHz. A SPI flash device with a valid descriptor must be attached to chip select 0 as the BIOS boot device.

On the Extreme Edge Server, there is a second on-board BIOS SPI flash device. This device is used to store a *golden* BIOS image for recovery in the event the primary BIOS image is corrupted.

1.7.4 USB Interface

Broadwell-DE contains one eXtensible Host Controller Interface (xHCI) controller and one Enhanced Host Controller Interface (EHCI) controller.

1.7.4.1 USB 3.0 Ports (xHCI)

For each CPU, port 1 from the xHCI controller is routed to a USB 3.0 Type A connector on the front panel of the server.

1.7.4.2 USB 2.0 Ports (EHCI)

The EHCI controller supports up to four USB 2.0 high-speed root ports. USB 2.0 allows data transfers up to 480Mb/s.

For each CPU, port 1 from the EHCI controller is routed to the front panel USB Type A connector. Port 1 implements a USB 2.0 based debug port that provides support for debugger software to interact with the CPU.

For CPU1 only, port 2 of the EHCI controller is routed to the BMC. For CPU2, this port is unused. The other ports of the EHCI controller are unused.

1.7.5 UART Interface

A dual UART controller is integrated in the Broadwell-DE processor.

Serial console COM0 of each CPU is connected to a USB to Dual UART bridge device, Silicon Labs CP2105F01-GM (5106811D61). The CP2105 includes a USB 2.0 full speed function controller, USB transceiver, oscillator, one-time programmable ROM, and two asynchronous serial data ports (UARTs) with full modem control signals. Because there are two UART ports on the CP2105, one device can be shared between both CPUs. The UART interfaces are connected to the processors and the USB port of CP2105 is connected to a Type A USB connector on the front panel for access to the consoles of both CPUs through a single USB connector.

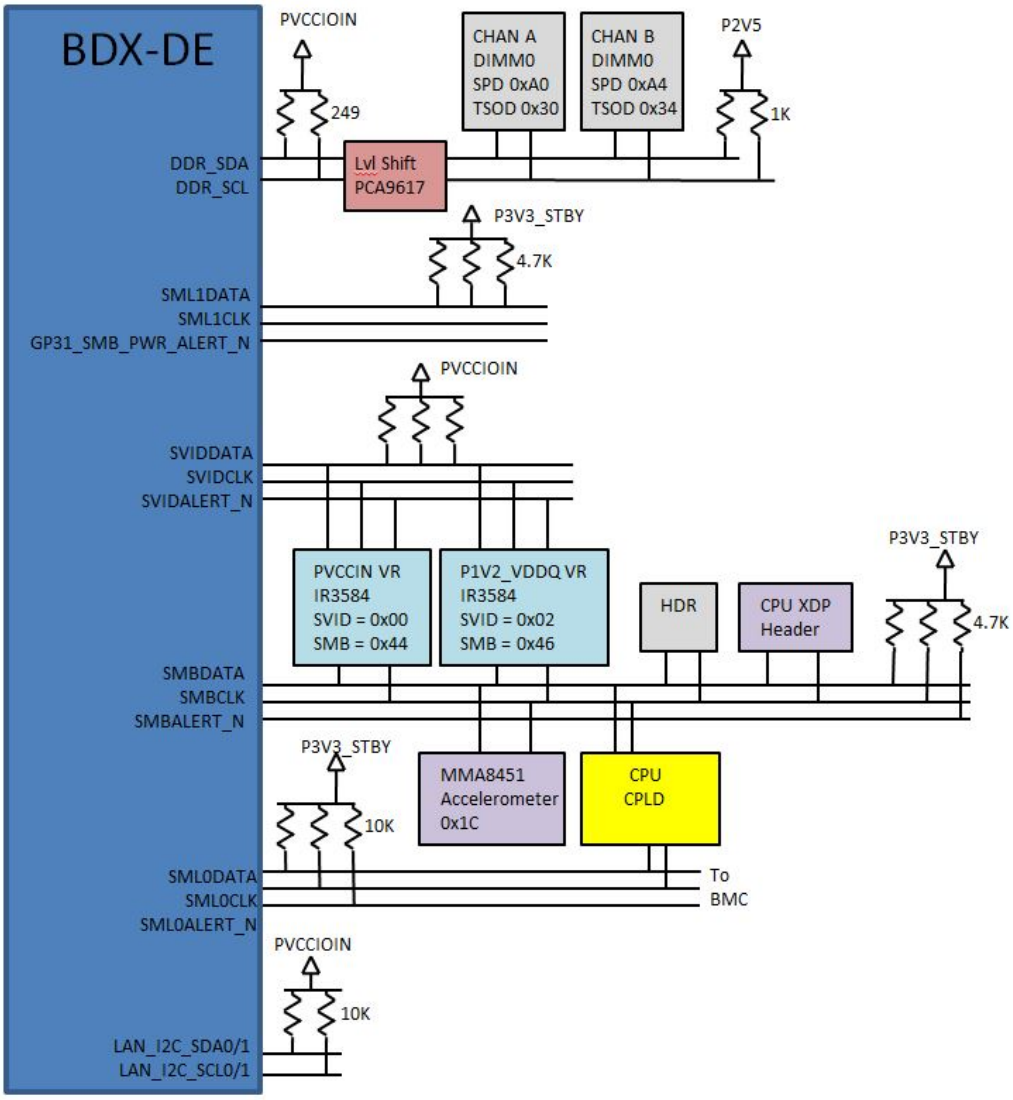
The computer used to display the console information must have the CP2105 software driver installed. Drivers for Linux or Windows are available at the Silicon Labs web site, *www.silabs.com*. The CP2105 device is powered from the host cable so that the terminal session is not lost when system power is cycled.

Serial port COM1 of each CPU is routed to the BMC through the Glue CPLD.

1.7.6 SMBus and I²C Interface

The Broadwell-DE integrates a SMBus 2.0 controller that provides an interface to manage peripherals such as the Serial Presence Detection (SPD) on the RAM, thermal sensors, PCI cards, etc. There are four SMBus ports on the SoC. The slave interface allows an external microcontroller to access system resources. The diagram below shows the SMBus architecture of each CPU.

Figure 1-6 CPU SMBus Architecture



The Host SMBus interface (SMBCLK, SMBDATA) is connected to the XDP connector and to the point of load power controllers for VCCIN and VDDQ (IR3584 devices). It also connects to a local accelerometer that can be used for debug of vibration related issues (CPU1 SMBus only).

The SM Link 0 interface (SML0CLK, SML0DATA) from CPU1 is routed to the BMC. This interface is used to read thermal sensors in the CPU and on the DIMM modules. The BMC also uses this interface for communication with the CPU CPLD to control the card and read status registers.

The SM Link 1 interface (SML1CLK, SML1DATA) of each CPU is not used.

The DDR I^2C interface (DDR_SDA, DDR_SCL) is connected to the DIMM slots. The interface is used to read the SPD EEPROM and the integrated thermal sensor of the DIMM modules.

1.7.7 LPC Interface

The LPC interface of each CPU is connected to an optional TPM module.

The LPC interface of each processor is also connected to the CPU CPLD to allow Port80 post code forwarding and as a communication channel to the CPLD registers. The LPC interface of CPU1 is also routed to the Glue CPLD for access to the status and control registers of the SFP+ modules.

The LPC interface of CPU1 is also directly connected to the BMC LPC pins.

1.7.8 PECI Interface

The Platform Environment Control Interface (PECI) uses a single wire for self-clocking and data transfer. The bus requires no additional control lines. The interface design is optimized for interfacing to Intel processor (CPU) and chipset components (PCH) in both single processor and multiple processor environments.

The processor PECI client is designed to support processor and DRAM thermal management, platform manageability functions including thermal, power, and error monitoring, as well as processor interface tuning and diagnostics capabilities.

The PECI interface is connected between CPU and PCH, both integrated in the Broadwell-DE SoC.

1.8 10 Gigabit Ethernet

1.8.1 Ethernet Switch

The Extreme Edge Server includes an on-board Ethernet switch, which is a 10Gbps 8-port Ethernet switch for high-bandwidth internal and external communication. With high performance 10Gbps SerDes, advanced Layer 2 functionality, low power, and flexible I/O configuration, this switch is designed to reduce overall system costs. Features of the Ethernet switch include the following:

- 80Gbps switching capacity bandwidth
- Optional integrated ARM Cortex A9 CPU
- Integrated 10G SerDes with native support for KX, KR, SFI, XFI, XAUI, RXAUI, SGMII, QSGMII
- Priority-based Flow Control (PFC)
- Advanced single-stage Content Aware Engine for ACLs and QoS
- Time stamping support with IEEE 1588 1-step and 2-step Transparent Clock (TC) and Synchronized Ethernet (SyncE) as well as OAM (IEEE 802.1ag)
- IEEE 802.1q VLAN and VLAN translation
- Low-power Energy Efficient Ethernet (EEE) support
- Enterprise-class L2/L2+ scalability
- Integrated 2MB packet buffer
- Nonblocking architecture, line rate at all packet sizes
- Capable of being an unmanaged switch. For details contact your SMART EC sales representative

The following table shows the port connections on the Ethernet switch.

Table 1-7 Ethernet Switch Port Assignments

SerDes Quad	Lane	Protocol	Speed	Destination
TSC1	0	SFI	10Gbps	SFP+ Port 1 (ETH3)
TSC1	1	SFI	10Gbps	SFP+ Port 2 (ETH4)
TSC1	2	SFI	10Gbps	SFP+ Port 3 (ETH5)
TSC1	3	SFI	10Gbps	SFP+ Port 4 (ETH6)
TSC2	0	SFI	10Gbps	SFP+ Port 5 (ETH7)
TSC2	1	10G-KR	10Gbps	CPU1

Table 1-7 Ethernet Switch Port Assignments (continued)

SerDes Quad	Lane	Protocol	Speed	Destination
TSC2	2	SGMII	1Gbps	BMC
TSC2	3	10G-KR	10Gbps	CPU2

1.8.2 SFP+ Ports

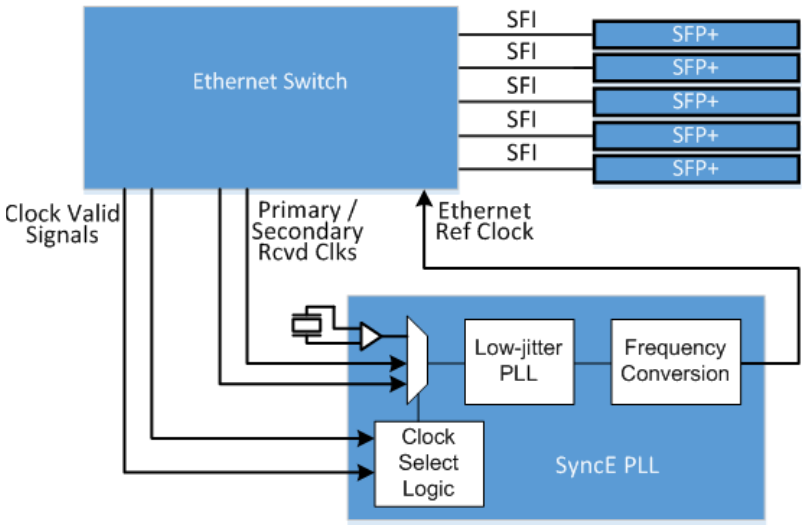
The Extreme Edge Server has five SFP+ ports on the front panel, each of which is directly connected to the Ethernet switch. The front panel cages can accept 10GBase-SR (short range) or 10GBase-LR (long range) SFP+ modules. Higher powered modules may require SFP+ modules with industrial temperature limits. These ports include Synchronous Ethernet support through the Ethernet switch. The I^2C bus from each SFP+ is connected to the Glue CPLD.

1.8.3 Synchronous Ethernet and IEEE 1588 Support

1.8.3.1 Synchronous Ethernet PLL

The Extreme Edge Server has a Synchronous Ethernet (SyncE) PLL device on board that allows a recovered clock from one SFP+ port to be used as the Ethernet timing reference for the Ethernet switch. This allows the other SFP+ ports to be synchronized to this timing reference. The diagram below shows the SyncE clocking architecture.

Figure 1-7 Synchronous Ethernet Clocking Architecture



The SyncE PLL has a free-running oscillator that can be used to generate a reference clock when no recovered clock is available. When it is desired to use a recovered clock, the ports used for primary and secondary clock recovery can be set up in the control registers of the Ethernet switch. The primary and secondary recovered clocks go to the input multiplexer of the SyncE PLL. The clock valid signals go to the input selection logic of the SyncE PLL chip. In addition, the SyncE PLL chip has internal monitoring circuits to evaluate the quality of the incoming clocks, and it can be set up for hitless, automatic switching between the primary and secondary recovered clocks. It also supports holdover mode in case the recovered clocks are temporarily lost.

The SyncE PLL can store up to four configurations (0-3). By default, configuration 0 is the only one programmed and is loaded at power-on. Other configurations (1 - 3) could be programmed into the device and selected via a register in the Glue CPLD. Upon the next payload reset, the selected configuration would be loaded. The Glue CPLD retains this selection as long as management power is present.

1.8.3.2 IEEE 1588 Support

The Ethernet switch has time-stamping capability with support for IEEE 1588 1-step and 2-step transparent clock. No external hardware is required.

1.9 PCIe Slot

The Extreme Edge Server base board has a x16 PCIe right-angle connector that can accommodate a standard or custom PCIe add-in card up to full height, 3/4 length. Additional physical height is available beyond 0.8" if a customer application needs additional heat sink height.

Connector lanes are routed as:

- Lane 7:0 to PCIe 3.0 port of CPU1
- Lanes 15:8 to PCIe 3.0 port of CPU2

Because of this routing, a standard PCIe add-in card with a single port can only connect to CPU1, with a maximum link width of x8.

A custom PCIe add-in card with multiple ports on the PCIe connector can connect to both CPUs. For example, a custom card may have x16 card edge, bifurcated into two x8 ports. In this case, it can connect to CPU1 and CPU2, each with a maximum link width of x8. Refer to *Figure 1-5*, *High Level Broadwell-DE Block Diagram on page 53*.

NOTE: Because the PCIe slot has only one reset signal, which is generated by CPU1, this custom routing has implications when a CPU is rebooted. If both CPUs have already established a link to the installed PCIe card and it is necessary to reboot one CPU, then both CPUs must be rebooted simultaneously to successfully re-establish PCIe links to both CPUs. If both are not rebooted simultaneously then one CPU may not re-establish a PCIe link.

The PCIe slot receives 12V (5.5A max) and 3.3V (3.0A max) power from the base board. The PCIe slot can accommodate a board with up to 75W power dissipation.

1.10 Storage

The Extreme Edge Server includes three sockets for M.2 NVMe modules to provide mass storage for the CPUs. Two of the M.2 modules are connected to CPU1 and one is connected to CPU2. In each case they are connected via a PCIe Gen3 x4 interface to the corresponding CPU. The sockets accept a 22mm x 80mm (2280) module with the M key. Industrial temperature modules are required for the extended-temperature versions of the Extreme Edge Server.

1.10.1 Supported NVMe Modules

The following types of M.2 NVMe modules are compatible with the Extreme Edge Server. Only 80mm M.2 drives are supported. The types qualified in the initial product release are highlighted in green

Table 1-8 M.2 NVMe Module Support

Capacity	Size	Interface	Memory Type	Qualified Module	SMART EC Part #
128GB	2280	PCIe Gen3 x4	MLC NAND Flash	AF128GSMJA-AY3 (C-temp) AF128GSMJA-AY2 (I-temp)	8806813A29 8806813A26
256GB	2280	PCIe Gen3 x4	MLC NAND Flash		
512GB	2280	PCIe Gen3 x4	MLC NAND Flash		
1024GB	2280	PCIe Gen3 x4	MLC NAND Flash		

1.11 Connectors

1.11.1 PCI Express Connector

The pinout of x16 PCI Express edge connector is as defined in the *PCI Express Card Electromechanical Specification Revision 3.0* with the exception that PCIe lanes [15:8] are defined as a second PCIe link, lanes [7:0] respectively. On the base board, these are routed to CPU2 as previously noted in this document.

Table 1-9 PCIe Slot Connector Pinout

Pin	Function	Pin	Function
A1	PRSNT1# - Card Presence Detect	B1	12V Power
A2	12V Power	B2	12V Power
A3	12V Power	B3	12V Power
A4	Ground	B4	Ground
A5	JTAG TCK - Input to Card	B5	SMCLK
A6	JTAG TDI - Input to Card	B6	SMDAT
A7	JTAG TDO - Output from Card	B7	Ground
A8	JTAG TMS - Input to Card	B8	3.3V Power
A9	3.3V Power	B9	JTAG TRST# - Input to Card
A10	3.3V Power	B10	3.3V Aux Power
A11	PERST# - Reset to Card	B11	NC
A12	Ground	B12	NC
A13	100MHz Refclk+	B13	Ground
A14	100MHz Refclk-	B14	PETp0 - Lane 0 from CPU1 to Card
A15	Ground	B15	PETn0 - Lane 0 from CPU1 to Card
A16	PERp0 - Lane 0 from Card to CPU1	B16	Ground
A17	PERn0 - Lane 0 from Card to CPU1	B17	PRSNT2# - Card Presence Detect
A18	Ground	B18	Ground
A19	NC	B19	PETp1 - Lane 1 from CPU1 to Card
A20	Ground	B20	PETn1 - Lane 1 from CPU1 to Card

Table 1-9 PCIe Slot Connector Pinout (continued)

Pin	Function	Pin	Function
A21	PERp1 - Lane 1 from Card to CPU1	B21	Ground
A22	PERn1 - Lane 1 from Card to CPU1	B22	Ground
A23	Ground	B23	PETp2 - Lane 2 from CPU1 to Card
A24	Ground	B24	PETn2 - Lane 2 from CPU1 to Card
A25	PERp2 - Lane 2 from Card to CPU1	B25	Ground
A26	PERn2 - Lane 2 from Card to CPU1	B26	Ground
A27	Ground	B27	PETp3 - Lane 3 from CPU1 to Card
A28	Ground	B28	PETn3 - Lane 3 from CPU1 to Card
A29	PERp3 - Lane 3 from Card to CPU1	B29	Ground
A30	PERn3 - Lane 3 from Card to CPU1	B30	NC
A31	Ground	B31	PRSNT2# - Card Presence Detect
A32	NC	B32	Ground
A33	NC	B33	PETp4 - Lane 4 from CPU1 to Card
A34	Ground	B34	PETn4 - Lane 4 from CPU1 to Card
A35	PERp4 - Lane 4 from Card to CPU1	B35	Ground
A36	PERn4 - Lane 4 from Card to CPU1	B36	Ground
A37	Ground	B37	PETp5 - Lane 5 from CPU1 to Card
A38	Ground	B38	PETn5 - Lane 5 from CPU1 to Card
A39	PERp5 - Lane 5 from Card to CPU1	B39	Ground
A40	PERn5 - Lane 5 from Card to CPU1	B40	Ground
A41	Ground	B41	PETp6 - Lane 6 from CPU1 to Card
A42	Ground	B42	PETn6 - Lane 6 from CPU1 to Card
A43	PERp6 - Lane 6 from Card to CPU1	B43	Ground
A44	PERn6 - Lane 6 from Card to CPU1	B44	Ground
A45	Ground	B45	PETp7 - Lane 7 from CPU1 to Card
A46	Ground	B46	PETn7 - Lane 7 from CPU1 to Card

Table 1-9 PCIe Slot Connector Pinout (continued)

Pin	Function	Pin	Function
A47	PERp7 - Lane 7 from Card to CPU1	B47	Ground
A48	PERn7 - Lane 7 from Card to CPU1	B48	PRSNT2# - Card Presence Detect
A49	Ground	B49	Ground
A50	NC	B50	PETp8 - Lane 0 from CPU2 to Card
A51	Ground	B51	PETn8 - Lane 0 from CPU2 to Card
A52	PERp8 - Lane 0 from Card to CPU2	B52	Ground
A53	PERn8 - Lane 0 from Card to CPU2	B53	Ground
A54	Ground	B54	PETp9 - Lane 1 from CPU2 to Card
A55	Ground	B55	PETn9 - Lane 1 from CPU2 to Card
A56	PERp9 - Lane 1 from Card to CPU2	B56	Ground
A57	PERn9 - Lane 1 from Card to CPU2	B57	Ground
A58	Ground	B58	PETp10 - Lane 2 from CPU2 to Card
A59	Ground	B59	PETn10 - Lane 2 from CPU2 to Card
A60	PERp10 - Lane 2 from Card to CPU2	B60	Ground
A61	PERn10 - Lane 2 from Card to CPU2	B61	Ground
A62	Ground	B62	PETp11 - Lane 3 from CPU2 to Card
A63	Ground	B63	PETn11 - Lane 3 from CPU2 to Card
A64	PERp11 - Lane 3 from Card to CPU2	B64	Ground
A65	PERn11 - Lane 3 from Card to CPU2	B65	Ground
A66	Ground	B66	PETp12 - Lane 4 from CPU2 to Card
A67	Ground	B67	PETn12 - Lane 4 from CPU2 to Card
A68	PERp12 - Lane 4 from Card to CPU2	B68	Ground
A69	PERn12 - Lane 4 from Card to CPU2	B69	Ground
A70	Ground	B70	PETp13 - Lane 5 from CPU2 to Card
A71	Ground	B71	PETn13 - Lane 5 from CPU2 to Card
A72	PERp13 - Lane 5 from Card to CPU2	B72	Ground

Table 1-9 PCIe Slot Connector Pinout (continued)

Pin	Function	Pin	Function
A73	PERn13 - Lane 5 from Card to CPU2	B73	Ground
A74	Ground	B74	PETp14 - Lane 6 from CPU2 to Card
A75	Ground	B75	PETn14 - Lane 6 from CPU2 to Card
A76	PERp14 - Lane 6 from Card to CPU2	B76	Ground
A77	PERn14 - Lane 6 from Card to CPU2	B77	Ground
A78	Ground	B78	PETp15 - Lane 7 from CPU2 to Card
A79	Ground	B79	PETn15 - Lane 7 from CPU2 to Card
A80	PERp15 - Lane 7 from Card to CPU2	B80	Ground
A81	PERn15 - Lane 7 from Card to CPU2	B81	PRSNT2# - Card Presence Detect
A82	Ground	B82	NC

1.11.2 -48V Power Connector

The input power connector is Molex 42820-2213 (2806858A05). The pinout of each power connector is as shown.

Table 1-10 Input Power Connector Pinout

Pin	Function
1	-48V RTN (+ input)
2	-48V (- input)

1.11.3 SFP+ Module Connectors

Table 1-11 SFP+ Connector Pinout

Pin	Function	Pin	Function
1	GND	11	GND
2	TX_FAULT	12	RX-
3	TX_DISABLE	13	RX+
4	SDA	14	GND
5	SCL	15	+3.3V
6	MOD_ABS	16	+3.3V
7	RS0	17	GND
8	RX_LOS	18	TX+
9	RS1	19	TX-
10	GND	20	GND

1.11.4 RJ-45 Ethernet Connectors

Table 1-12 Ethernet RJ-45 Connector Pinout

Pin	Function - 10Base-T or 100Base-Tx	Function - 1000Base-T
1	ETH_TX+	ETH_DA+
2	ETH_TX-	ETH_DA-
3	ETH_RX+	ETH_DB+
4		ETH_DC+
5		ETH_DC-
6	ETH_RX-	ETH_DB-
7		ETH_DD+
8		ETH_DD-

1.11.5 USB 2.0 Connector

Table 1-13 USB 2.0 Connector Pinout

Pin	Function
1	VBUS
2	D-
3	D+
4	GND

1.11.6 USB 3.0 Connectors

Table 1-14 USB 3.0 Connector Pinout

Pin	Function
1	VBUS
2	D-
3	D+
4	GND
5	SS_RX-
6	SS_RX+
7	GND
8	SS_TX-
9	SS_TX+

1.11.7 DDR4 DIMM Connectors

Table 1-15 DDR4 DIMM Pinout

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	nc	73	VDDQ	145	nc	217	VDDQ
2	GND	74	CK0	146	VREF	218	CK1
3	DQ4	75	CK0#	147	GND	219	CK1#
4	GND	76	VDDQ	148	DQ5	220	VDDQ

Table 1-15 DDR4 DIMM Pinout (continued)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
5	DQ0	77	VTT	149	GND	221	VTT
6	GND	78	EVENT#	150	DQ1	222	PAR
7	DQS9	79	MA0	151	GND	223	VDDQ
8	DQS9#	80	VDDQ	152	DQS0#	224	BA1
9	GND	81	BA0	153	DQS0	225	MA10
10	DQ6	82	MA16	154	GND	226	VDDQ
11	GND	83	VDDQ	155	DQ7	227	nc
12	DQ2	84	CS0#	156	GND	228	MA14
13	GND	85	VDDQ	157	DQ3	229	VDDQ
14	DQ12	86	MA15	158	GND	230	nc
15	GND	87	ODT0	159	DQ13	231	VDDQ
16	DQ8	88	VDDQ	160	GND	232	MA13
17	GND	89	CS1#	161	DQ9	233	VDDQ
18	DQS10	90	VDDQ	162	GND	234	nc
19	DQS10#	91	ODT1	163	DQS1#	235	nc
20	GND	92	VDDQ	164	DQS1	236	VDDQ
21	DQ14	93	nc	165	GND	237	nc
22	GND	94	GND	166	DQ15	238	SA2
23	DQ10	95	DQ36	167	GND	239	GND
24	GND	96	GND	168	DQ11	240	DQ37
25	DQ20	97	DQ32	169	GND	241	GND
26	GND	98	GND	170	DQ21	242	DQ33
27	DQ16	99	DQS13	171	GND	243	GND
28	GND	100	DQS13#	172	DQ17	244	DQS4#
29	DQS11	101	GND	173	GND	245	DQS4
30	DQS11#	102	DQ38	174	DQS2#	246	GND

Table 1-15 DDR4 DIMM Pinout (continued)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
31	GND	103	GND	175	DQS2	247	DQ39
32	DQ22	104	DQ34	176	GND	248	GND
33	GND	105	GND	177	DQ23	249	DQ35
34	DQ18	106	DQ44	178	GND	250	GND
35	GND	107	GND	179	DQ19	251	DQ45
36	DQ28	108	DQ40	180	GND	252	GND
37	GND	109	GND	181	DQ29	253	DQ41
38	DQ24	110	DQS14	182	GND	254	GND
39	GND	111	DQS14#	183	DQ25	255	DQS5#
40	DQS12	112	GND	184	GND	256	DQS5
41	DQS12#	113	DQ46	185	DQS3#	257	GND
42	GND	114	GND	186	DQS3	258	DQ47
43	DQ30	115	DQ42	187	GND	259	GND
44	GND	116	GND	188	DQ31	260	DQ43
45	DQ26	117	DQ52	189	GND	261	GND
46	GND	118	GND	190	DQ27	262	DQ53
47	ECC4	119	DQ48	191	GND	263	GND
48	GND	120	GND	192	ECC5	264	DQ49
49	ECC0	121	DQS15	193	GND	265	GND
50	GND	122	DQS15#	194	ECC1	266	DQS6#
51	DQS17	123	GND	195	GND	267	DQS6
52	DQS17#	124	DQ54	196	DQS8#	268	GND
53	GND	125	GND	197	DQS8	269	DQ55
54	ECC6	126	DQ50	198	GND	270	GND
55	GND	127	GND	199	ECC7	271	DQ51
56	ECC2	128	DQ60	200	GND	272	GND

Table 1-15 DDR4 DIMM Pinout (continued)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
57	GND	129	GND	201	ECC3	273	DQ61
58	RESET#	130	DQ56	202	GND	274	GND
59	VDDQ	131	GND	203	CKE1	275	DQ57
60	CKE0	132	DQS16	204	VDDQ	276	GND
61	VDDQ	133	DQS16#	205	nc	277	DQS7#
62	ACT#	134	GND	206	VDDQ	278	DQS7
63	BG0	135	DQ62	207	BG1	279	GND
64	VDDQ	136	GND	208	ALERT#	280	DQ63
65	MA12	137	DQ58	209	VDDQ	281	GND
66	MA9	138	GND	210	MA11	282	DQ59
67	VDDQ	139	SA0	211	MA7	283	GND
68	MA8	140	SA1	212	VDDQ	284	VDDSPD
69	MA6	141	SCL	213	MA5	285	SDA
70	VDDQ	142	VPP	214	MA4	286	VPP
71	MA3	143	VPP	215	VDDQ	287	VPP
72	MA1	144	nc	216	MA2	288	VPP

1.11.8 NVMe Module Connectors

Table 1-16 NVMe Module Pinout

Pin	Function	Pin	Function
1	GND	2	+3.3V
3	GND	4	+3.3V
5	PERn3 - Output from Module	6	nc
7	PERp3 - Output from Module	8	nc
9	GND	10	Activity LED
11	PETn3 - Input to Module	12	+3.3V
13	PETp3 - Input to Module	14	+3.3V
15	GND	16	+3.3V
17	PERn2 - Output from Module	18	+3.3V
19	PERp2 - Output from Module	20	nc
21	GND	22	nc
23	PETn2 - Input to Module	24	nc
25	PETp2 - Input to Module	26	nc
27	GND	28	nc
29	PERn1 - Output from Module	30	nc
31	PERp1 - Output from Module	32	nc
33	GND	34	nc
35	PETn1 - Input to Module	36	nc
37	PETp1 - Input to Module	38	nc
39	GND	40	SMB_CLK
41	PERn0 - Output from Module	42	SMB_DATA
43	PERp0 - Output from Module	44	ALERT#
45	GND	46	nc
47	PETn0 - Input to Module	48	nc
49	PETp0 - Input to Module	50	PERST#

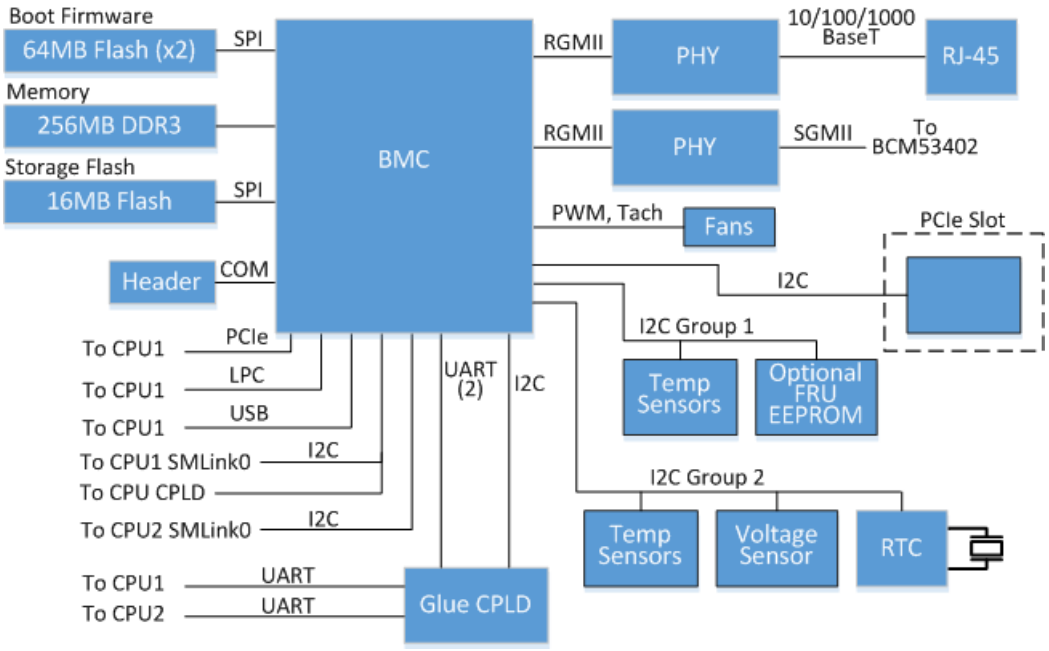
Table 1-16 NVMe Module Pinout (continued)

Pin	Function	Pin	Function
51	GND	52	nc
53	100MHz Refclk-	54	nc
55	100MHz Refclk+	56	nc
57	GND	58	nc
59	Key	60	Key
61	Key	62	Key
63	Key	64	Key
65	Key	66	Key
67	nc	68	Susclk
69	nc	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	GND		

1.12 Baseboard Management Controller (BMC)

The Extreme Edge Server includes a Baseboard Management Controller (BMC) to perform system management functions. The device used as the BMC is a highly-integrated SoC management processor. A block diagram of the BMC subsystem is shown next.

Figure 1-8 BMC Block Diagram



1.12.1 BMC Subsystem Devices

- BMC Core
  - 457-ball FPBGA package, 23mm x23mm2, 0.8mm ball pitch
- Memory/Flash/EEPROM
  - Memory: 256MB, DDR3
  - Flash: Dual 64MB, main socket and backup device soldered
  - Storage flash: 16MB
- Ethernet PHY
  - RGMII to SGMII conversion going to Ethernet switch
  - RGMII to 10/100/1000Base-T going to front panel RJ-45

- RTC: I^2C RTC w/128Byte EEPROM, 64Bytes SRAM, UID
- Reset Generator

1.12.2 BMC Subsystem Features

- Platform Power Management
  - Enable/disable -48V to 12V payload power brick (via Glue CPLD)
  - Power up/down or reset individual CPUs (via CPU CPLD)
- FRU Management
  - Provides platform FRU information
- External Connectivity
  - 10/100/1000BaseT connectivity (RJ-45) for management access
- Platform Control and Status
  - PERST_N control for PCIe slot
  - Power button signal
  - Power LED (signifies -48V is present)
  - PwrGood LED (signifies payload power present and good)
  - BMC Status LED
- Private I^2C Buses
  - 6x temperature sensors
  - 2x voltage sensors
  - Real time clock
- Additional GPIO
  - Fan control: 3x PWM out, 7x tachometer in with noise filter
  - Analog voltage sensing for critical voltages
- BMC Debug Options
  - 8x debug LED (green), 1x heartbeat LED (red)
  - 4x debug switch (DIP switch type)
  - Console output via 3-pin header, R-232
- PCIe
  - PCIe GEN1 x1 link (endpoint) to CPU1 (root)

1.12.3 BMC Private I²C Buses

The two private I²C buses of the BMC, which are directly connected to the BMC, include discrete temperature sensors, voltage sensors, an RTC, and an optional FRU EEPROM. There are also routing resistors on the board that allow connection of these buses to the Glue CPLD as a BOM option. The I²C addresses of the devices are shown in the following tables.

Table 1-17 BMC I²C Bus 8 Devices

7-bit Addr	8-bit Addr	Description
0x49	0x92	Temperature sensor
0x4A	0x94	Temperature sensor
0x4B	0x96	Temperature sensor
0x4C	0x98	Temperature sensor
0x50	0xA0	Optional FRU EEPROM (BOM option)

Table 1-18 BMC I²C Bus 7 Devices

7-bit Addr	8-bit Addr	Description
0x48	0x90	Voltage sensor for CPU1
0x4A	0x94	Voltage sensor for CPU2
0x4D	0x9A	Temperature sensor
0x4E	0x9C	Temperature sensor
0x57	0xAE	EEPROM
0x6F	0xDE	RTC EEPROM

1.13 Programmable Logic

Two Programmable Logic Device (CPLD) are provided for various functions such as power up control, CPU interface multiplexing, SMBus routing, and additional glue logic functions needed on the card.

1.13.1 CPU CPLD

The CPU CPLD on the Extreme Edge Server runs off payload power and is associated with the two CPU complexes. It implements these major functions:

- Enable all on-board DC-DC converter for CPU complexes
- Implementation of power-up timing sequence requirements
- Supervision of power rails for CPU complex
- I^2C slave interface connected the BMC
  - Power control of both CPUs
  - Power fail registers for both CPUs
  - Control and status registers for each CPU
  - Error status registers for each CPU
- LPC target interface for each CPU
  - Port 0x80 for each CPU, select CPU via SMBus register
  - SERIRQ for KCS interrupt support
  - Control and status registers
  - Can be used to update configuration of the logic device

1.13.2 Glue CPLD

The Glue CPLD on the Extreme Edge Server runs off management power and is associated with the BMC and is powered anytime -48V power is present. It implements these major functions:

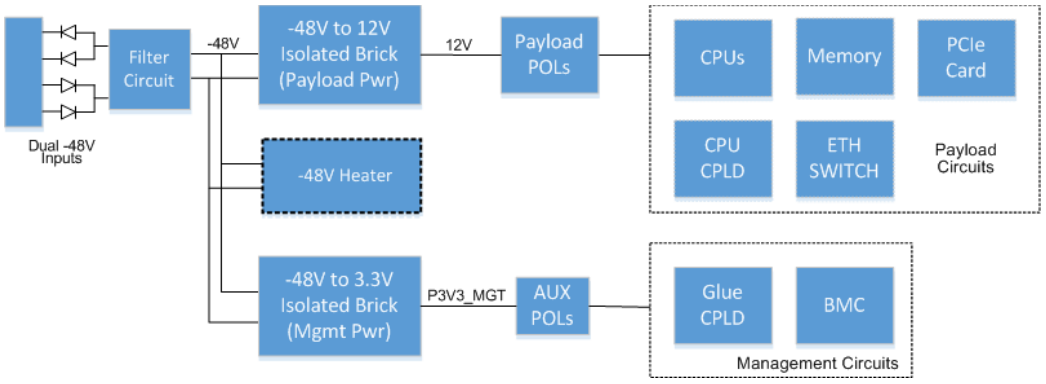
- Monitor output of low-temperature thermal switch
- Enable BMC power under appropriate operating conditions
- Implement power-up timing sequence requirements for non-CPU power rails
- Supervision of non-CPU power rails
- Enable on-board clocks when payload power is stable
- I^2C slave interface connected the BMC
- Update configuration of the logic device via I^2C interface
- Reset control
- BMC serial routing, routes 1 UART from each CPU to BMC
- Control debug LEDs via registers
- Watchdog timer
- LPC slave interface connected to CPU1
- Implement status and control registers for SFP+ modules

1.14 Power Supply

1.14.1 Power Architecture

The figure below illustrates the high-level power architecture of the Extreme Edge Server. When -48V power is applied the management power brick is enabled, which generates 3.3V to run the management circuits. At low temperatures, the heater is enabled. Once the BMC has booted it waits for the power button to be pressed, after which it enables the payload power POL converters and kicks off the CPU boot process. There is also an auto-power-on mode where the BMC does not wait for the power button, but automatically powers up the payload instead.

Figure 1-9 Power Architecture



1.14.2 Payload Power-Up Sequence

When the power button is pressed, the 12V power rail is enabled and the 3.3V and 5V standby power supplies automatically start up. The ME Engine and the CPU CPLD are powered at this point.

The next step of the power-up sequence is initiated via a message from the BMC to the CPU CPLD. This requires a connection between the BMC and the CPU CPLD/ME via SMBus. The CPU CPLD implements registers for power up control. When a message to power one of the CPUs is sent by the BMC via SMBus to these power control registers, the CPU power-up sequence is initiated. The power-up sequence continues until the S0 state is reached.

The processors on the card can be powered up/down independently. This requires a dual power-up state machine design in the CPU CPLD.

1.14.3 -48V Power Domain

The Extreme Edge Server accepts dual (redundant) -48V power inputs with a normal operating range of -40V to -57V. This voltage range is considered Safety Extra Low Voltage (SELV). The inputs are ORed together so that the system can run off either one. In addition, there is an input filter to reduce conducted emissions.

Two isolated power bricks convert the -48V power to the logic domain. One is a 600W quarter-brick that converts -48V to 12V as an intermediate bus voltage for the payload Point of Load (POL) converters. The other is a 10W module that converts -48V to 3.3V as management power for the BMC and Glue CPLD.

1.14.3.1 Heater Circuit

The Extreme Edge Server includes an optional heater circuit that can extend the operating temperature range of the product down to -40°C. The heater control circuit is autonomous. The Extreme Edge Server is required to be installed inside a closed, weather protected location. For installation sites outside of a building, a sealed cabinet is recommended. For cold weather start-up, wind conditions may overwhelm the server's designed-in heating elements. In locations where cold airflow is present, the customer may be required to provide additional heating to the cabinet.

The heater control circuit continuously monitors the heat sink temperature to make sure it is within the operating temperature range. If it ever approaches the lower operating temperature limit, the heater turns on again to keep sensitive devices within their operating temperature range.

1.15 Clock Structure

1.15.1 Processor Clocks

The Broadwell-DE SoC implements Full Integrated Clocking mode as the platform clock architecture. In the Full Integrated Clocking mode, a 25MHz crystal oscillator provides the input clock to the SoC which then internally generates the output clocks that are required by all the platform components.

1.15.2 Other Clocks

The 156MHz clock for the Ethernet switch is provided by the SyncE PLL as described previously in this document.

1.16 Reset Structure

The platform supports two types of reset, namely cold reset and warm reset. Cold reset is the first time when the platform asserts PWRGOOD_CPU and asserts RESET_CPU_N to the core. Warm reset is typically a platform wide event and is indicated by assertion and deassertion of the RESET_CPU_N signal on the socket while PWRGOOD_CPU remains asserted.

1.17 Debugging Support

1.17.1 POST Code Indicators

The Broadwell-DE processor provides its BIOS POST codes via the LPC interface, which are then decoded by the CPU CPLD. A POST code indicator is provided using discrete LEDs placed on the PCB.

1.17.2 Dip Switches

The board includes several DIP switches for factory use. All DIP switches should stay in their OFF positions (default).

1.18 Ordering and Support Information

The data sheet for the MC1600 Extreme Edge Server contain a complete list of available product variants and accessories. Refer to the *Appendix A, Related Documentation* or consult your local SMART Embedded Computing sales representative for the availability of other variants.

For technical assistance, documentation, or to report product damage or shortages, contact your local SMART EC sales representative or visit *https://www.smartembedded.com/ec/support/*.

Site Preparation

2.1 Introduction

This chapter provides information on unpacking the MC1600 Extreme Edge Server, safety precautions, and requirements for the product. Included are the environmental and power requirements, mounting options, cooling considerations, acoustic noise control, and dimensions and weight of the product.

2.2 Unpacking the Extreme Edge Server

Make sure you receive all items of your shipment:

- One MC1600 Extreme Edge Server with PCIe filler plate
- One Extreme Edge Server connector kit: two DC connectors and four crimp terminals

1. Carefully inspect the server and all shipped components.
2. Request an RMA for product return at *https://www.smartembedded.com/ec/support/* if any damage or discrepancies are observed with the items.
3. Tighten loose screws before proceeding.
4. Remove the desiccant bags delivered together with the system and dispose according to your country's legislation.

When installing or servicing the system or accessories, strictly observe the safety precautions noted in this document. Otherwise, personal injury or property damage may occur. Ignoring these instructions can void the system warranty.

Attach an ESD-preventive wrist strap before operating the product. Both terminals of the wrist strap must contact well. One terminal touches bare skin and the terminal with the alligator clip attaches to the grounding lug at I/O panel of the system.

2.3 Prepare the Installation Site

This section provides the basic site planning and installation requirements.

- 440W power should be available for the MC1600 system
- System should be positioned so that a power source is easy to reach
- Sufficient space should be available in racks to install the system

- Suitable equipment should be available to lift the system into the rack
- Enough space should be available to run a system console terminal
- Cable should be long enough to reach the system
- Make sure the inlet and outlet of the Extreme Edge Server is not blocked
- System should be installed in a restricted access location
- System should have access by trained personnel only

Make sure that all defined environmental and power requirements are met. Refer to *Electromechanical on page 86* and *Environmental on page 86*.

2.3.1 Power Requirements

Make sure that a suitable -40 to -57VDC power source is within reach of the system. Two independent power feeds can be connected to the system.

Table 2-1 System Power Requirements

Feature	Value
Voltage and input current	**Voltage:** -40 to -57VDC (SELV) **Current:** 1x11A maximum
Chassis idle power	170W
Chassis maximum power	440W

When installing additional blades or modules, make sure that the power consumption of all installed modules does not exceed the system's maximum power dissipation.

2.3.2 Dimensions and Weight

The table below lists the dimensions and weight of the Extreme Edge Server with system components installed.

Table 2-2 Dimensions and Weight of System

Component	Dimensions W x H x D	Weight
Server including DIMMs, M.2 SSDs, mounting ears, and PCIe filler panel	1U (H) x 19” (W) x 12” (D) (44.5mm x 482.6mm x 304.8mm)	12.4 lbs (5.6 kg)

2.4 ESD Prevention

To minimize the damage to the product pay attention to the following points:

- Before touching the card or electronic components make sure that you are working in an ESD safe environment
- Attach an ESD-preventive wrist strap before operating the product. Both terminals of the wrist strap must contact well. One terminal touches bare skin and the terminal with the alligator clip attaches to the grounding lug at I/O panel of the system.
- Avoid moving as much as possible. Movement gathers static electricity around you
- Do not touch the solder point, pin, or bare circuit
- Do not leave the product in an area where others can operate it
- Install the product right after you take it out of the anti-static package. If you need to lay down the product, replace it into the anti-static package. Do not place the product on the shelf or cabinet.
- Monitor the temperature and humidity of the equipment room. Warm air decreases the humidity but increases the static electricity in the room.

2.5 Mounting Options

The Extreme Edge Server is designed for installation in an IP55/IP65 19" outdoor cabinet or a standard 19" rack and is compliant to an IP20 Ingress Protection Rating.

The Extreme Edge Server is required to be installed inside a closed, weather protected location. For installation sites outside of a building, a sealed cabinet is recommended. For cold weather start-up, wind conditions may overwhelm the server's designed-in heating elements. In locations where cold airflow is present and where the input voltage is below nominal, the customer may be required to provide additional heating to the cabinet.

When installing the system, you must allow for 50mm (2 inches) on each side of the server for proper airflow.

Personal or System Damage

Unstable system installation in a rack can cause the rack to tip over. If your system is the only one in the rack, make sure to mount the system in the lowest part of the rack. If other systems are installed in one rack, start with the heaviest component at the bottom.

If the rack is equipped with stabilizing devices, make sure that they are installed and extended so that the rack is secure. Then proceed to mount or service the system.

NOTICE

During the course of handling, shipping, and assembly, the pins, shrouds and mounting screws, fans and other items can become loose or damaged.

Do not operate a damaged shelf, this can cause damage to installed devices.

Grounding
To ensure the system is properly grounded, each of the system's parts must contact the EMI gasket. The system contains gaskets at the shelf and module level.

The shelf is also fitted with ESD contacts. Make sure the operator uses proper ESD protection.

2.6 Electromechanical

- Dual (redundant) -48V power input connections
- High-efficiency fans in N+1 configuration with temperature sensor-based tachometer control
- Mechanical dimensions: 1U (H) x 19” (W) x 12” (D) (44.5mm x 482.6mm x 304.8mm)

2.7 Environmental

2.7.1 Environmental Conditions

To ensure proper function, do not operate equipment outside of the specified operating environment.

Proper operation requires adherence to environmental conditions for deployed systems. This includes adherence to environmental conditions when SMART EC or third-party system components are integrated at an installation site. The Extreme Edge Server is designed to operate under the following environmental conditions.

Table 2-3 Environmental Conditions

Characteristic	Condition
Operating temperature	0°C to 65°C without optional heater -40°C to +65°C with heater* (at the air inlet)
Storage temperature	-40°C to +70°C

Table 2-3 Environmental Conditions (continued)

Characteristic	Condition
Humidity range	5% to 95% noncondensing
Operating Altitude	-60m to 1800m without temperature derating, up to 4000m with temperature derating of 1C per 300m above 1800m
Operating Vibration	GR-3108-CORE Class 2 vibration

The Extreme Edge Server is designed for installation in an IP55/IP65 19" outdoor cabinet and is compliant to an IP20 Ingress Protection Rating.

External air filtering may be needed if installed in a location other than an IP55/IP65 cabinet.

2.7.2 Electronic Waste Disposal

Alway dispose used blades, system components, and batteries according to your country's legislation and manufacturer's instructions.

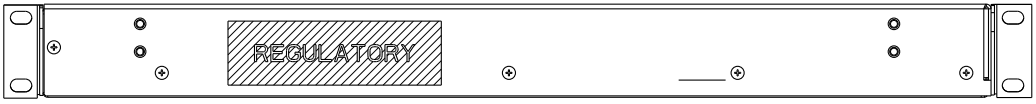
2.8 Regulatory Compliance

The Extreme Edge Server complies with the following standards:

Table 2-4 Regulatory Standards

Standard	Description
ULCSA 60950-1 EN 60950-1 IEC 60950-1 CB Scheme	Safety requirements
Directive (EU) 2015/863 (amending Annex II to Directive 2011/65/EU)	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
EN 55032 Class A (EU) EN 55024 (EU) FCC 47 CFR Part 15 Subpart B (US), Class A ETSI EN 300 386 Class A	EMC requirements
Telcordia GR-1089-CORE	Electromagnetic Compatibility and Electrical Safety-Generic Criteria for Network Telecommunications Equipment, Issue 6

Figure 2-1 Location of Regulatory Labels



FRU Installation

3.1 Introduction

This chapter describes the installation and removal of PCIe cards and details of the SFP/SFP+ modules.

3.2 Install PCIe Card

The system ships with a filler card or filler panel installed into the unpopulated PCIe slot. Remove the filler card or panel before installing PCIe card.

NOTE: The installation and removal procedures of PCIe cards depend on the type of the card. Refer to the documentation of the respective PCIe card for these procedures.

The Extreme Edge Server card has a x16 PCIe right-angle connector that can accommodate a standard or custom PCIe add-in card. There are two stand-offs available for optional, custom rear support for the PCIe card. The maximum physical size is full-height, 3/4 length.

Installation Procedure

1. Make sure that the system is powered down and disconnected from DC power before installing the card.
2. Make sure your are wearing an ESD wrist strap.
3. Remove the screws (on three sides) of the chassis top cover and remove the cover.
4. Unscrew the PCIe slot cover.
   Keep the screw and store the slot cover for later use.
5. Align the PCIe card with the PCIe connector and front panel opening.
6. Press the PCIe card into the connector until it is fully seated.
7. Secure the PCIe front panel with the screw removed in step *4*.

NOTES: SMART EC highly recommends securing the PCIe card to the two stand-offs located on the chassis at the rear of the card. Custom brackets may be required.

The PCIe slot receives 12V (5.5A max) and 3.3 V (3.0A max) power from the card. The PCIe slot can accommodate cards with up to 75W power dissipation.

The Extreme Edge Server is designed for side-to-side airflow. The PCIe card needs to be designed similarly. PCIe boards designed for the traditional airflow direction may cause overheating of the PCIe card or Extreme Edge Server.

3.3 SFP/SFP+ Modules

The five SFP+ ports on the front panel can accept SFP+ (10G) or SFP (1G) modules. Limited testing has been done with 10GBase-SR and 10GBase-LR optical modules as well as direct-attach copper cables. High powered optics may need to be rated to industrial temperatures. The following is a list of modules that have been verified to work in limited testing, but most other commercially available modules should work as well.

- Molex 74752-1051 (SFP+, direct attach copper, 0.5m)
- Molex 74752-2301 (SFP+, direct attach copper, 3m)
- Tyco 2032237-6 (SFP+, direct attach copper, 5m)
- Broadcom/Avago ABCU-5700RZ (SFP, 1000Base-T)
- Finisar FTLX1471D3BCL (SFP+, 10GBase-LR)
- Finisar FTLX1471D3BCV (SFP+, dual-rate 1G/10GBase-SR)
- Finisar FTLX8571D3BCL (SFP+, 10GBase-SR)

Refer to the documentation for your specific SFP+ module for installation instructions.

System Installation

4.1 Introduction

This chapter provides instructions for installing and removing the Extreme Edge Server in a rack or cabinet. It also provides information and procedures for grounding, powering up and down, and disconnecting the server from the power feed.

4.2 Before Installation

Refer to *Figure 1-1 on page 49* for location of LEDs, connectors and earth ground point.

Before you start the installation, make sure that you have all of the necessary equipment and tools available.

Usage	Equipment and Tools
General	Torque wrench ESD wrist strap
Server / Rack / Cabinet	Four bolts or screws 6mm / 0.24" diameter
Grounding	Ground cable 1.25 mm^2 for DC system
Power	DC power cable
System Access	USB Type-A to USB Type-A cable PC or laptop

Provide the following cables:

- Earth grounding cable with an M4 ring lug in case of rack installation
- Twisted pair Ethernet cable for connecting the BMC ETH
- Twisted pair Ethernet cable for the front panel ETH1 and ETH2 RJ-45 ports
- SFP+ or SFP modules or direct connect copper cables for the five SFP+ ports

The connectivity of the RJ-45 ports to CPU1 and/or CPU2 is covered in *Figure 1-1 on page 49* and *Section 1.7.2.2, PCIe-Based Gigabit Ethernet on page 57*.

4.3 Install the Extreme Edge Server in the Cabinet

For installation recommendations regarding outside installations, go to *Mounting Options on page 85*.

1. Insert the Extreme Edge Server in an IP55/IP65 19" outdoor cabinet or a standard 19" rack.

When installing the system, you must allow for 50mm (2 inches) on each side of the server for proper airflow.

2. Fasten the server to the rack via the integrated mounting flanges using two bolts or screws (minimum 6mm / 0.24 inch in diameter) on the left side and two on the right side of the server. Torque the 6mm bolts to 4.3 Nm (38 in-lbs.)

NOTES: There are also four M2.5 screw locations on the rear of the chassis for optional rear mounting support. SMART EC highly recommends the use of these locations with custom brackets for high vibration environments.

The Extreme Edge Server can also be placed on a table top.

4.3.1 Ground the Server

1. Connect the rack grounding cable to the M4 system ground threaded insert on the front right side of the server.
2. Torque the ground screw to a maximum of 1.2 Nm (10.6 in-lbs). Use a grounding cable of size 1.25 mm^2 for the DC system.
3. Connect the system permanently to the earth ground of the building.

4.3.2 Connect to the Power Feed

Make sure that a suitable -40 to -57VDC power source is within reach of the system. Two independent power feeds can be connected to the system.

1.Put on an ESD wrist strap and connect the strap to the server by attaching the front ESD jack/ESD snap (if you are not in an ESD safe environment).

2.Make sure the external power feeds that you plan to attach are powered off and cannot be switched on while you are working.

3. Connect the power connector to the DC power supply and insert the connector into the Extreme Edge Server.
4. Turn on the external feed power. The input power LED on the front panel turns green.

Product Damage

Improper cabling damages your product. Take extreme care not to connect the power cable in reverse polarity.

4.3.3 Connect the Serial Console

The USB port on the front of the labeled CONSOLE uses a USB-to-dual serial interface from Silicon Labs (CP2105). Connect a USB Type-A to USB Type-A cable with one end to the CONSOLE on the MC1600 and the other end to the display console.

For Windows 7 or later: Teraterm

Drivers are automatically installed when connecting the cable. If the drivers do not install automatically, they can be downloaded and installed from *https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers*

For Linux (any recent distribution): minicom

Serial USB driver cp210x should be available.

4.3.4 Access the Console (BIOS and OS)

The following table provides serial port configuration information.

Table 4-1 Serial Port Configuration Parameters

Parameter	Default Settings
Baud Rate	38400
Data Bits	8
Parity	No
Stop Bit	1
Flow Control	Off
Terminal Type	VT-100

The output from the system CPU can be viewed over serial console. The default kernel command line uses the following console options.

```
console=ttyS0,38400n8
```

NOTE: The following stty settings are recommended for the client serial device when accessing the CPU serial console.

```
-parenb -parodd cs8 -hupcl -cstopb cread clocal -crtscts ignbrk -brkint -
ignpar -parmrk -inpck -istrip -inlcr -igncr -icrnl ixon -ixoff -iuclc -
ixany -imaxbel -iutf8 -opost -olcuc -ocrnl -onlcr -onocr -onlret -ofill -
ofdel nl0 cr0 tab0 bs0 vt0 ff0 -isig -icanon -iexten -echo -echoe -echok
-echonl -noflsh -xcase -tostop -echoprt -echoctl -echoke
```

4.3.5 4.3.5 Connection of a USB Device

If using a USB 3.0 device (for example, a thumb drive) via one of the front panel USB ports, the device should be plugged directly into the front panel port if possible or with a short cable if necessary. Long cables on the USB 3.0 port may adversely affect signal quality and operation of the USB device.

4.3.6 Power Up

Before powering on the system, make sure that it was not stored where moisture could form inside the unit. If it was, make sure the system is located in an environment in which it can completely dry and reach room temperature before applying power.

The BMC automatically powers up the CPUs after it boots, this is the default. If the system is changed from autonomous boot to power-button boot, then payload power must be enabled manually. To manually switch on the main power, press **PWR** at the Extreme Edge Server front panel for a brief time. A tool similar to a pen or stylus is needed.

NOTE: Fans spin up and then spin down after a while. The main CPUs of the Extreme Edge Server boot up. Allow booting to complete. Boot time may vary depending on conditions.

4.4 Removal

The following subsections describe the procedures for removing the server from a rack or cabinet.

4.4.1 Power Down the Server

For data integrity reasons SMART EC recommends to save data and close all applications before power down.

Perform the server power down via the BMC's web interface or by pressing the power button on the I/O panel. This guarantees a clean shutdown of all system circuitry.

Do not disconnect DC power to shut down the server. This may lead to improper startup behavior when powering up again.

DC Power-Down Procedure

To power down the DC system, proceed as follows:

1. Power down the server using a system management software.
2. Remove power from the server using the external disconnect.
3. Verify that the power LED of the Extreme Edge Server is off.

4.4.2 Disconnect from the Power Feed

If you want to remove the server from the rack or cabinet, you must disconnect it from the power feed. Make sure that the power feeds you plan to remove are powered off and cannot be switched on while removing the server.

4.4.3 Removing the Server

Short Circuit and Personal Injury

Make sure the power feeds are powered off and cannot be switched on while you are working.

Make sure all power input lines are not energized. Use caution with the tools to prevent a short circuit

To remove the server from a rack, proceed as follows:

1. Disconnect power input cables.
2. Disconnect all cables from the PCIe cards and from the I/O panel.
3. Remove the earth ground connection.
4. Loosen and remove the mounting screws.
5. Remove the system from the rack.

Software Configuration

5.1 Introduction

The MC1600 Extreme Edge Server comes with software and firmware preinstalled and ready for use when the system powers up. Each of the two CPUs boot up with an Insyde UEFI BIOS that is accessible via the CPU's serial port, refer to *Connect the Serial Console on page 93* for further information. Each CPU is initially configured to boot a CentOS Linux which includes SMART Embedded Computing's Basic Blade Services (BBS). System management and monitoring is accomplished through the BMC and provides a standard IPMI implementation as well as some custom OEM commands.

5.2 Installed Software

This chapter describes the installed software and firmware along with the tools for managing and configuring the softwares using the on-board utilities.

The software that is installed on the system includes the Linux-based BBS with a utility to perform some of the firmware upgrades, a utility to configure the Broadcom switch, and a utility to query and configure the front panel SFP modules.There is also AMI MegaRac©-based BMC firmware that provides system management functionality including firmware upgrades and sensor monitoring, and a BIOS for each system CPU as the boot firmware. The following sections provide additional details about the utilities provided.

5.2.1 Basic Blade Services (BBS)

The Linux/BBS is based on CentOS 7.5 and contains Linux-based utilities to upgrade firmware.To login to the BBS use the default username: password - root:root.

5.2.1.1 Default Network Configuration

When the provided BBS/Linux boots up on the CPUs, there is a default network configuration that is enabled as shown in the following tables.

Table 5-1 Single CPU Variant

CPU	Interface	Description	Default IP Address
CPU1	ETH1	Front panel interface	172.26.1.10
	ETH2	Front panel interface	Not configured
	bcm	Network interface from CPU1 to the Broadcom switch	Not configured

Table 5-2 Dual CPU Variant

CPU	Interface	Description	Default IP Address
CPU1	ETH1	Front panel interface	172.26.1.10
	bcm	Network interface from CPU1 to the Broadcom switch	Not configured
	xlink	Network interface to CPU2	172.27.1.10
CPU2	ETH2	Front panel interface	172.26.1.20
	bcm	Network interface from CPU2 to Broadcom switch	Not configured
	xlink	Network interface to CPU1	DHCP enabled

When CPU1 boots, a DHCP configuration is created and the DHCPD service is started. This allows CPU2 to PXE boot from CPU1. See the following figures for the single and dual default network diagrams.

Figure 5-1 Single CPU Variant

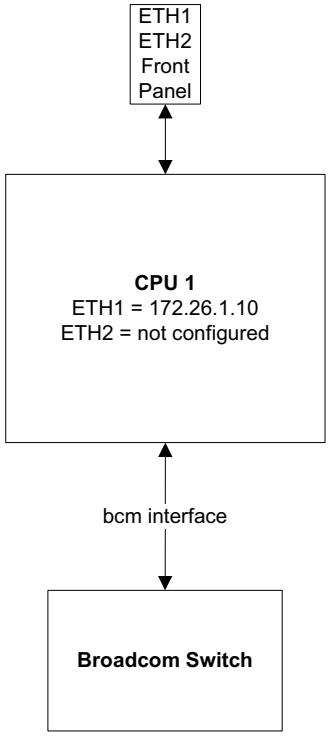
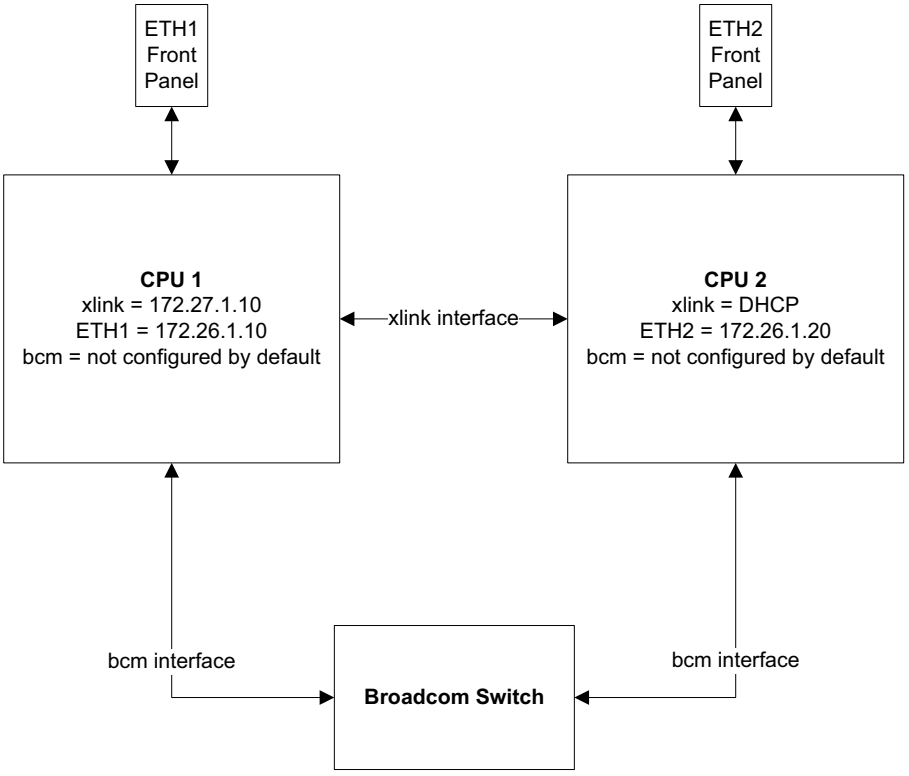


Figure 5-2 Dual CPU Variant



5.2.1.2 Firmware Upgrade

5.2.1.2.1 BMC Upgrade

The BMC can be upgraded using ipmitool over LAN as shown below:

NOTE: BMC default front panel Ethernet IP address is 192.168.201.9

1. Set your IP address on CPU1 or external server, to the same subnet as BMC. (192.168.201.xxx)
2. Download hpm.1 image to CPU1 or external server and execute the following command:
   `ipmitool –I lanplus –H 192.168.201.9 –z 0x7fff –U admin –P admin hpm upgrade <image name>`

3. Once the upgrade is complete an hpm activate command is required to reset the BMC and boot from the newly upgraded image.
   `ipmitool –I lan –H 192.168.201.9 –U admin –P admin hpm activate`

5.2.1.2.2 BIOS Upgrade

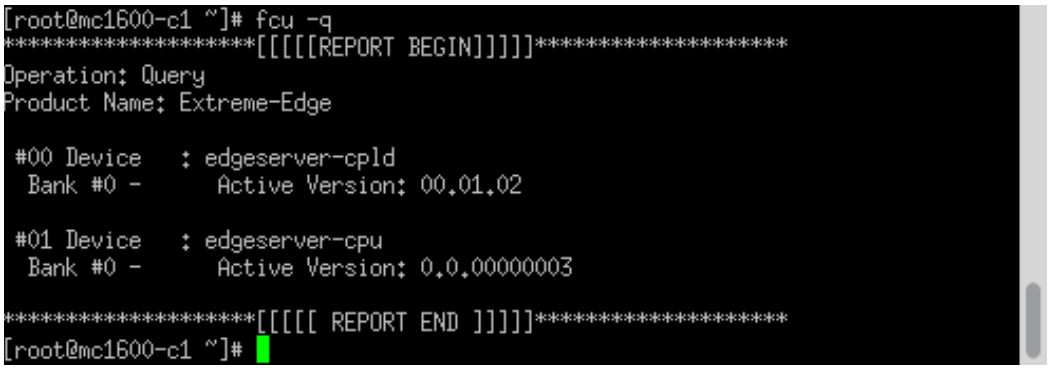
Query Operation

Using the Query Operation, FCU returns firmware information for a specific device (if used with -d) or information about all firmware devices.

To find the current BIOS version before upgrading it with a new version, use the following command:

```
$ fcu -q
```

The following screen shows a typical output when the $**`fcu -q`** command is executed.



The above screen depicts the following information:

- Device #00 represents the CPLD and the firmware version is 00.01.02.
- Device #01 represents CPU and the firmware version is 0.0.00000003.

Show Operation

Show Operation does not access any device. It only operates with the firmware image and it shows the metadata, which is part of the image. Furthermore, it validates the firmware image to compare the checksum part of the metadata against the checksum of the raw image. The output of the Show Operation is similar to the output of the Query Operation. A sample output of the BIOS image is shown below.

Show contents of BIOS firmware image:

```
root@mc1600-c1 ~]# fcu -sf edgeserver-cpu-0.0.3.fri
**********[[[[[REPORT BEGIN]]]]]**********
Operation: Show
Manufacturer : ARTESYN
Board        : EdgeServer
#00 Device   : edgeserve-cpu
 Bank #0 -             Version: 0.0.00000003

#01 Device   : edgeserver-cpu
 Bank #0 -             Version: 0.0.00000003

**********[[[[[ REPORT END ]]]]]**********
root@mc1600-c1 ~]#
```

Verification of BIOS image:

```
[root@mc1600-c1 ~]# fcu -vf edgeserver_cpu_cpld_0.1.2.fri
**********[[[[[REPORT BEGIN]]]]]**********
Operation: Verify
Result   : Success
**********[[[[[ REPORT END ]]]]]**********
[root@mc1600-c1 ~]#
```

Upgrade Operation

Upgrade Operation uploads the firmware image to the device. Before the upload process, the firmware image is validated first and the FCU verifies if the image is applicable to the firmware device.

To upgrade BIOS, use the following command:

```
$ fcu -uf <BIOS image>.fri
```

Here, **<BIOS image>.fri** is the firmware file to which BIOS is upgraded. The following screen shows a typical output when the above command is executed.

```
[root@mc1600-c1 ~]# fcu -uf edgeserver-cpu-0.0.3.fri
**********[[[[[REPORT BEGIN]]]]]**********
Operation: Upgrade
profuct_id = 2039
Current BIOS version is 00.00.03
ME versions are matching from image and running one
Perform a BIOS region only flash update
  erasing ...100 %
  verifying flash for being empty ...100 %
  writing ...100 %
Please reboot to enable new BIOS version
Result   : Success
**********[[[[[ REPORT END ]]]]]**********
[root@mc1600-c1 ~]#
```

After completion of this procedure the image is copied to the flash temporary location. Once the upgrade procedure shows the result as **Success** (as notified in the above screen), the upgrade procedure would complete with the rebooting of the system. After the reboot, the CPU boots with the updated BIOS.

NOTICE

Do not reset or reboot the system at this point in time. This may corrupt the BIOS. Once the upgrade is successful, the system automatically resets and boots with the upgraded BIOS.

After the system boots to Linux, confirm that the BIOS has upgraded: **fcu -q** command.

5.2.1.2.3 CPLD Upgrades

There are two CPLD components that can be updated using HPM.1 upgrade tool: the Glue CPLD and the CPU CPLD. The CPU CPLD may also be upgraded using the fcu utility.

Use the following commands for HPM.1 upgrade.

Glue CPLD Upgrade

```
ipmitool -I lanplus -U admin -P admin -H 192.168.201.9 -z 0x7fff hpm
upgrade mc1600-cpld-glue-x.x.x.hpm activate
```

CPU CPLD Upgrade

```
ipmitool -I lanplus -U admin -P admin -H 192.168.201.9 -z 0x7fff hpm
upgrade mc1600-cpld-cpu-x.x.x.hpm activate
```

NOTE: The activation command will fail if the payload power is on. However, there is a known issue that the CPLD upgrade will fail if the payload power is off. This means you will do the CPLD firmware upgrade when the payload power is on, and then perform a system power cycle to activate the new Glue and / or CPU CPLD firmware.

5.2.1.2.4 CPU CPLD Upgrade Using fcu Utility:

Query Operation

To find the current CPLD version before upgrading it with a new version, use the following command:

$ **fcu -q**

The following screen shows a typical output when the $ **fcu -q** command is executed.

```
[root@mc1600-c1 ~]# fcu -q
**********[[[[[REPORT BEGIN]]]]]**********
Operation: Query
Product Name: Extreme-Edge

 #00 Device   : edgeserver-cpld
  Bank #0 -      Active Version: 00.01.02

 #01 Device   : edgeserver-cpu
  Bank #0 -      Active Version: 0.0.00000003

**********[[[[[ REPORT END ]]]]]**********
[root@mc1600-c1 ~]#
```

Show Operation

Verification of CPLD Firmware Image

fcu -vf <Fri file image> is the command used for verifying a CPLD firmware image.

The following screen shows an example output of the command.

```
[root@mc1600-c1 ~]# fcu -vf edgeserver_cpu_cpld_0.1.2.fri
**********[[[[[REPORT BEGIN]]]]]**********
Operation: Verify
Result   : Success
**********[[[[[ REPORT END ]]]]]**********
[root@mc1600-c1 ~]#
```

Show contents of CPLD firmware image:

```
[root@mc1600-c1 ~]# fcu -sf edgeserver_cpu_cpld_0.1.2.fri
**********[[[[[REPORT BEGIN]]]]]**********
Operation: Show
 Manufacturer : ARTESYN
 Board        : EdgeServer
 #00 Device   : edgeserver-cpld
  Bank #0 -             Version: 00.01.02

**********[[[[[ REPORT END ]]]]]**********
[root@mc1600-c1 ~]#
```

Upgrade Operation

To upgrade CPLD, use the following command:

$ **fcu -uf <CPLD image>.fri**

Here, **<CPLD image>.fri** is the firmware file to which CPLD will be upgraded.

The following screen shows a typical output when the above command is executed.

```
[root@mc1600-c1 ~]# fcu -uf edgeserver_cpu_cpld_0.1.2.fri
**********[[[[[REPORT BEGIN]]]]]**********
Operation: Upgrade
erasing ...
  verifying flash for being empty ...100 %
  writing ...100 %
Result   : Success
**********[[[[[ REPORT END ]]]]]**********
[root@mc1600-c1 ~]#
```

For the newly upgraded CPLD image to be active, you need to power cycle the system.

After the system boots to Linux, to confirm the CPLD upgrade, execute the **fcu -q** command.

5.2.1.3 Broadcom Switch

The MC1600 contains a Broadcom BCM53402 8-port Ethernet switch. Each port supports 10GbE. The eight ports are connected as follows:

1 - Front panel SFP+, labeled ETH3 (BCM port xe0)

2 - Front panel SFP+, labeled ETH4 (BCM port xe1)

3 - Front panel SFP+, labeled ETH5 (BCM port xe2)

4 - Front panel SFP+, labeled ETH6 (BCM port xe3)

5 - Front panel SFP+, labeled ETH7 (BCM port xe4)

6 - CPU 1 (linux bmc interface) (BCM port xe5)

7 - BMC controller (1Gb) (BCM port xe6)

8 - CPU 2 (linux bmc interface) (BCM port xe7) [dual CPU model only]

This switch is initialized when the Linux kernel comes up on CPU 1. The default configuration defines a single VLAN (ID 1) and all eight ports are included in this VLAN. In this configuration there is no switch management and all broadcast packets are routed to all ports.

In this default configuration broadcast storms can easily be created if multiple front panel connections are made.

Depending on the customer's network topology, the switch should be reconfigured appropriately.

This release includes the capability to initialize the BCM switch with user-specific commands and have these commands automatically applied whenever the board is booted. This configuration step also happens when the *bcm* service is restarted.

To use this feature, add the desired BCM commands to the file `/opt/bladeservices/tools/bcm/rc_user.soc`.

The Broadcom switch is configurable from Linux/BBS using the Broadcom utility **`bcm.user.proxy`**. To execute, type: **`bcm.user.proxy`** followed by two **`<CR>`**. The second **`<CR>`** is needed to see the `BCM.0>` prompt. To exit the utility, type: **`exit <CR>`**.

Once in the utility both general and specific help is available. For example:

```
BCM.0> help
```

```
BCM.0> help PortStat
```

Notice in the help output that certain characters are capitalized in the command names. The capital letters represent the minimum letters necessary (or shortcut) to issue the command. For example to call the **`PortStat`** command, the shortcut would be `ps.`

Here is example output for the **ps** command on the Extreme Edge Server:

```
BCM.0 ps
         ena/   speed  link  auto  STP                    lrn  inter  max    loop
port     link   /dupl  scan  neg?  state   pause  discrd  ops  face   frame  back
                ex
xe0(2)   down     -     HW    Yes   Forward TX RX  None    FA   SGMII  16356
xe1(3)   down     -     HW    Yes   Forward TX RX  None    FA   SGMII  16356
xe2(4)   down     -     HW    Yes   Forward TX RX  None    FA   SGMII  16356
xe3(5)   down     -     HW    Yes   Forward TX RX  None    FA   SGMII  16356
xe4(6)   down     -     HW    Yes   Forward TX RX  None    FA   SGMII  16356
xe5(7)   up     10G FD  HW    Yes   Forward TX RX  None    FA   KR     16356
xe6(8)   up     1G FD   HW    Yes   Forward        None    FA   KX     16356
xe7(9)   down     -     HW    Yes   Forward TX RX  None    FA   SGMII  16356
BCM.0>
```

Notice the ports are labeled xe0 through xe7. The xe0-xe4 ports correspond to the SFP+ front panel ports labeled ETH 3 through 7. The connections to CPU1 & CPU2 are xe5 and xe7. The BMC link is xe6.

If a (slower) 1G SFP module, copper or fabric, is inserted into any of the front panel SFP ports, then the corresponding port must be reconfigured with auto-negotiation turned on, using the BCM utility. For example, if a 1G SFP copper module is inserted in ETH 7 (xe4):

```
BCM.0> port xe4 autoneg=on
```

To capture statistic (packet) counters for a particular, or group of ports, use the **show** command. For example, the following command displays counters for ports xe5 & xe6:

```
BCM.0> show c xe5-xe6
```

To transmit dummy packets from a specific port, use the **tx** command. For example, the following command transmits 1000 packets on port xe0, assuming the link is up:

```
BCM.0> tx 1000 pbm=xe0
```

To display the currently configured VLANs, use the **vlan show** command. For example:

```
BCM.0> vlan show
```

To create a new VLAN, use the **vlan create** command. For example, the following command creates a new VLAN with ID=5 which includes ports xe2 & xe5 in both tagged and untagged mode:

```
BCM.0> vlan create 5 pbm=xe2,xe5 ubm=xe2,xe5
```

To add ports to an existing VLAN, use the **vlan add** command. For example, the following command adds port xe0 to VLAN 10 in tagged mode:

```
BCM.0> vlan add 10 pbm=xe0
```

To remove ports from an existing VLAN, use the **vlan remove** command. For example, the following command removes port xe2 from VLAN 5:

```
BCM.0> vlan remove 5 pbm=xe2
```

To display the default VLAN IDs for all ports, use the **pvlan show** command.

To modify the default VLAN ID for a port, or ports, use the **pvlan set** command. For example, the following command sets the default VLAN ID to 10 for ports xe2 & xe5:

```
BCM.0> pvlan set pbm=xe2,xe3 10
```

Port Mirroring

First you must configure a mirror destination. This is the port (referred as the *destport*) where the mirrored packets are replicated to. The *mirror dest create* API returns a *mirror ID*. This ID is then used in all further *mirror* API commands. The first ID defaults to 0x3c000000. Next the user calls the **mirror dest add** command to attach a port (referred as the srcport) to an already created mirror ID. This source port is where the mirrored packets come from. The *mirror dest add* API command also takes a mode parameter which specifies whether to replicate Ingress, Egress, or both types of packets. The mode parameter values can be Ingress, Egress, or IngressEgress.

Example commands to replicate Ingress and Egress packets from xe0 to xe1 (using **bcm.user.proxy**):

```
BCM.0> mir dest create id=0 destport=xe1

BCM.0> mir dest add id=0x3c000000, mode=IngressEgress
srcport=xe0
```

To display the mirror configurations:

```
BCM.0> mir show

BCM.0> mir dest show
```

To remove the example mirror configuration:

```
BCM.0> mir dest delete id=0x3c000000 mode=IngressEgress
srcport=xe0
```

```
BCM.0> mir dest destroy id=0x3c000000
```

This release includes a shell script which allows the user to execute BCM utility commands without having to enter and exit the program. This can be useful if a BCM commands need to be scripted, for example, from the Linux command line:

```
# bcmui.sh port xe0 autoneg=on
```

5.2.1.4 sfptool

Included with an Extreme Edge Server installation is a CLI utility called sfptool. This utility allows for the information status display and reconfiguration of the front panel SFP modules. Here is the sfptool help display:

```
[root@mc1600-c1 ~]# sfptool -h

Usage: sfptool [-p <port>] [-spdvhrtw]
Where:
  -h    Help
  -s    Run SFP Port Scan
  -p    SFP Port Number: one-based number (range 1..5)
  -d    Dump SFP Registers for given <port>
           (e.g., sfptool -p 3 -d)
  -r    Enable(1) or disable(0) rate select pin for a given port.
  -t    Enable(1) or disable(0) transmitter for a given port.
  -v    Verbose mode.
  -w    Write bytes to SFP, parm='page/offset/number/value'.

Display options include:
"-s"  - display SFP status for all 5 front panel ports.
"-d" - dump register content for a specific port.

Reconfiguration options include:
"-r" - enable or disable rate select for multi-speed SFP modules.
"-t" - enable or disable the transmitter for a specific port.
"-w" - modify SFP register values, for advanced debug only.
```

Examples:

1. Display SFP module scan output:

```
[root@mc1600-c1 ~]# sfptool -s
SFP Name Pr Tx LOS TxFl SFP Info
--- ---- -- -- --- ---- ----------------------------------------
-----
 1  xe0  1  1   1   0   speed=1G ETH  AVAGO           ABCU-5700RZ
 2  xe1  1  1   0   0   speed=10G ETH Molex Inc.       74752-1051
 3  xe2  1  1   0   0   speed=10G ETH Tyco Electronics 2032237-6
 4  xe3  1  1   1   0  speed=10G ETH FINISAR CORP.    FTLX1471D3BCV
 5  xe4  0  0   1   1   Nothing there
[root@mc1600-c1 ~]#
```

2. Dump register content for SFP module - port 1 (xe0):

```
[root@mc1600-c1 ~]# sfptool -p1 -d
Page 0:
00: 03 04 00 00 00 00 08 00 00 00 00 01 0d 00 00 00 ................
10: 00 00 64 00 41 56 41 47 4f 20 20 20 20 20 20 20 ..d.AVAGO
20: 20 20 20 20 00 00 17 6a 41 42 43 55 2d 35 37 30     ...jABCU-570
30: 30 52 5a 20 20 20 20 20 20 20 20 20 00 00 00 b0 0RZ         ....
40: 00 12 00 00 41 4e 30 38 31 39 33 56 34 55 20 20 ....AN08193V4U
50: 20 20 20 20 30 38 30 35 30 38 20 20 00 00 00 ba    080508  ....
60: 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
70: 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
80: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ................
90: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ................
a0: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ................
b0: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ................
c0: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ................
d0: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ................
e0: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ................
f0: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ................
Page 1:
No ACT received.
READ ERROR at offset 0x0
Page 6:
00: 01 40 01 49 01 41 0c c1 0c 01 00 00 00 04 20 01 .@.I.A........ .
10: 00 00 0e 00 40 00 00 00 00 00 00 00 00 00 f0 00 ....@...........
20: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ................
30: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ................
[root@mc1600-c1 ~]#
```

3. Enable rate select (high speed) for SFP module - port 1 (xe0):

```
[root@mc1600-c1 ~]# sfptool -p1 -r1
[root@mc1600-c1 ~]#
```

4. Disable the transmitter for SFP module - port 3 (xe2):

```
[root@mc1600-c1 ~]# sfptool -p3 -t0
[root@mc1600-c1 ~]#
```

5.2.2 Baseboard Management Controller (BMC)

Hardware management and monitoring is accomplished via the BMC.

Sensors:

Sensors are read using the ipmitool utility with the command shown:

```
ipmitool sensor
```

CPU2 power state:

From the CPU1 command line the ipmitool utility is used to set the power state of CPU2 with the following command:

```
ipmitool raw 0x2e 0x34 0xae 0 0 0x3 0x61 <power state>
```

The valid values for power state:

0: power down

1: power up

2: reset

5.2.2.1 IPMI OEM Commands

A list of IPMI OEM commands have been created to help with platform management in *Table 5-4 SMART EC IPMI OEM Command Summary on page 111*. This section documents the OEM commands with the details specific to Extreme Edge Server, which may be different from other similar platforms.

SMART EC IPMI OEM commands use the network function code 0x2E/0x2F, which is OEM/Group according to the IPMI 2.0 specification.

Deviated from the IPMI specification, instead of the three-byte IANA number, the Artesyn OEM commands use a single byte value 0xae as the identifier of the SMART EC OEM commands under the net function group. SMART EC IPMI OEM commands also include an additional version byte in the request message in case the requested data structure gets enhanced over time. Therefore, a generic SMART EC IPMI OEM command **must** follow the *General OEM Command Structure* table shown next.

Table 5-3 General OEM Command Structure

Request Data	1	0xae
	2	Version of the command
	(*n*)	Request payload data if any, *n* bytes
Response Data	1	0xae
	2	Completion code
	(*m*)	Response payload data if any, *m* bytes

5.2.2.1.1 SMART EC IPMI OEM Command Summary

These OEM commands are specific for the Extreme Edge Server. OEM commands for other similar platforms may vary.

Table 5-4 SMART EC IPMI OEM Command Summary

Command	NetFn	Command	Privilege Level	Table
Set FRU Instance Power State	OEM/Group	0x34	Administrator	*Table 5-5*
Get FRU Instance Power State	OEM/Group	0x35	User	*Table 5-6*
Set Chassis Power Policy	OEM/Group	0x36	Operator	*Table 5-7*
Get Chassis Power Policy	OEM/Group	0x37	User	*Table 5-8*
Set Aggregated Temperature Sensor	OEM/Group	0x3C	Administrator	*Table 5-9*
Get Aggregated Temperature Sensor	OEM/Group	0x3D	User	*Table 5-10*
Get FRU Present State Version 0	OEM/Group	0x47	User	*Table 5-11*
Get FRU Present State Version 1	OEM/Group	0x47	User	*Table 5-12*
Set Chassis Address Info	OEM/Group	0x48	Administrator	*Table 5-13*
Get Chassis Address Info	OEM/Group	0x49	User	*Table 5-14*

5.2.2.1.2 Power Management

In addition to the standard IPMI Chassis Control command, the following OEM commands are created for a fine power control over the chassis.

Table 5-5 Set FRU Instance Power State

Request Data	1	0xae
	2	Version Write as 0
	3	FRU Device ID 0: the CPU1 and / or CPU2 1: the PCIe card Other values are reserved
	4	Entity ID 0x03: Entity processor 0x90: Entity PCIe slot
	5	Entity Instance Number For Entity 0x03 processor: 0x60+*x*: CPU *x* on the FRU (FRU0 or FRU1). x starts from 0 For Entity 0x90 PCIe slot: 0x60: entire slot
	6	[7:5] reserved [4:0] Power State: 0: power down 1: power up 2: reset For processor entities, a reset of the CPU is performed. For a PCIe-slot entity, a reset performs the #PERST of the slot. **Note:** It depends on the hardware architecture whether a certain power state is supported. There might be states that are not supported by the hardware.
Response Data	1	Completion Code
	2	0xae

Table 5-6 Get FRU Instance Power State

Request Data	1	0xae
	2	Version Write as 0
	3	FRU Device ID 0: the CPU1 and / or CPU2 1: the PCIe card
	4	Entity ID 0x03: Entity processor 0x90: Entity PCIe slot
	5	Entity Instance Number For Entity 0x03 processor: 0x60+*x*: CPUx on the FRU (FRU0 or FRU1). x starts from 0 For Entity 0x90 PCIe slot: 0x60: entire slot
Response Data	1	Completion Code
	2	0xae
	3	[7:5] reserved [4:0] Power State: 0: power down 1: power up 2: reset **Note:** It depends on the hardware architecture whether a certain power state is supported. There might be states that are not supported by the hardware.

5.2.2.1.3 Chassis Power Policy

The chassis power policy specifies how the system is powered when it comes up.

Table 5-7 Set Chassis Power Policy

Request Data	1	0xae
	2	Version 0 for this specification
	3	Power policy: [0]: payload power auto on 0: payload power remains off when the DC input power is turned on, until a power on command or button event is received 1: payload power is turned on automatically when the DC input power is turned on [1]: payload power off after power loss 0: Bit 0 of this policy takes the payload power control after a power loss event 1: Bit 0 of this policy is ignored, and the payload power remains off when the DC input power gets recovered from an unexpected power loss event. An explicit power on command or button event is required to turn on the payload power.
Response Data	1	Completion Code
	2	0xae

Table 5-8 Get Chassis Power Policy

Request Data	1	0xae
	2	Version 0 for this specification
Response Data	1	Completion Code
	2	0xae
	3	Power policy: [0]: payload power auto on 0: payload power remains off when the DC input power is turned on, until a power on command or button event is received 1: payload power is turned on automatically when the DC input power is turned on [1]: payload power off after power loss 0: Bit 0 of this policy takes the payload power control after a power loss event 1: Bit 0 of this policy is ignored, and the payload power remains off when the DC input power gets recovered from an unexpected power loss event. An explicit power on command or button event is required to turn on the payload power.

5.2.2.1.4 Aggregated Temperature Sensors

The aggregated temperature sensor is a logical sensor the BMC firmware implements for the PCIe slot representing the thermal status of the PCIe card in the corresponding slot. This logical sensor is provided so the user may include the thermal status of the PCIe card to be included in the aggregated sensor to be used by the system cooling algorithm. The BMC considers the thermal status along with other thermal information collected within the chassis, and determines the speed of cooling fans.

The `Set Aggregated Temperature Sensor` command is used to update the aggregated temperature sensor of the PCIe card. If the aggregated temperature sensor is never updated, it is considered as disabled, and will not be part of the cooling algorithm. However, if an aggregated temperature sensor has been updated through the `Set Aggregated Temperature Sensor` command, the application or service keeps updating the sensor at least once every 3 seconds, or the sensor reading will become invalid. An invalid aggregated temperature makes the chassis-wide aggregated temperature invalid and as a result, all fans will run at full speed. To avoid this from happening, the application or service shall use the **`Set Aggregated Temperature Sensor`** command to disable the sensor gracefully before it exits or stops.

The aggregated thermal status is tabevaluated in a 0 to 63 scale, where 0 means no thermal concerns and cooling fans may be turned off or running at their minimum speed, 56 means the cooling fans should be running at full speed to avoid the further temperature rising, and 63 indicates permanent thermal damage may happen. Typically, a temperature between the IPMI temperature sensor upper non-critical threshold and the upper critical threshold is linearly mapped to 0 to 56, and a temperature between the upper critical threshold and the upper non-recoverable threshold is linearly mapped to 56 to 63. All temperatures below the upper non-critical threshold are mapped to 0, and all temperatures over the upper non-recoverable are mapped to 63.

Following is a simple pseudo code example showing how to implement the PCIe card thermal monitoring.

```
for t_sensor in all_readable_temperature_sensors_on_the_pcie_card
    temperature=read(t_sensor)
    if temperature < non-critical[t_sensor]
        aggtemp[t_sensor] = 0
    else if temperature < critical[t_sensor]
        aggtemp[t_sensor] = (56 - 0) * (temperature - non-
critical[t_sensor]) / (critical[t_sensor] - non-critical[t_sensor])
    else if temperature < non-recoverable[t_sensor]
       aggtemp[t_sensor] = (63 - 56) * (temperature - critical[t_sensor])
/ (non-recoverable[t_sensor] - critical[t_sensor])
    else
        aggtemp[t_sensor] = 63
```

```
set_aggregated_temperature_sensor(MAX(aggtemp))
sleep 1second and repeat forever
exit:
set_aggregated_temperature_sensor(disable)
```

Table 5-9 Set Aggregated Temperature Sensor

Request Data	1	0xae
	2	Version Write as 0
	3	FRU Device ID 1: the PCIe card Other values are reserved
	4	Aggregated Temperature Level 0xFF: Aggregated Temperature Sensor disabled Other values [7]: invalid flag 0: temperature in [5:0] is valid 1: temperature in [5:0] is invalid [6]: write as 0 [5:0] aggregated temperature level
Response Data	1	Completion Code
	2	0xae

Table 5-10 Get Aggregated Temperature Sensor

Request Data	1	0xae
	2	Version Write as 0
	3	FRU Device ID 1: the PCIe card Other values are reserved
Response Data	1	Completion Code
	2	0xae
	3	Aggregated Temperature Level 0xFF: Aggregated Temperature Sensor disabled Other values [7]: invalid flag 0: temperature in [5:0] is valid 1: temperature in [5:0] is invalid [6]: write as 0 [5:0] aggregated temperature level

5.2.2.1.5 Fan Control

The chassis fans run in the autonomous mode or the manual control mode and are configurable via the Set Fan Speed Control command. When the fans are in the autonomous mode, the fan control speed is determined by the aggregated temperature level and the selected fan speed profile.Since only one cooling domain (cooling zone) is supported, one setting is applied to all operating fans. Note that at low temperatures the system may turn off some or all fans.

5.2.2.1.6 FRU Present State

There are two versions of the Get FRU Present State command. As shown in *Table 5-12 Get FRU Present State Version 1*, the command also returns the manufacturer's IANA number, Product ID, and the device revision. Such information may not be available if either the FRU does not provide the information or the FRU is in such a state that it cannot provide the information to the BMC. In either case, zeros are returned.

Table 5-11 Get FRU Present State Version 0

Request Data	1	0xae
	2	Version Write as 0
	3	FRU Device ID
Response Data	1	Completion Code
	2	0xae
	3	FRU Present State 0: unknown 1: not present 2: present

Table 5-12 Get FRU Present State Version 1

Request Data	1	0xae
	2	Version Write as 1
	3	FRU Device ID
Response Data	1	Completion Code
	2	0xae
	3	FRU Present State 0: unknown 1: not present 2: present
	4:6	Manufacturer ID IANA, LSB first
	7:8	Product ID, LSB first
	9	Device Revision

5.2.2.1.7 Chassis Address Info

The Chassis Address is a user-defined identification of the chassis. The BMC stores this information, but does not interpret nor validate this address information.

Table 5-13 Set Chassis Address Info

Request Data	1	0xae
	2	Version Write as 0
	3	Type/Length Byte [7:6]: write as 0 [5:0]: length of the address info data *N* 0: clears the address info to a C null string 1 – 16: address data length Other values are reserved If a C string is required, the length N includes the null string delimiter.
	(4:3+*N*)	Chassis Address Info
Response Data	1	Completion Code
	2	0xae

Table 5-14 Get Chassis Address Info

Request Data	1	0xae
	2	Version Write as 0
Response Data	1	Completion Code
	2	0xae
	3	Type/Length Byte [7:6]: write as 0 [5:0]: length of the address info data *N*
	4:3+*N*	Chassis Address Info If there is no address info, a C null string with data length 1 is returned.

5.2.3 AMI MegaRAC® Web GUI

The BMC provides a web interface which can be accessed via RJ-45 connector on the system front panel. This version of the web GUI does not support insecure connections (http://) so you must use a secured URL to connect (https://).

Example URL using the default IP Address of the BMC front panel Ethernet:

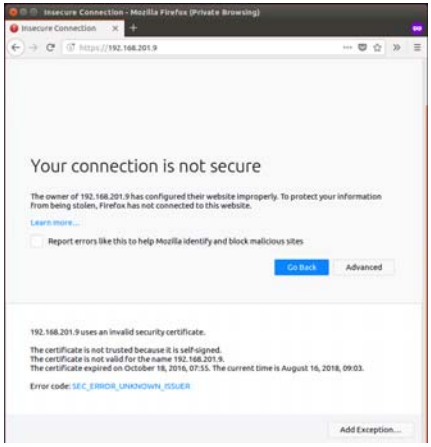
```
https://192.168.201.9/
```

NOTE: The default IP Address of the BMC may be modified via this web GUI interface.

5.2.3.0.1 Invalid Certificate

The first time you connect to the web GUI, you may encounter the following page. If you see this Insecure Connection page, you must add an exception to your web browser to continue to the login page.

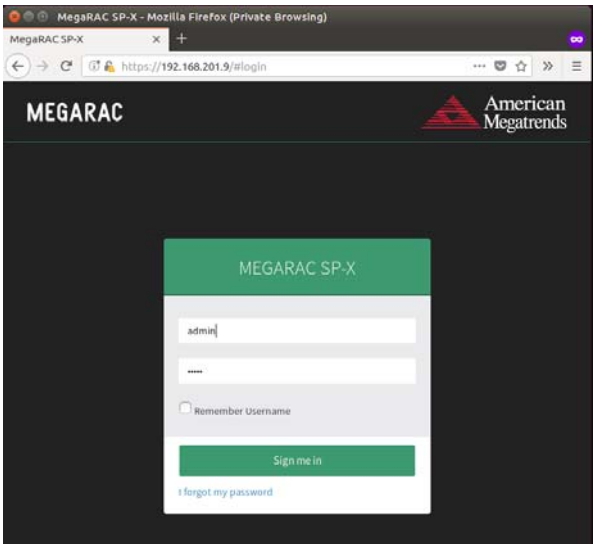
Figure 5-3 Insecure Connection Page - MegaRAC Web GUI



5.2.3.0.2 Login Page

The default username:password is admin:admin

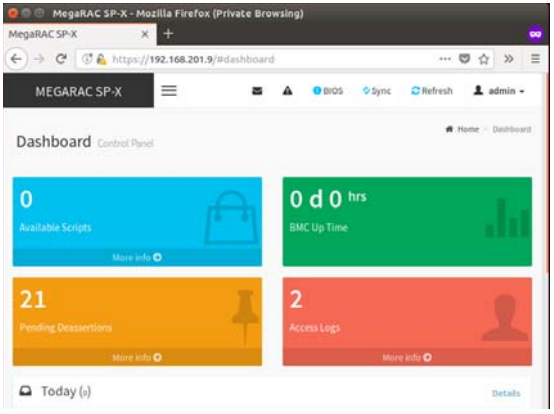
Figure 5-4 MegaRAC Login Page



5.2.3.0.3 MegaRAC Dashboard

Once you have successfully logged in, the dashboard is displayed. From the dashboard, you can traverse through the GUI menus to query and manage the system.

Figure 5-5 MegaRAC Dashboard



Related Documentation

A.1 SMART Embedded Computing Documentation

The documentation listed is referenced in this manual. Technical documentation can be found by using the Documentation Search at *https://www.smartembedded.com/ec/support/* or you can obtain electronic copies of SMART EC documentation by contacting your local sales representative.

Table A-1 SMART EC Documentation

Document Title	Publication Number
MC1600 Series Extreme Edge Server Data Sheet	MC1600 Series DS
MC1600 Extreme Edge Server Safety Notes Summary	6806870A04
MC1600 Extreme Edge Server Quick Start Guide	6806870A03

Related Documentation

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