

Syncro[®] CS 9361-8i and Syncro CS 9380-8e Controllers

User Guide

Version 3.0
August 18, 2015

pub-005070

For a comprehensive list of changes to this document, see the [Revision History](#).

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Chapter 1: Introduction

This document explains how to set up and configure the hardware and the software for the Syncro® CS 9286-8e and the Syncro 9286-8e high-availability direct-attached storage (HA-DAS) solution.

The Syncro CS solution provides fault tolerance capabilities as a key part of a high-availability data storage system. This solution combines redundant servers, Avago HA-DAS RAID controllers, computer nodes, cable connections, common SAS enclosures, and dual-ported SAS storage devices.

The redundant components and software technologies provide a high-availability system with ongoing service that is not interrupted by the following events:

- The failure of a single internal node does not interrupt service because the solution has multiple nodes with cluster failover.
- An expander failure does not interrupt service because the dual expanders in every enclosure provide redundant data paths.
- A drive failure does not interrupt service because RAID fault tolerance is part of the configuration.
- A system storage expansion or maintenance activity can be completed without requiring an interruption of service because of redundant components, management software, and maintenance procedures.

1.1 Concepts of High-Availability DAS

In terms of data storage and processing, *High Availability* (HA) means a computer system design that ensures a high level of operational continuity and data access reliability over a long period of time. High-availability systems are critical to the success and business needs of small and medium-sized business (SMB) customers, such as retail outlets and health care offices, who cannot afford to have their computer systems go down. An HA-DAS solution enables customers to maintain continuous access to and use of their computer system. Shared direct-attached drives are accessible to multiple servers, thereby maintaining ease of use and reducing storage costs.

A *cluster* is a group of computers working together to run a common set of applications and to present a single logical system to the client and application. *Failover clustering* provides redundancy to the cluster group to maximize up-time by utilizing fault-tolerant components. In the example of two servers with shared storage that comprise a failover cluster, when a server fails, the failover cluster automatically moves control of the shared resources to the surviving server with no interruption of processing. This configuration allows seamless failover capabilities in the event of planned failover (maintenance mode) for maintenance or upgrade, or in the event of a failure of the CPU, memory, or other server failures.

The Syncro CS solution is specifically designed to provide HA-DAS capabilities for a class of server chassis that include two server motherboards in one chassis. This chassis architecture is often called a *cluster in a box* (CiB).

Because multiple initiators exist in a clustered pair of servers (nodes) with a common shared storage domain, there is a concept of *device reservations* in which physical drives, drive groups, and virtual drives (VDs) are managed by a selected single initiator. For HA-DAS, I/O transactions and RAID management operations are normally processed by a single Syncro CS controller, and the associated physical drives, drive groups, and VDs are only visible to that controller. To assure continued operation, all other physical drives, drive groups, and VDs are also visible to, though not normally controlled by, the Syncro CS controller. This key functionality allows the Syncro CS solution to share VDs among multiple initiators as well as exclusively constrain VD access to a particular initiator without the need for SAS zoning.

Node downtime in an HA system can be either *planned* and *unplanned*. *Planned* node downtime is the result of management-initiated events, such as upgrades and maintenance. *Unplanned* node downtime results from events that are not within the direct control of IT administrators, such as failed software, drivers, or hardware. The Syncro CS 9286-8e solution protects your data and maintains system up-time from both planned and unplanned node downtime. It also enables you to schedule node downtime to update hardware or firmware, and so on. When you

bring one controller node down for scheduled maintenance, the other node takes over with no interruption of service.

1.2 HA-DAS Terminology

This section defines some additional important HA-DAS terms.

- **Cache Mirror:** A cache coherency term describing the duplication of write-back cached data across two controllers.
- **Exclusive Access:** A host access policy in which a VD is only exposed to, and accessed by, a single specified server.
- **Failover:** The process in which the management of drive groups and VDs transitions from one controller to the peer controller to maintain data access and availability.
- **HA Domain:** A type of storage domain that consists of a set of HA controllers, cables, shared disk resources, and storage media.
- **Peer Controller:** A relative term to describe the HA controller in the HA domain that acts as the failover controller.
- **Server/Controller Node:** A processing entity composed of a single host processor unit or multiple host processor units that is characterized by having a single instance of a host operating system.
- **Server Storage Cluster:** An HA storage topology in which a common pool of storage devices is shared by two computer nodes through dedicated Syncro CS controllers.
- **Shared Access:** A host access policy in which a VD is exposed to, and can be accessed by, all servers in the HA domain.
- **Virtual Drive (VD):** A storage unit created by a RAID controller from one or more physical drives. Although a virtual drive can consist of multiple drives, it is seen by the operating system as a single drive. Depending on the RAID level used, the virtual drive might retain redundant data in case of a drive failure.

1.3 Syncro CS 9286-8e and Syncro CS 9286-8e Solution Features

The Syncro CS solution for these controllers supports the following HA features.

- Server storage cluster topology, enabled by the following supported operating systems:
 - Microsoft® Windows Server®2008 R2
 - Microsoft Windows Server 2008 R2 SP1
 - Microsoft Windows Server 2012
 - Microsoft Windows Server 2012 R2
 - Microsoft Windows Storage Server 2012
 - Microsoft Windows Storage Server 2012 R2
 - Red Hat® Enterprise Linux 6.3
 - Red Hat Enterprise Linux 6.4
 - CentOS® 6.5
 - SuSE® Linux Enterprise Server 11 SP3
 - SuSE Linux Enterprise Server 11 SP2
- Clustering/HA services support:
 - Microsoft failover clustering
 - Red Hat High Availability Add-on
 - SuSE High Availability Extensions
- Dual-active HA with shared storage

- Controller-to-controller intercommunication over SAS
- Write-back cache coherency
- Shared and exclusive VD I/O access policies
- Operating system boot from the controller (exclusive access)
- Controller hardware and property mismatch detection, handling, and reporting
- Global hot spare support for all volumes in the HA domain
- Planned and unplanned failover modes
- CacheVault® modules to provide cache cached data protection in case of host power loss or server failure
- Full MegaRAID® features, with the following exceptions.
 - CacheCade® is not supported.
 - Dimmer switch is not supported.
 - SGPIO sideband signaling for enclosure management is not supported.
 - SATA drives are not supported.
 - SSD drives that do not support SCSI-3 persistent reservations (PR) for the VDs are not supported.
 - System/JBOD physical drives are not supported (that is, the individual physical drives are *not* exposed to the operating system).
 - Drives that are directly attached to the controller (not through an expander device) are not supported.
 - Cluster-active reconstruction operations (RAID-Level Migration or Online Capacity Expansion) are not supported.
 - Patrol Read operations that were in progress do not resume after failover.
 - Firmware-level node incompatibility details are not reported for non-premium features.
 - The Maintain Pd Fail History feature is not supported. This feature, which is available in the WebBIOS utility and the MegaRAID Command Tool, maintains the history of all drive failures.
 - Cache memory recovery is not supported for I/O shipped commands. I/O shipping occurs when a cluster node has a problem in the I/O path, and the I/O from that cluster node is shipped to the other cluster node.
 - Battery backup units are not supported.
 - HA-DAS does not support configuration of a global hot spare (GHS) when no VDs exist on the two nodes. Configuring a GHS when no VDs exist on the two nodes and then rebooting both nodes can cause problems.

1.4 Hardware Compatibility

The servers, disk drives, and optional enclosures you use in the Syncro CS solution must be selected from the list of approved components that Avago has tested for compatibility. Refer to the web page for the compatibility lists at <http://www.avagotech.com/support/interop-compatibility>.

NOTE

The Syncro CS solution requires the use of SAS SSD drives that support SCSI-3 persistent reservations (PR) for the VDs. The compatibility list shows the SAS SSD drives that meet the HA-DAS requirements.

1.5 Overview of the Hardware Installation, Cluster Setup, and Configuration

Chapter 2 describes how to install the hardware and software so that you can use the fault tolerance capabilities of HA-DAS to provide continuous service in event of drive failure or server failure and expand the system storage

[Chapter 2](#) documents how to connect the CacheVault modules, and then install the Syncro CS controllers and the remote mount boards in the CiB enclosure. In addition, it lists the steps required after controller installation and cable connection, which include the following:

- Configure the drive groups and the virtual drives on the two controllers
- Install the operating system driver on both server nodes
- Install the operating system on both server nodes, following the instructions from the manufacturer
- Install StorCLI and MegaRAID Storage Manager™ utilities

Refer to the *12Gb/s MegaRAID SAS Software User Guide* at <http://www.avagotech.com/support/download-search> for information about running the configuration utilities.

Refer to the *Syncro CS 9361-8i and Syncro CS 9380-8e Solution User Guide* at <http://www.avagotech.com/support/download-search> for the procedures used to perform the following actions after the hardware is fully configured and the operating system is installed:

- Install and enable the Cluster feature on both servers.
- Set up a cluster under the supported operating systems
- Configure drive groups and virtual drives

1.6 Performance Considerations

SAS technology offers throughput-intensive data transfers and low latency times. Throughput is crucial during failover periods where the system needs to process reconfiguration activity in a fast, efficient manner. SAS offers a throughput rate of 12 Gb/s over a single lane. SAS controllers and enclosures typically aggregate 4 lanes into an x4 wide link, giving an available bandwidth of 48 Gb/s across a single connector, which makes SAS ideal for HA environments.

Syncro CS controllers work together across a shared SAS link to achieve sharing, cache coherency, heartbeat monitoring and redundancy by using a set of protocols to carry out these functions. At any point in time, a particular VD is accessed or owned by a single controller. This owned VD is termed a local VD. The second controller is aware of the VD on the first controller, but it has only indirect access to the VD. The VD is a remote VD for the second controller. In a configuration with multiple VDs, the workload is typically balanced across controllers to provide a higher degree of efficiency.

When a controller requires access to a remote VD, the I/Os are shipped to the remote controller, which processes the I/O locally. I/O requests that are handled by local VDs are much faster than those handled by remote VDs.

The preferred configuration is for the controller to own the VD that hosts the clustered resource (the MegaRAID Storage Manager utility shows which controller owns this VD). If the controller does not own this VD, it must issue a request to the peer controller to ship the data to it, which affects performance. This situation can occur if the configuration has been configured incorrectly or if the system is in a failover situation.

NOTE Performance tip: You can reduce the impact of I/O shipping by locating the VD or drive groups with the server node that is primarily driving the I/O load. Avoid drive group configurations with multiple VDs whose I/O load is split between the server nodes.

MSM has no visibility to remote VDs, so all VD management operations must be performed locally. A controller that has no direct access to a VD must use I/O shipping to access the data if it receives a client data request. Accessing the remote VD affects performance because of the I/O shipping overhead.

NOTE

Performance tip: Use the MSM utility to verify correct resource ownership and load balancing. Load balancing is a method of spreading work between two or more computers, network links, CPUs, drives, or other resources. Load balancing is used to maximize resource use, throughput, or response time. Load balancing is the key to ensuring that client requests are handled in a timely, efficient manner.

Chapter 2: Hardware and Software Setup

This chapter explains how to set up the hardware and software for the Syncro CS 9286-8e solution and the Syncro CS 9286-8e solution with two controller nodes and shared storage. For this implementation, use a Cluster-in-a-Box (CiB) configuration in which the two server nodes with Syncro CS controllers and the shared disk drives are installed and connected inside a single CiB enclosure.

The Syncro CS cluster-in-a-box (CiB) system design combines two servers and a common pool of direct attached drives within one custom-designed enclosure. After you initially set it up, the CiB system design simplifies the deployment of two-node clusters because all components and connections are contained in one closed unit.

The Syncro CS cluster-in-a-box configuration requires a specially designed server and storage chassis that includes two Syncro CS controller boards and multiple SAS drives selected from the Avago disk compatibility list (see the URL in [Section 1.4, Hardware Compatibility](#)).

2.1 Syncro CS 9361-8i Controller Kit

The Avago Syncro CS 9361-8i controller kit includes the following items:

- Two Syncro CS 9361-8i controllers
- Two CacheVault Flash Modules 04 (CVFM04) (pre-installed on the controllers)
- Two CacheVault Power Modules 02 (CVPM02)
- Two CacheVault Power Module mounting clips and hardware
- Two CacheVault Power Module extension cables
- Two low-profile brackets
- *Syncro CS 9361-8i and Syncro CS 9380-8e Controllers Getting Started Guide*

The Syncro CS 9361-8i controllers in the kit include the CacheVault Module LSICVM02 Kit, which consists of a CacheVault Flash Module 04 (CVFM04), a CacheVault Power Module 02 (CVPM02), a clip, and a cable.

The CVFM04 module is an Open NAND Flash Interface (ONFI) flash module that is pre-installed on the Syncro CS controller. The CVFM04 module provides cache off-load capability to protect cached data in case of host power loss or server failure.

The CVPM02 module is a super-capacitor pack that provides power for the backup of your data in case of host power loss or server failure. The CVPM02 module provides both capacitor charge maintenance and capacitor health monitoring functions similar to those of an intelligent battery backup unit.

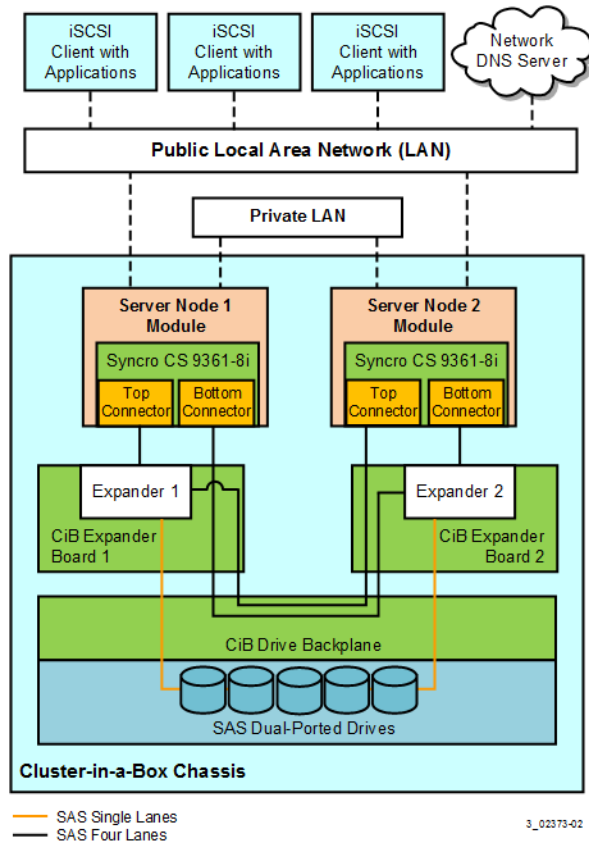
If a power failure occurs, the CVPM02 module unit provides power to transfer the cache memory contents from DRAM to a nonvolatile flash memory array on the CVFM04 module the next time the controller is power on. Cached data can then be written to the storage devices.

The following figure shows a high-level diagram of a CiB Syncro CS 9361-8i CiB configuration connected to a network. The diagram includes the details of the SAS interconnections.

NOTE

The CB220 Quanta CIBs midplane has two SAS 8088 connectors. You can connect cables from these connectors to the enclosure external storage modules (ESMs). You should connect two cables from each port to the two ESM modules (one cable to a module) present in the storage enclosure.

Figure 1 CiB Syncro CS 9361-8i Configuration



2.2 Syncro CS 9361-8i Cluster-in-a-Box Hardware Setup

Follow these steps to set up the hardware for a Syncro CS 9361-8i CiB configuration. The setup procedure might be somewhat different for CiB models from different vendors, so be sure to also read the CiB manufacturer's documentation.

NOTE

The Syncro CS solution includes two Syncro CS controllers, so you must perform the installation procedure for both controllers, one in each server module inside the CiB enclosure.

1. Unpack the controller kit in a static-free environment and check the contents. Remove the components from the antistatic bags and inspect them for damage. If any components are missing or damaged, contact Avago or your Syncro CS OEM support representative.
2. Turn off power to the CiB enclosure, if necessary, and unplug the power cords from the power supply. Remove the cover from the CiB.

CAUTION

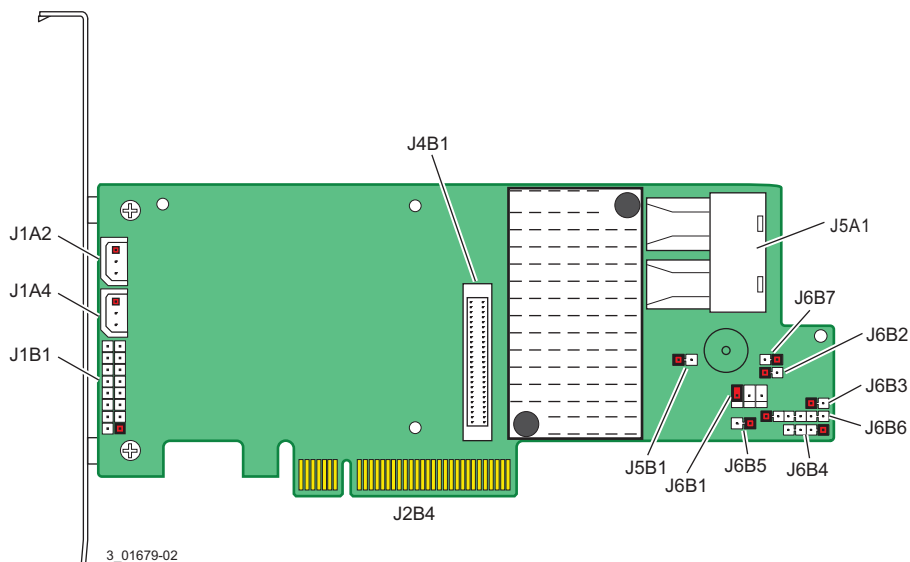
Before you install the Syncro CS controllers, make sure that the CiB enclosure is disconnected from the power and from any networks.

3. Review the Syncro CS connectors and the jumper settings and change them if necessary. You usually *do not* need to change the default factory settings of the jumpers. The following figure shows the location of the jumpers and connectors on the controller board.

The CVFM04 module comes pre-installed on your Syncro CS 9361-8i controller; however, the module is not attached in the following figure so that you can see all of the connectors and headers on the controller. [Figure 5](#), [Figure 6](#), and [Figure 7](#) show the controller with the CVFM04 module installed.

In the figure, Pin 1 is highlighted in red for each jumper.

Figure 2 Layout of the Syncro CS 9361-8i Controller



The following table describes the jumpers and connectors on the Syncro CS 9361-8i controller.

Table 1 Syncro CS 9361-8i Controller Jumpers and Connectors

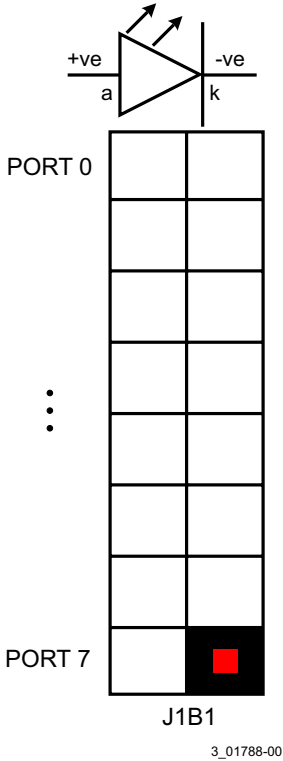
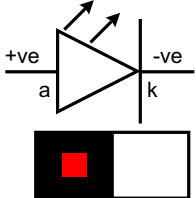
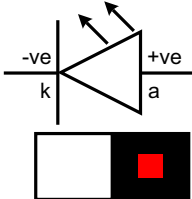
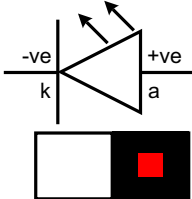
Jumper/ Connector	Type	Description
J1A2	IPMI-style I ² C connector for Ports 4 to 7	3-pin connector. Supports SCSI Enclosure Services (SES) over I ² C through an internal I ² C backplane cable.
J1A4	IPMI-style I ² C connector for Ports 0 to 3	3-pin connector. Supports SES over I ² C through an internal I ² C backplane cable.
J1B1	Individual PHY and drive fault indication header Ports 0 to 3 Ports 4 to 7 	2x8-pin header. Connects to an LED that indicates whether a drive is in a fault condition. One LED exists per port. When lit, each LED indicates the corresponding drive has failed or is in the <i>Unconfig-Bad</i> state. The LEDs function in a direct-attach configuration (no SAS expanders exist). Direct attach is defined as a maximum of one drive connected directly to each port. The J5A1 connector on the MegaRAID SAS 9361-4i RAID controller is a single internal port connector.
J2B4	Standard edge card connector	The interface between the RAID controller and the host system. Along with the PCIe® interface, this connector provides power to the board and an I ² C interface connected to the I ² C bus for the Intelligent Platform Management Interface (IPMI).
J4B1	CacheVault Flash Module (ONFI) interface	70-pin connector. Connects the RAID controller to a flash module.
J5A1	Dual x4 SAS Port 0 through Port 7 internal connector	Two SFF-8643 mini-SAS HD-4i internal connectors. Connects the controller by cable to SAS drives.
J5B1	Avago Test header	2-pin connector. Reserved for Avago use.

Table 1 Syncro CS 9361-8i Controller Jumpers and Connectors (Continued)

Jumper/ Connector	Type	Description
J6B1	Advanced software options hardware key header	3-pin header. Enables support for selected advanced features, such as Recovery, FastPath, and SafeStore™ disk encryption. Refer to the <i>MegaRAID Advanced Software Options Hardware Key Quick Installation Guide</i> for more information.
J6B2	Default Serial boot ROM (SBR) header	2-pin connector. Reserved for Avago use.
J6B3	Global hard disk drive (HDD) activity LED header  J6B3 3_01789-00	2-pin connector. Connects to an LED that indicates activity on the drives connected to the controller.
J6B4	On-board Serial Universal Asynchronous Receiver/Transmitter (UART) connector	4-pin connector. Reserved for Avago use.
J6B5	Global drive fault LED header  J6B5 3_01790-00	2-pin connector. Connects to an LED that indicates whether a drive is in a fault condition
J6B6	Complex programmable logic device (CPLD) header	6-pin connector. Reserved for Avago use.
J6B7	Cache write pending header  J6B7 3_01791-00	2-pin connector. Connector for an LED mounted on the system enclosure. The LED indicates that the data in the cache has yet to be written to the storage devices.

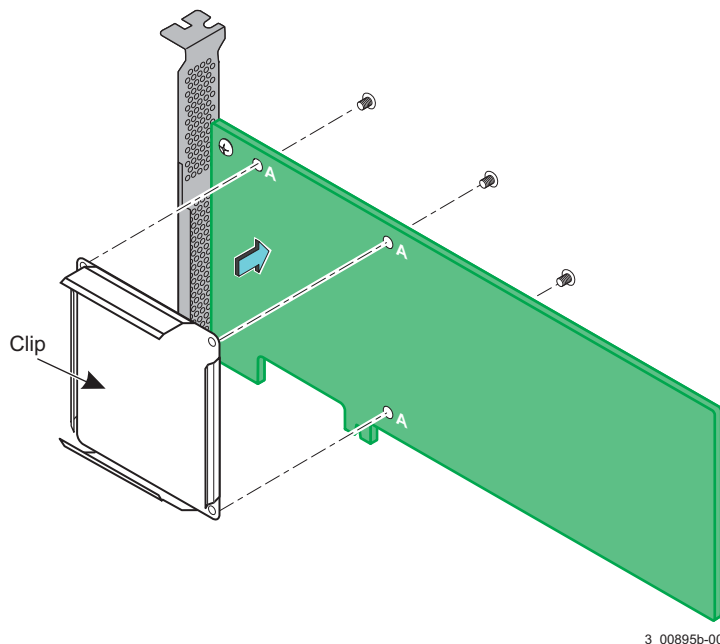
4. Ground yourself and then place the Syncro CS controller and the remote mount board on a flat, clean, static-free surface.

NOTE

If you want to replace a bracket, refer to the *Replacing Brackets on MegaRAID SAS+SATA RAID Controllers Quick Installation Guide* at <http://www.avagotech.com/support/download-search> for instructions.

5. Perform the following steps to attach the clip to a BBU-BRACKET-05 remote mount board.
 - a. With the remote mount board on a flat, clean, static-free surface, ground yourself, and make sure that the system is grounded.
 - b. Remove the mounting clip and the remote mount board module from the package.
 - c. Place the clip and the remote mount board module front-side-up on a flat, clean, static-free surface.
 - d. Hold the clip so the screw holes on the clip line up with the screw holes on the remote mount board, as shown in the following figure.

Figure 3 Installing the Clip on the Remote Mount Board



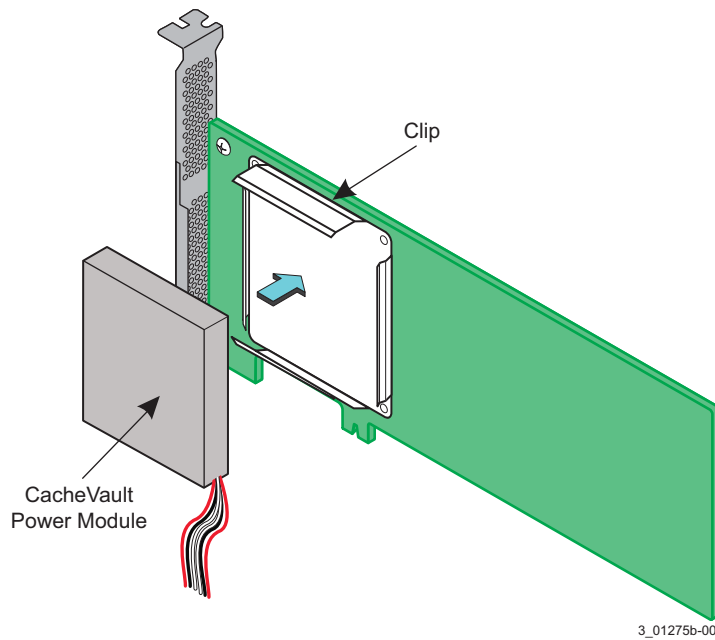
- e. Secure the clip to the three screw holes with the screws and the nuts.
The screws thread through the front of the clip and the remote mount board.

NOTE

Center the screwdriver carefully to avoid stripping the screw heads. Do not over-tighten the screws.

6. Perform the following steps to attach the CVPM02 module to the clip.
 - a. Ground yourself, and make sure that the system is grounded.
 - b. Remove the CVPM02 module from the package.
 - c. Place the CVPM02 module front-side-up on a flat, clean, static-free surface.
 - d. Press the CVPM02 module into the clip until the module clicks firmly into place, as shown in the following figure.

Figure 4 Attaching the CVPM02 Module to the Clip

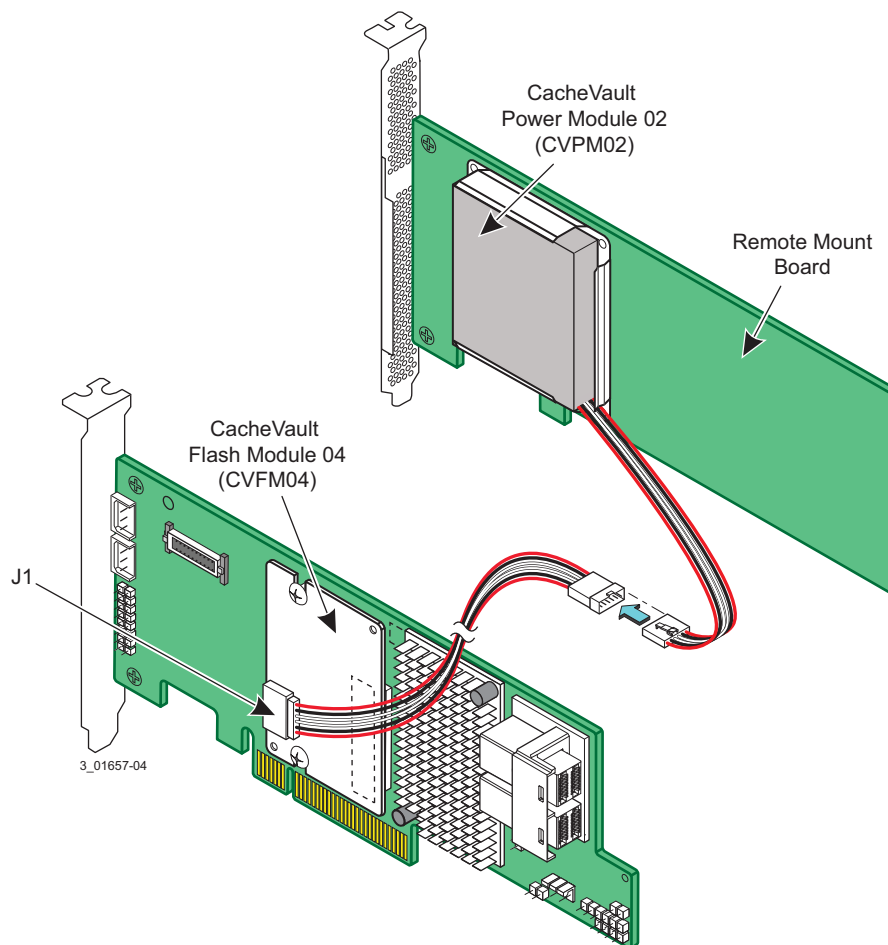


7. Follow these steps to connect the CVFM04 module on your Syncro CS controller by cable to the remote CVPM02 module.

NOTE The CVFM04 modules come pre-installed on the Syncro CS 9361-8i controllers.

- a. Place the controller on a flat, clean, static-free surface.
- b. Ground yourself, and make sure that the system is grounded.
- c. Remove the cable that is included in the box.
The cable has a 9-pin connector on one end and a 6-pin connector on the other.
- d. Insert the 9-pin connector on the cable into the 9-pin J1 connector on the CVFM04 module, as shown in the following figure.
- e. Insert the 6-pin connector into the 6-pin connector on the cable from the remote CVPM02 module.
Align the cable connectors to make sure that they are connected correctly.

Figure 5 Connecting the CVFM04 Module by Cable to the Remote CVPM02 Module



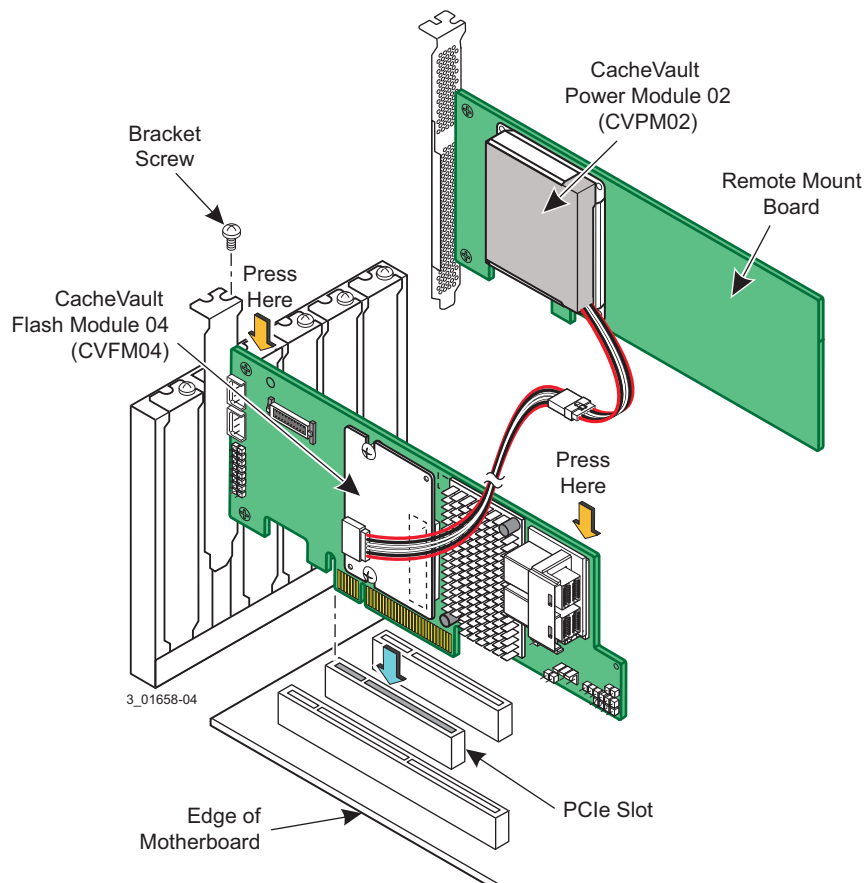
8. Follow these steps to reinstall your Syncro CS 9361-8i controller in a PCIe slot on the motherboard.
 - a. Make sure that the power to the chassis is still turned off, the power cords are unplugged, and the chassis is grounded and has no AC power.
 - b. Install the controller in a PCIe slot on the motherboard, as shown in the following figure.

NOTE

Some PCIe slots support only PCIe graphics cards; a controller installed in one of these slots will not function. Refer to your computer documentation for information about the PCIe slot.

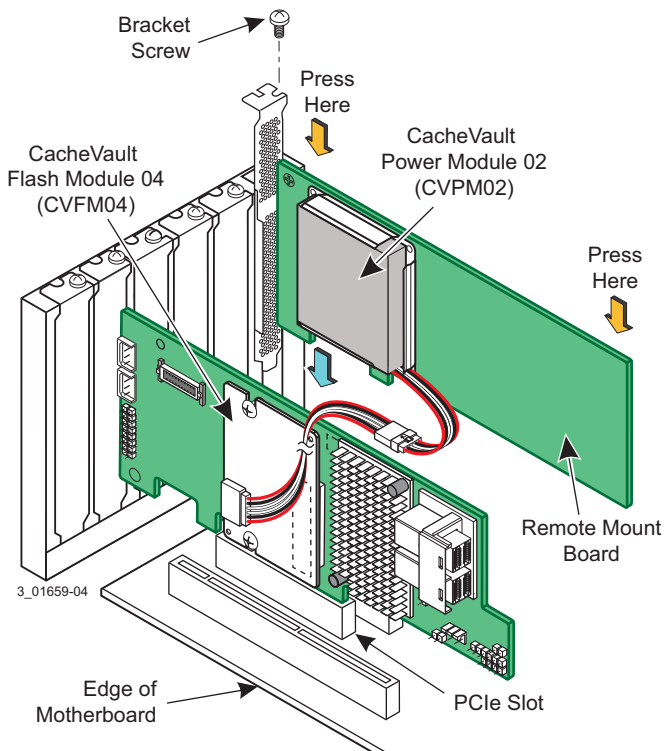
- c. Press down gently, but firmly, to seat the card correctly in the slot.
- d. Secure the controller to the computer chassis with the bracket screw.

Figure 6 Reinstalling the Controller



9. Follow these steps to install the remote mount board on the motherboard.
 - a. Insert the remote mount board in a PCIe slot on the motherboard, as shown in the following figure
 - b. Press down gently, but firmly, to seat the board correctly in the slot.
 - c. Use the bracket screw to secure the remote mount board to the system chassis.

Figure 7 Installing the Remote Mount Board



10. Repeat step 4 to step 9 to install the second Syncro CS controller and the CVPM02 module in the second server module of the CiB enclosure.
11. If necessary, install SAS disk drives in the CiB enclosure.

NOTE

Drives that are used in the Avago Syncro CS solution must be selected from the compatibility list that Avago maintains on its website. See the URL for this compatibility list in [Section 1.4, Hardware Compatibility](#).

12. Use SAS cables to connect the internal connectors of the Syncro CS controllers to SAS devices in the CiB enclosure. Refer to the CiB manufacturer's documentation for information on connecting SAS cables.

NOTE

CiB chassis manufacturers determine the availability and configuration of external JBOD storage expansion connections. Refer to the instructions from the CiB vendor on how to properly configure SAS cable connections for external JBOD enclosures, if your CiB chassis offers this capability. Also, see the Avago hardware compatibility list at the UL listed in [Section 1.4, Hardware Compatibility](#).

13. Reinstall the cover of the CiB enclosure and reconnect the power cords. Turn on the power to the CiB enclosure. The firmware takes several seconds to initialize. During this time, the controllers scan the ports.
Refer to the *12Gb/s MegaRAID SAS Software User Guide* at <http://www.avagotech.com/support/download-search> for information about running the configuration utilities and installing the software drivers.
Refer to the *Syncro CS 9361-8i and Syncro CS 9380-8e Solution User Guide* at <http://www.avagotech.com/support/download-search> for the procedures used to create the HA-DAS cluster configuration after the hardware is fully configured and the operating system is installed.

2.3 Syncro CS 9380-8e Controller Kit

The Avago Syncro CS 9380-8e controller kit includes the following items:

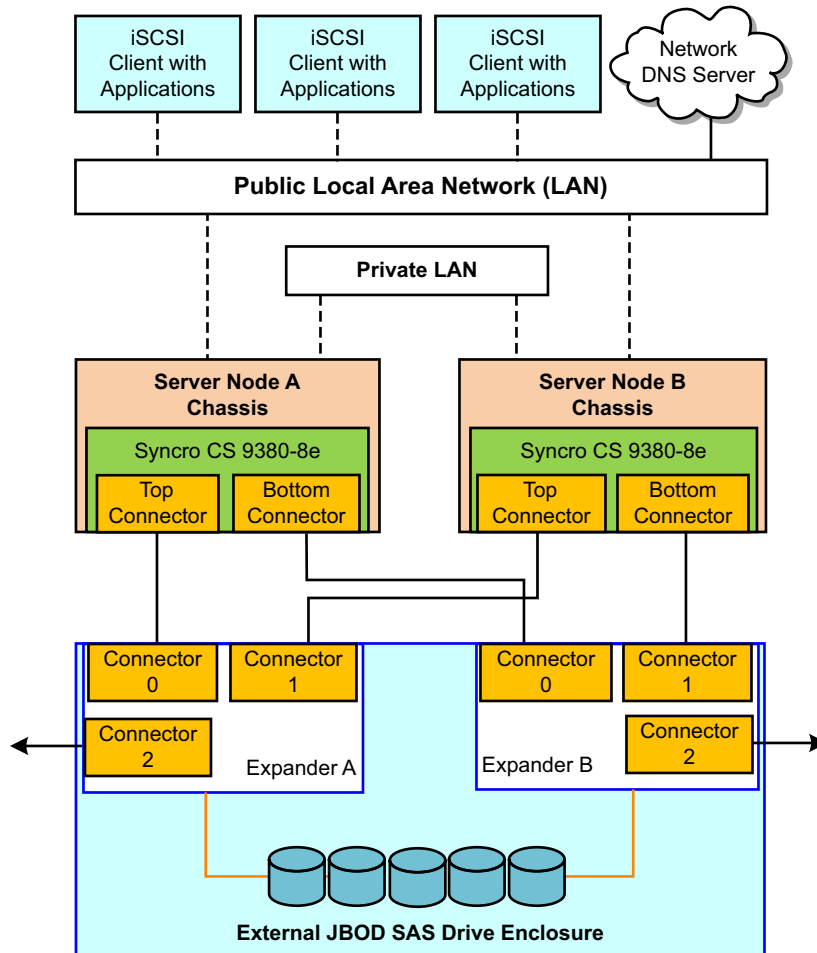
- Two Syncro CS 9380-8e controllers
- Two CacheVault Flash Modules 04 (CVFM04) (pre-installed on the controllers)
- Two CacheVault Power Modules 02 (CVPM02)
- Two CVPM02 mounting clips and hardware
- Two CVPM02 extension cables
- Two low-profile brackets
- *Syncro CS 9361-8i and Syncro CS 9380-8e Controllers Getting Started Guide*

The hardware configuration for the Syncro CS 9380-8e solution requires the following additional hardware that is not included in the kit:

- Two server modules from the Avago-approved compatibility list. The servers must include network cards.
- One or more JBOD enclosures with SAS disk drives from the Avago-approved compatibility list.
- A monitor and mouse for each server node.
- Network cabling and SAS cabling to connect the servers and JBOD enclosures.

The following figure shows a high-level diagram of a Syncro CS 9380-8e solution connected to a network and to a single enclosure.

Figure 8 Two-Server Syncro CS 9380-8e Configuration with Single Enclosure



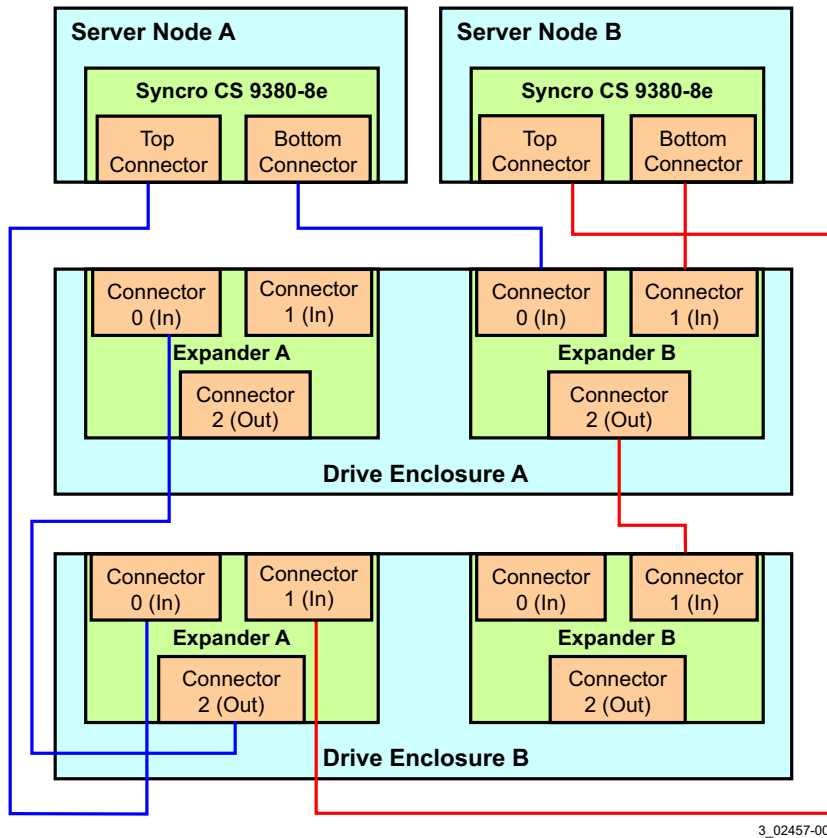
Note: Expander A connects to Port A of the SAS drives
Expander B connects to Port B of the SAS drives

— SAS Single Lanes
— SAS Four Lanes

3_02395-00

The following figure shows a high-level diagram of a Syncro CS 9380-8e solution with the controllers connected to multiple enclosures.

Figure 9 Two-Server Syncro CS 9380-8e Configuration with Multiple Enclosures



2.4 Syncro CS 9380-8e Two-Server Cluster Hardware Setup

Perform the following steps to set up the hardware for a Syncro CS 9380-8e configuration.

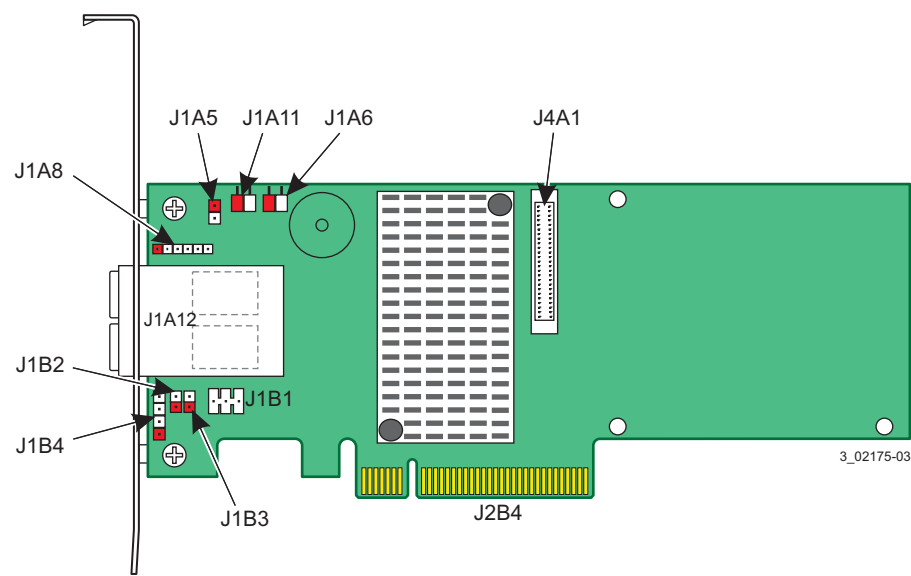
1. Unpack the Syncro CS 9380-8e controllers and the CVPM02 modules from the kit and inspect them for damage. If any components of the kit appear to be damaged, or if any items are missing from the kit, contact your Avago Customer and Technical Support representative.
2. Turn off the power to the server units, disconnect the power cords, and disconnect any network cables.
3. Remove the covers from the two server units.
Refer to the server documentation for instructions on how to do this.
4. Review the Syncro CS 9380-8e jumper settings and change them if necessary. Also note the location of the external Mini-SAS SFF8644 connector J1A12.

You usually do not need to change the default factory settings of the jumpers. The following figure shows the location of the jumpers and connectors on the controller board.

The CVFM04 module comes pre-installed on the Syncro CS controller; however, the module is not included in the following figure so that you can see all of the connectors and headers on the controller board. [Figure 13](#), [Figure 14](#), and [Figure 15](#) show the controller with the CVFM04 module installed.

In the figure, Pin 1 is highlighted in red for each jumper.

Figure 10 Card Layout for the Syncro CS 9380-8e Controller



The following table describes the jumpers and the connectors on the Syncro CS 9380-8e controller.

Table 2 Syncro CS 9380-8e Jumpers and Connectors

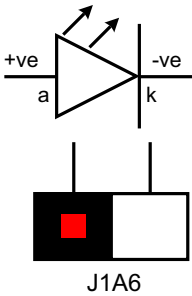
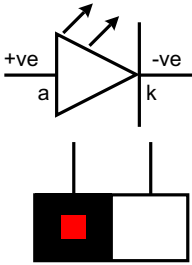
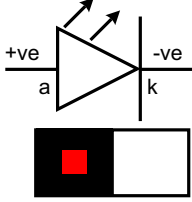
Jumper/Connector	Type	Description
J1A5	Default Serial boot ROM (SBR) header	2-pin connector. Reserved for Avago use.
J1A6	Global drive fault LED header  J1A6 3_02277-01	2-pin connector. Connects to an LED that indicates activity on the drives connected to the controller.
J1A8	CPLD header	5-pin connector. Reserved for Avago use.

Table 2 Syncro CS 9380-8e Jumpers and Connectors (Continued)

Jumper/ Connector	Type	Description
J1A11	Global hard disk drive (HDD) activity LED header  J1A11 3_02280-01	2-pin connector. Connects to an LED that indicates activity on the drives connected to the controller.
J1A12	SAS Port 0 through Port 7 external connector	Two SFF-8644 mini-SAS HD-4e external connectors. Connects the controller by cable to an enclosure containing SAS drives.
J1B1	Advanced software options hardware key header	3-pin header. Enables support for selected advanced features, such as Recovery, FastPath, and SafeStore™ disk encryption. Refer to the <i>MegaRAID Advanced Software Options Hardware Key Quick Installation Guide</i> for more information.
J1B2	Cache write pending header  J1B2 3_02281-00	2-pin connector. Connector for an LED mounted on the system enclosure. The LED indicates that the data in the cache has yet to be written to the storage devices.
J1B3	Avago Test header	2-pin connector. Reserved for Avago use.
J1B4	On-board Serial Universal Asynchronous Receiver/Transmitter (UART) connector	4-pin connector. Reserved for Avago use.
J2B4	Standard edge card connector	The interface between the RAID controller and the host system. Along with the PCIe interface, this connector provides power to the board and an I ² C interface connected to the I ² C bus for the Intelligent Platform Management Interface (IPMI).
J4A1	CacheVault Flash Module (ONFI) interface	80-pin connector. Connects the RAID controller to a flash module.

5. Ground yourself and then place the Syncro CS controller on a flat, clean, static-free surface.

NOTE

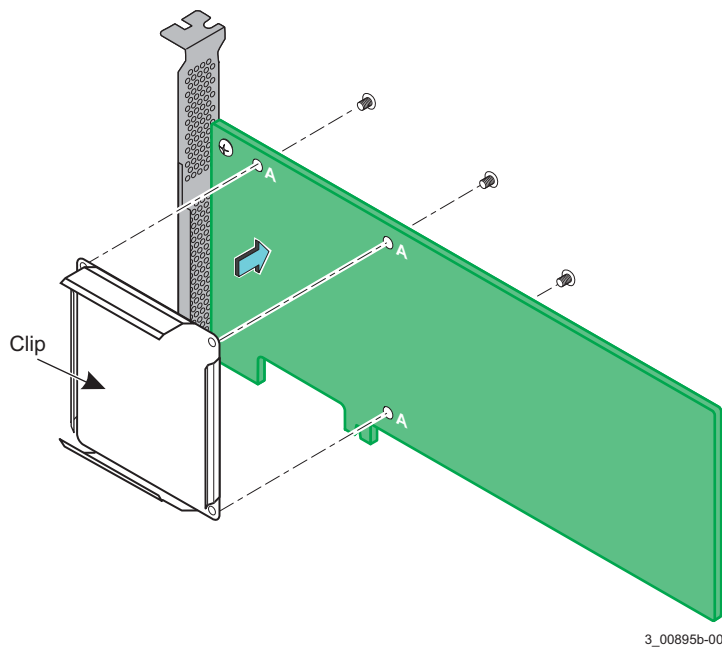
If you want to replace a bracket, refer to the *Replacing Brackets on MegaRAID SAS+SATA RAID Controllers Quick Installation Guide* at <http://www.avagotech.com/support/download-search> for instructions.

6. Perform the following steps to attach the clip to a BBU-BRACKET-05 remote mount board.
 - a. With the remote mount board on a flat, clean, static-free surface, ground yourself, and make sure that the system is grounded.
 - b. Remove the mounting clip and the remote mount board module from the package.
 - c. Place the clip and the remote mount board module front-side-up on a flat, clean, static-free surface.
 - d. Hold the clip so the screw holes on the clip line up with the screw holes on the remote mount board, as shown in the following figure.
 - e. Secure the clip to the three screw holes with the screws and the nuts.The screws thread through the front of the clip and the remote mount board.

NOTE

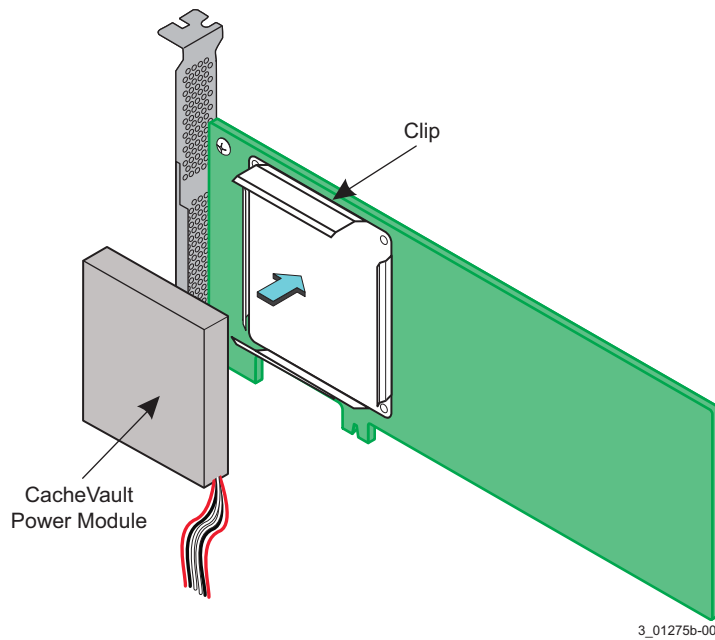
Center the screwdriver carefully to avoid stripping the screw heads. Do not over-tighten the screws.

Figure 11 Installing the Clip on the Remote Mount Board



7. Perform the following steps to attach the CVPM02 module to the clip.
 - a. Ground yourself, and make sure that the system is grounded.
 - b. Remove the CVPM02 module from the package.
 - c. Place the CVPM02 module front-side-up on a flat, clean, static-free surface.
 - d. Press the CVPM02 module into the clip until the module clicks firmly into place, as shown in the following figure.

Figure 12 Attaching the CVPM02 Module to the Clip

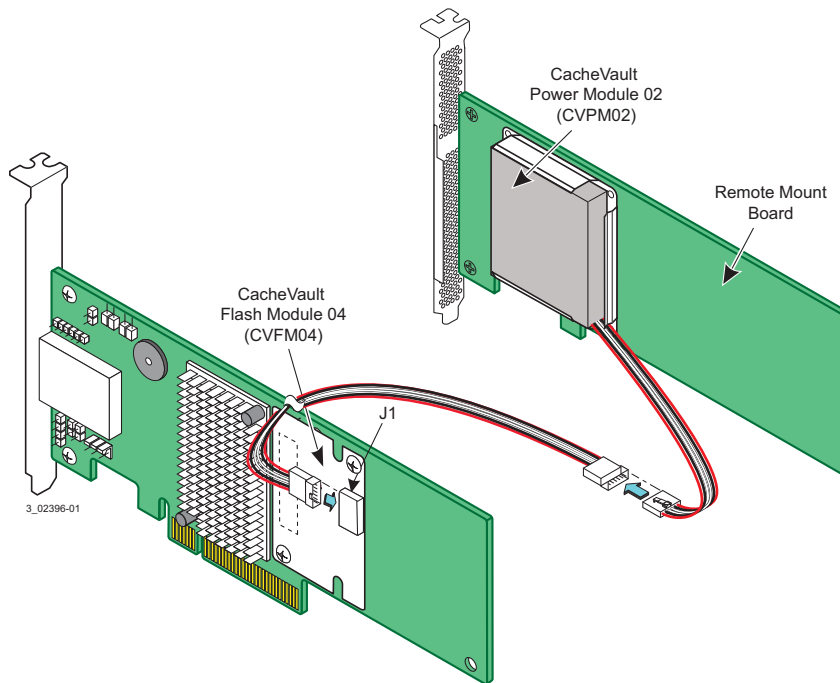


8. Follow these steps to connect the CVFM04 module on your Syncro CS controller by cable to the remote CVPM02 module.

NOTE The CVFM04 modules come pre-installed on the Syncro CS 9380-8e controllers.

- a. Place the controller on a flat, clean, static-free surface.
- b. Ground yourself, and make sure that the system is grounded.
- c. Remove the cable that is included in the box.
The cable has a 9-pin connector on one end and a 6-pin connector on the other.
- d. Insert the 9-pin connector on the cable into the 9-pin J1 connector on the CVFM04 module, as shown in the following figure.
- e. Insert the 6-pin connector into the 6-pin connector on the cable from the remote CVPM02 module.
Align the cable connectors to make sure that they are connected correctly.

Figure 13 Connecting the CVFM04 Module by Cable to the Remote CVPM02 Module



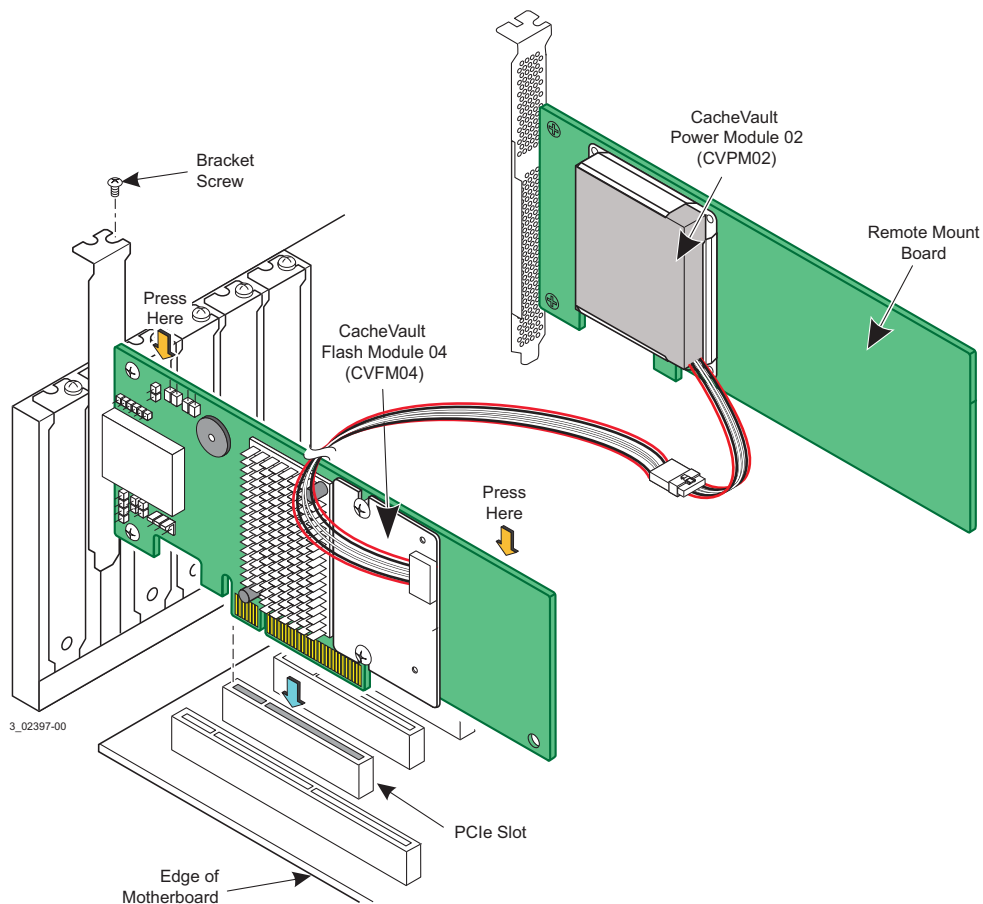
9. Follow these steps to reinstall your Syncro CS 9380-8e controller in a PCIe slot on the motherboard.
 - a. Make sure that the power to the chassis is still turned off, the power cords are unplugged, and the chassis is grounded and has no AC power.
 - b. Install the controller in a PCIe slot on the motherboard, as shown in the following figure.

NOTE

Some PCIe slots support only PCIe graphics cards; a controller installed in one of these slots will not function. Refer to your computer documentation for information about the PCIe slot.

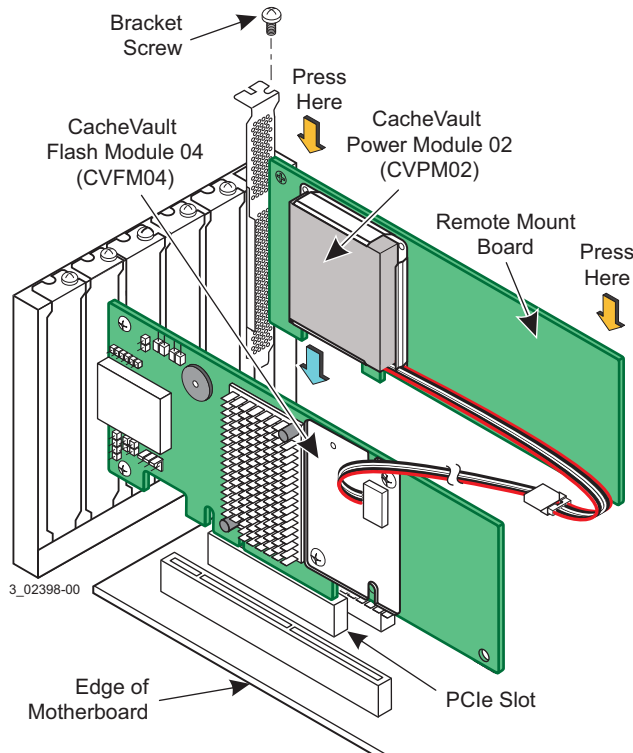
- c. Press down gently, but firmly, to seat the card correctly in the slot.
- d. Secure the controller to the computer chassis with the bracket screw.

Figure 14 Reinstalling the Controller



10. Follow these steps to install the remote mount board on the motherboard.
 - a. Insert the remote mount board in a PCIe slot on the motherboard, as shown in the following figure
 - b. Press down gently, but firmly, to seat the board correctly in the slot.
 - c. Use the bracket screw to secure the remote mount board to the system chassis.

Figure 15 Installing the Remote Mount Board



11. Repeat step 4 to step 10 to install the second Syncro CS controller and the CVPM02 module in the second server module of the CiB enclosure.
12. If necessary, install SAS disk drives in the CiB enclosure.

NOTE

Drives that are used in the Avago Syncro CS solution must be selected from the compatibility list that Avago maintains on its website. See the URL for this compatibility list in [Section 1.4, Hardware Compatibility](#).

13. Use SAS cables to connect the internal connectors of the Syncro CS controllers to SAS devices in the CiB enclosure. Refer to the CiB manufacturer's documentation for information on connecting SAS cables.

NOTE

CiB chassis manufacturers determine the availability and configuration of external JBOD storage expansion connections. Refer to the instructions from the CiB vendor on how to properly configure SAS cable connections for external JBOD enclosures, if your CiB chassis offers this capability. Also, see the Avago hardware compatibility list at the UL listed in [Section 1.4, Hardware Compatibility](#).

14. Reinstall the cover of the CiB enclosure and reconnect the power cords. Turn on the power to the CiB enclosure. The firmware takes several seconds to initialize. During this time, the controllers scan the ports.

Refer to the *12Gb/s MegaRAID SAS Software User Guide* at <http://www.avagotech.com/support/download-search> for information about running the configuration utilities and installing the software drivers.

Refer to the *Syncro CS 9361-8i and Syncro CS 9380-8e Solution User Guide* at <http://www.avagotech.com/support/download-search> for the procedures used to create the HA-DAS cluster configuration after the hardware is fully configured and the operating system is installed.

2.5 Syncro CS Cluster-in-a-Box Software Setup

Perform the following steps to set up the software for a Syncro CS CiB configuration.

1. Configure the drive groups and the virtual drives on the two controllers.
For specific instructions, refer to the *Syncro CS 9361-8i and Syncro CS 9380-8e Solution User Guide* at <http://www.avagotech.com/support/download-search>. You can use the WebBIOS, StorCLI, or MegaRAID Storage Manager configuration utilities to create the groups and virtual drives.
2. Install the operating system driver on both server nodes.
You must install the software driver first, before you install the operating system.
You can view the supported operating systems and download the latest drivers for the Syncro CS controllers from the Avago website at <http://www.avagotech.com/support/download-search>. Access the download center, and follow the steps to download the appropriate driver.
Refer to the *MegaRAID SAS Device Driver Installation User Guide* at <http://www.avagotech.com/support/download-search> for more information about installing the driver. Be sure to review the readme file that accompanies the driver.
3. Install the operating system on both server nodes, following the instructions from the operating system vendor.
Make sure you apply all of the latest operating system updates and service packs to ensure proper functionality.
You have two options for installing the operating system for each controller node:
 - Install it on a private volume connected to the system-native storage controller. The recommended best practice is to install the operating system on this private volume because the disks in the clustering configuration cannot see this volume. Therefore, no danger exists of accidentally overwriting the operating system disk when you set up clustering.
 - Install it on an exclusive virtual drive connected to the Syncro CS controller. Exclusive host access is required for a boot volume so the volume is not overwritten accidentally when you create virtual drives for data storage. For instructions on how to create exclusive virtual drives using the WebBIOS utility, refer to the *Syncro CS 9361-8i and Syncro CS 9380-8e Solution User Guide* at <http://www.avagotech.com/support/download-search>.

NOTE The Syncro CS solution does not support booting from a shared operating system volume.

4. Install StorCLI and MegaRAID Storage Manager for the Windows® and Linux® operating systems following the installation steps outlined in the *StorCLI Reference Manual* and *12Gb/s MegaRAID SAS Software User Guide* at <http://www.avagotech.com/support/download-search>.

Revision History

Version 3.0, August 18, 2015

Revised [Figure 1, CiB Syncro CS 9361-8i Configuration](#).

Version 2.0, November 2014

Revised [Section 1.6, Performance Considerations](#) and [Figure 1](#). Added a link to the download page on the LSI.com website.

Version 1.0, August 2014

Initial release of this document.

