

# Dell PowerVault MD1200/MD1220 Disk Expansion SAS Quick Cabling Guide

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PowerVault™ MD3200/MD3220, MD3200i/MD3220i-series, MD3600i/MD3620i-series and MD3600f/MD3620f Storage Arrays



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## Components of Dell PowerVault™ MD32xx/MD32xxi and MD36xxi/MD36xxf Systems

The following are the integral blocks of the Dell PowerVault™ MD32/36 series storage array systems:

1. **MD3200 and MD3220 SAS RAID array** residing in the enclosure with 12 horizontally positioned 3.5" disk slots and 24 vertically positioned 2.5" disk slots respectively.
2. **MD3200i and MD3220i** have 1Gb iSCSI **RAID array** residing in the enclosure with 12 horizontally positioned 3.5" disk slots and 24 vertically positioned 2.5" disk slots respectively.
3. **MD3600i and MD3620i** have the 10Gb iSCSI **RAID array** residing in the enclosure with 12 vertically positioned 3.5" disk slots and 24 vertically positioned 2.5" disk slots respectively.
4. **MD3600f and MD3620f** have the Fibre Channel-connected **RAID array** residing in the enclosure with 12 vertically positioned 3.5" disk slots and 24 vertically positioned 2.5" disk slots respectively.
5. **MD1200 and MD1220** have the RAID array **expansion** residing in the enclosure with 12 horizontally positioned 3.5" disk slots and 24 vertically positioned 2.5" disk slots respectively.

MD3200 and MD3220 (back view):



MD3200i and MD3220i (back view):



MD3600i and MD3620i (back view):



MD3600f and MD3620f (back view):



MD1200 and MD1220 (back view):



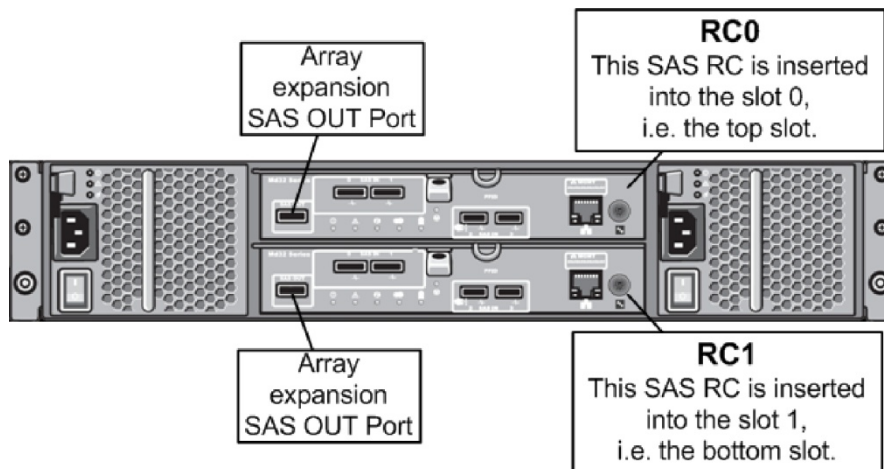
**NOTE:**

This guide makes an assumption that the user has MD32/MD36 systems operating in the duplex mode (the recommended mode of operation), i.e. when both RAID controllers are present and are fully operational.

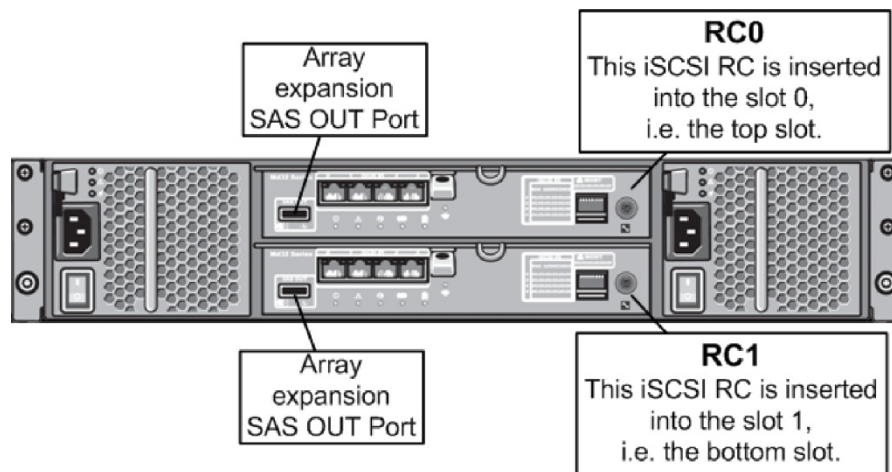
Front view of MD32/36-series/MD1200 (top) and MD1220 (bottom):



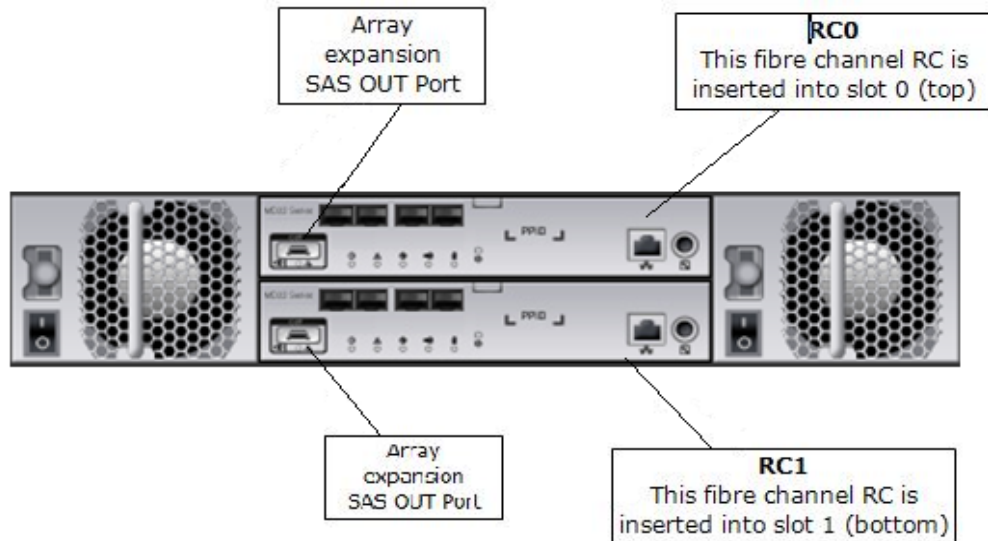
MD32xx SAS RAID array has SAS RAID controllers (RCs):



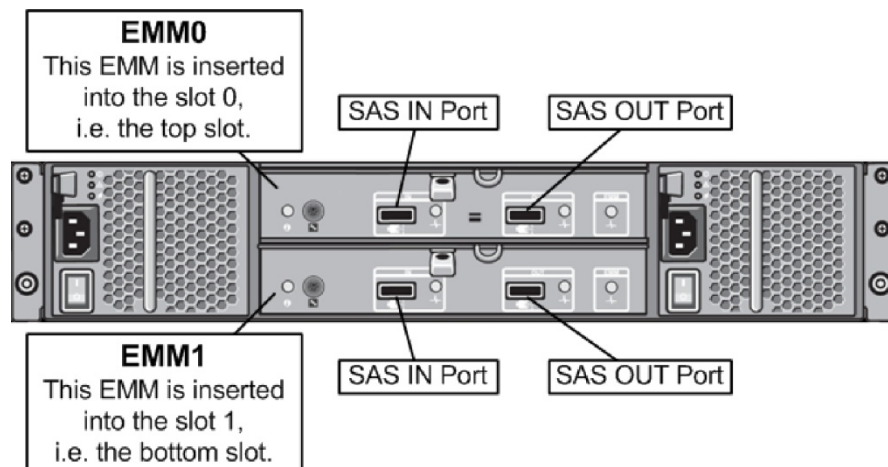
MD32xxi iSCSI RAID array has iSCSI RAID controllers (RCs):



MD36xxf Fibre Channel RAID array has Fibre Channel RAID controllers (RCs):



Array expansion enclosure has enclosure management modules (EMMs):



## Supported System Configurations

The MD32/MD36-series storage arrays can be mixed and matched and can expand up to 96 drives.

[Table 1](#) shows some of the supported system configurations.

**Table 1.** Supported System Configurations

Config uration ID	Total Number of Enclosures	Maximum Number of Disks	Number of Enclosures with 12 Disk Slots	Number of Enclosures with 24 Disk Slots	Simple Cascade Scheme Illustration	Fault-tolerant Asymmetric Cabling Scheme Illustration
C01	8	96	8	0	( <a href="#">hyperlink</a> ) <a href="#">Figure 1</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 9</a>
C02	7	96	6	1	( <a href="#">hyperlink</a> ) <a href="#">Figure 2</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 10</a>
C03	7	84	7	0	( <a href="#">hyperlink</a> ) <a href="#">Figure 2</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 10</a>
C04	6	96	4	2	( <a href="#">hyperlink</a> ) <a href="#">Figure 3</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 11</a>
C05	6	84	5	1	( <a href="#">hyperlink</a> ) <a href="#">Figure 3</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 11</a>
C06	6	72	6	0	( <a href="#">hyperlink</a> ) <a href="#">Figure 3</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 11</a>
C07	5	96	2	3	( <a href="#">hyperlink</a> ) <a href="#">Figure 4</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 12</a>
C08	5	84	3	2	( <a href="#">hyperlink</a> ) <a href="#">Figure 4</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 12</a>
C09	5	72	4	1	( <a href="#">hyperlink</a> ) <a href="#">Figure 4</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 12</a>
C10	5	60	5	0	( <a href="#">hyperlink</a> ) <a href="#">Figure 4</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 12</a>
C11	4	96	0	4	( <a href="#">hyperlink</a> ) <a href="#">Figure 5</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 13</a>
C12	4	84	1	3	( <a href="#">hyperlink</a> ) <a href="#">Figure 5</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 13</a>
C13	4	72	2	2	( <a href="#">hyperlink</a> ) <a href="#">Figure 5</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 13</a>
C14	4	60	3	1	( <a href="#">hyperlink</a> ) <a href="#">Figure 5</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 13</a>
C15	4	48	4	0	( <a href="#">hyperlink</a> ) <a href="#">Figure 5</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 13</a>
C16	3	72	0	3	( <a href="#">hyperlink</a> ) <a href="#">Figure 6</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 14</a>
C17	3	60	1	2	( <a href="#">hyperlink</a> ) <a href="#">Figure 6</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 14</a>
C18	3	48	2	1	( <a href="#">hyperlink</a> ) <a href="#">Figure 6</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 14</a>
C19	3	36	3	0	( <a href="#">hyperlink</a> ) <a href="#">Figure 6</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 14</a>
C20	2	48	0	2	( <a href="#">hyperlink</a> ) <a href="#">Figure 7</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 7</a>
C21	2	36	1	1	( <a href="#">hyperlink</a> ) <a href="#">Figure 7</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 7</a>
C22	2	24	2	0	( <a href="#">hyperlink</a> ) <a href="#">Figure 7</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 7</a>
C23	1	24	0	1	( <a href="#">hyperlink</a> ) <a href="#">Figure 8</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 8</a>
C24	1	12	1	0	( <a href="#">hyperlink</a> ) <a href="#">Figure 8</a>	( <a href="#">hyperlink</a> ) <a href="#">Figure 8</a>

## Fault-tolerant Asymmetric Cabling Scheme

Although more complex to set up, a fault-tolerant asymmetric cabling scheme is the recommended method of connecting an expansion enclosure to the RAID array.

*Enclosure loss protection* is an attribute of a disk group. Enclosure loss protection guarantees accessibility to data on the virtual disks in a disk group if a total loss of communication occurs with a single expansion enclosure. An example of total loss of communication might include loss of power to the expansion enclosure or failure of both EMM modules. Obviously, enclosure loss protection is not guaranteed if a physical disk has already failed in the disk group. In this situation, losing access to an expansion enclosure and a second physical disk failure in the disk group would cause a loss of data.

Enclosure loss protection can be achieved in a disk group where all physical disks that comprise the disk group are located in different expansion enclosures, depending on RAID level.

For sample cabling diagrams, see <sup>([hyperlink](#))</sup> [Table 1](#)

**Note:** Incorrect SAS cabling will be detected by the array system. The MD Storage Manager will warn you about mis-wired enclosures by logging a major event in the event log. In addition, the Recovery Guru will point you to the condition and provide guidance on correcting the problem. However, a mis-wired enclosure will only be reported if the issue results in a non-working configuration. For example, it is possible to mis-wire the expansion enclosures, but retain non-optimal storage array function. In such a case, the mis-wire events will not be logged in the event log.

## Simple Cascade Cabling Scheme

A simple cascade cabling scheme may be appropriate when enclosure loss protection is not required. The advantage of using this simplified scheme is the ease of the initial system setup.

For sample cabling diagrams, see <sup>([hyperlink](#))</sup> [Table 1](#)



## SAS Expansion Cabling Diagrams

This section contains cabling diagrams illustrating the MD32/MD36-series expansion configurations. For consistency,

The last diagram ([hyperlink](#)) [Figure 15](#) contained in this section is a special case: it contains picture of the labels which you can print, cut out and attach to the both ends of every SAS cable used in your configuration for an easy identification. If after initial wiring your array system has to be transported/moved then the labeled SAS cables will simplify the task of re-assembling the system.

**Figure 1.** Simple Cascade Cabling Scheme: Configuration C01

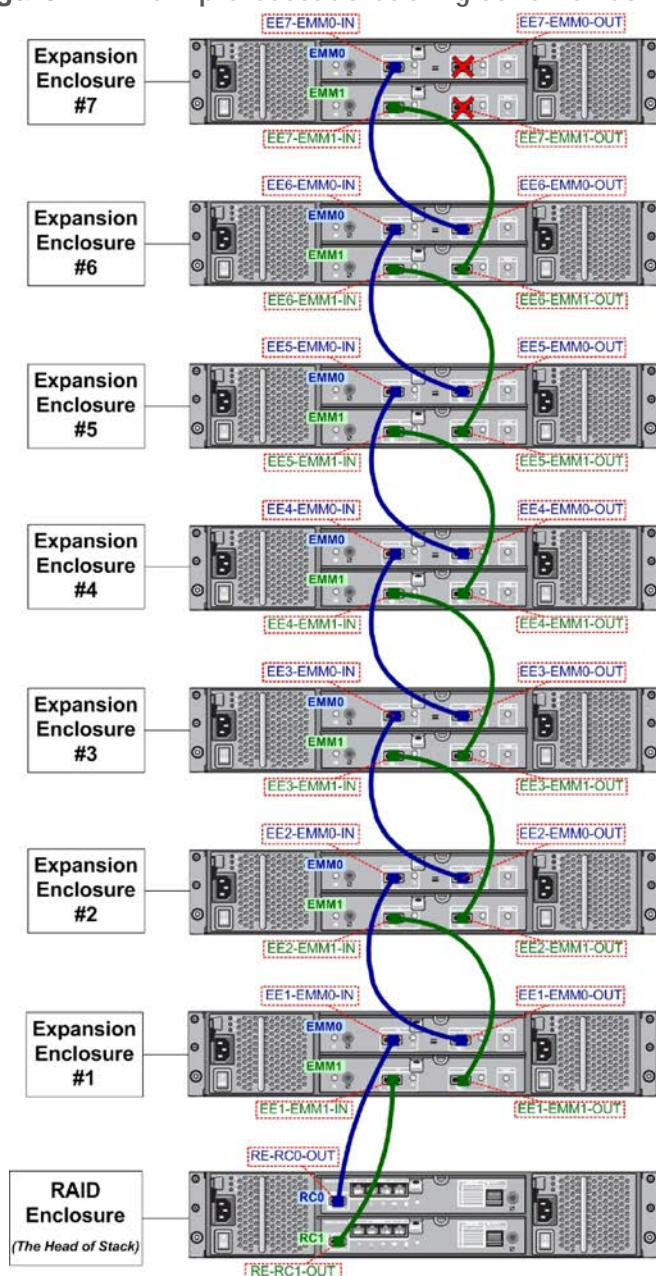


Figure 2. Simple Cascade Cabling Scheme: Configurations C02, C03

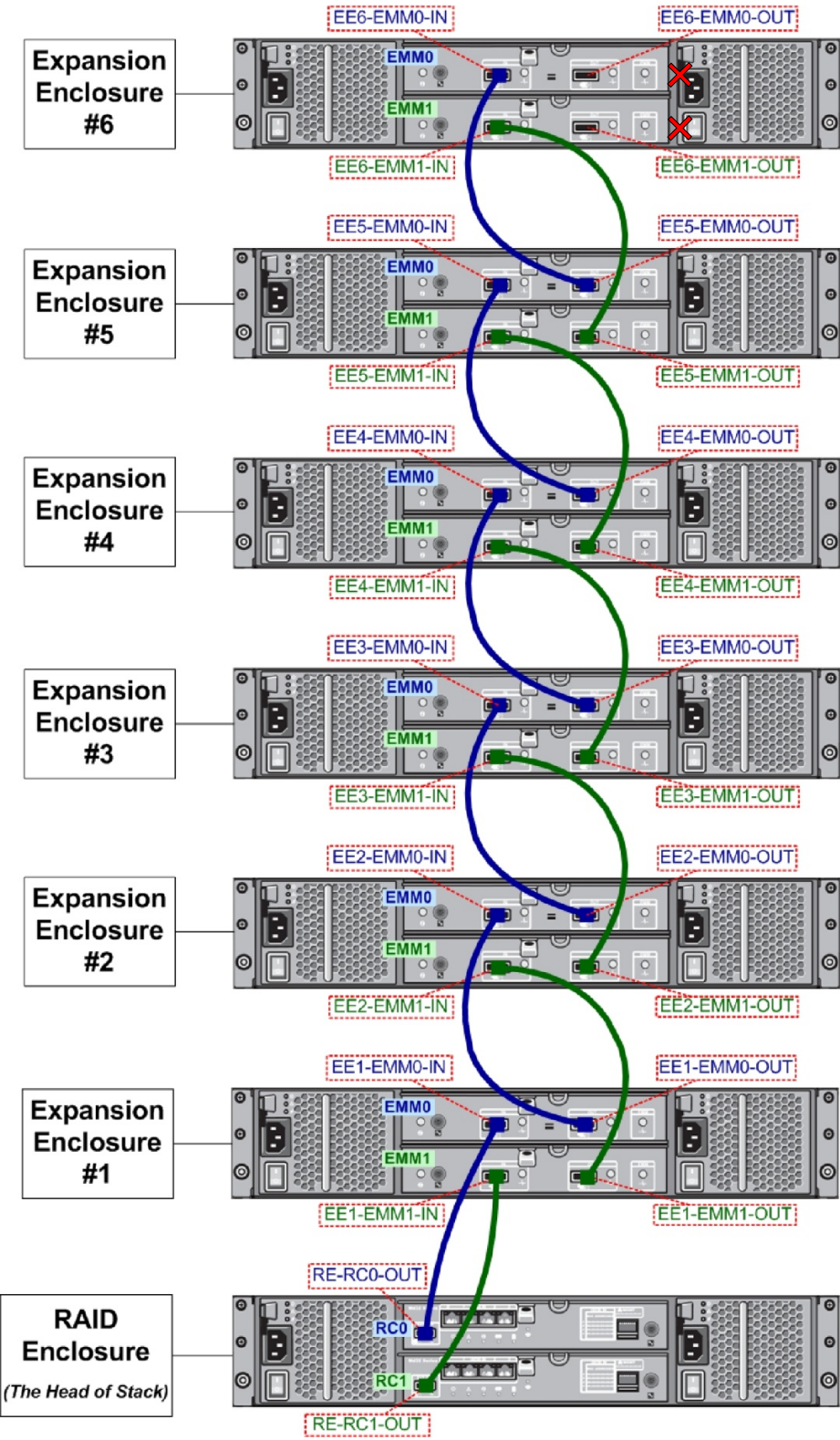


Figure 3. Simple Cascade Cabling Scheme: Configurations C04, C05, C06

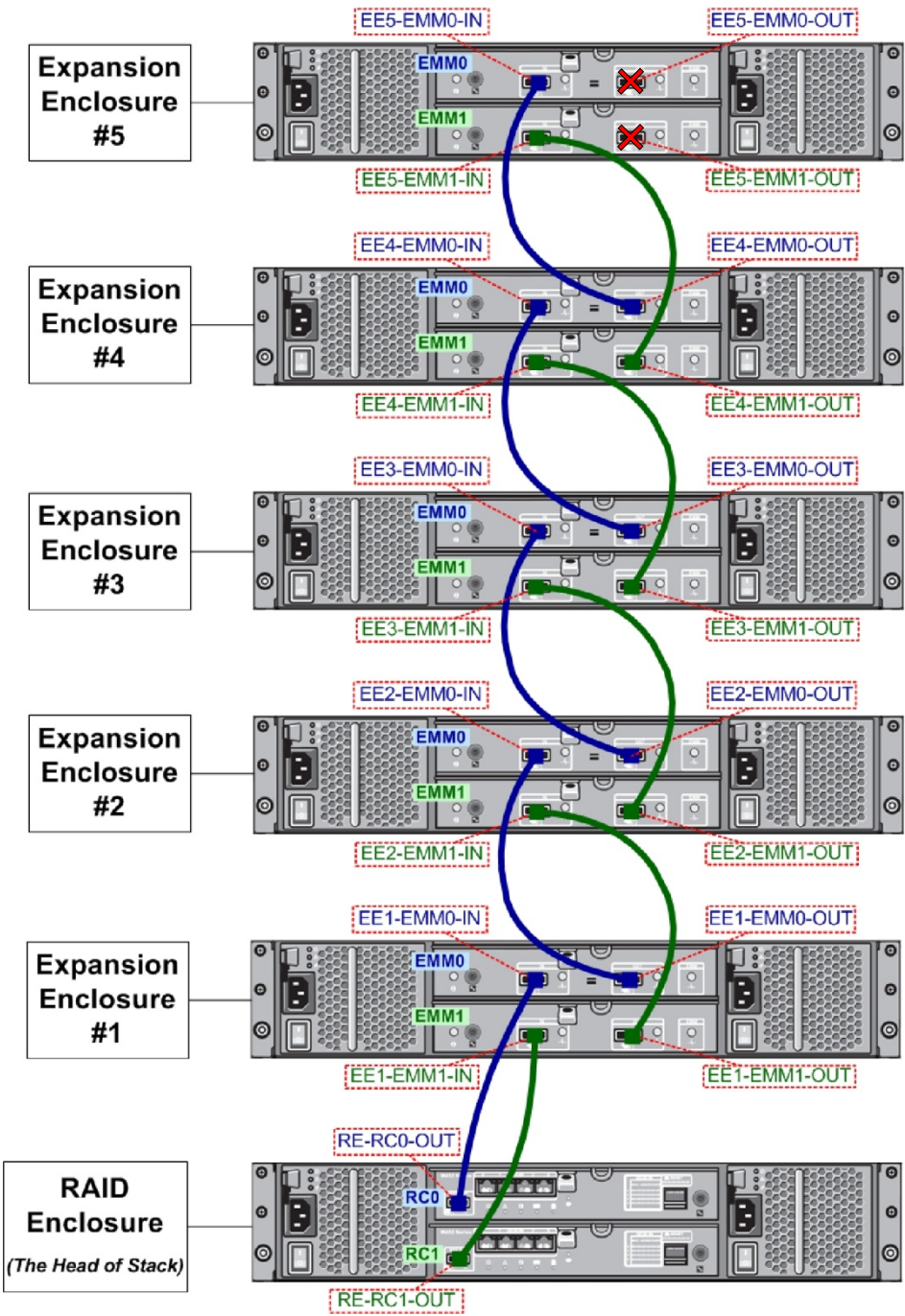




Figure 4. Simple Cascade Cabling Scheme: Configurations C07, C08, C09, C10

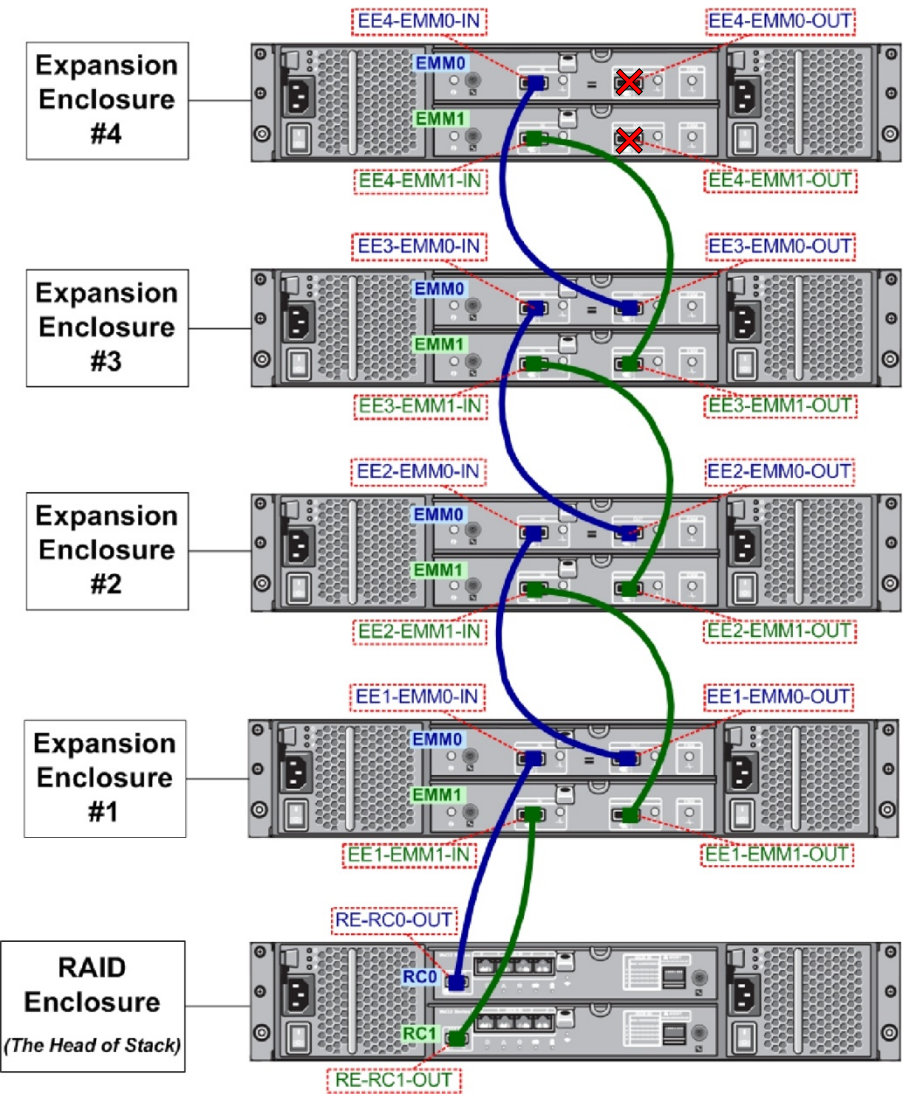


Figure 5. Simple Cascade Cabling Scheme: Configurations C11, C12, C13, C14, C15

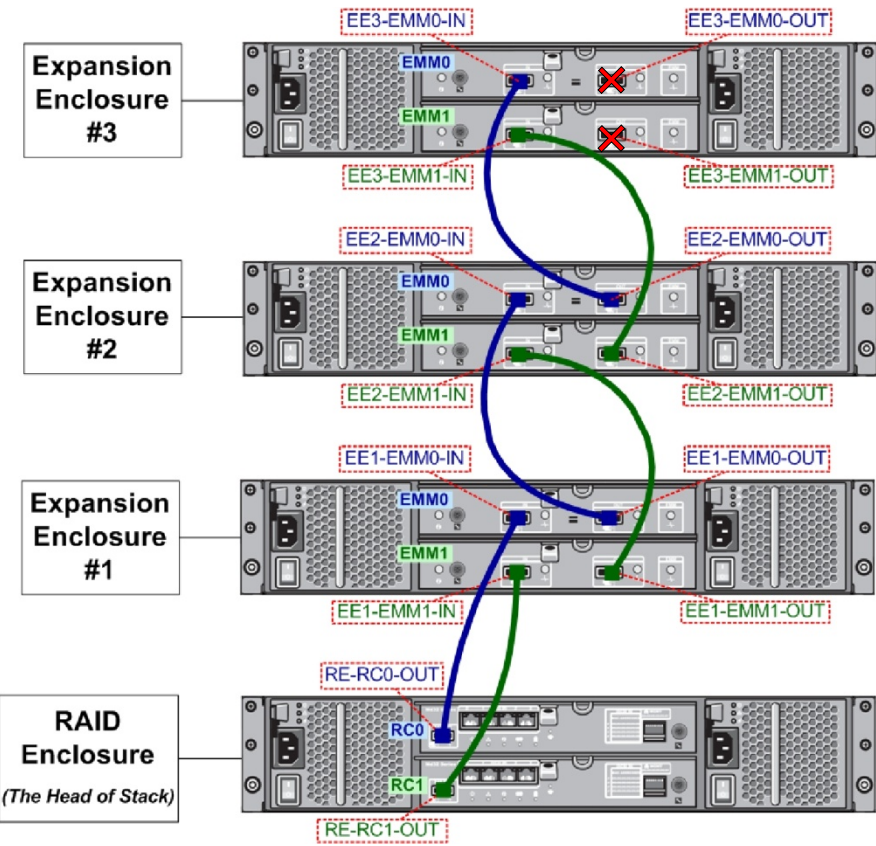


Figure 6. Simple Cascade Cabling Scheme: Configurations C16, C17, C18, C19

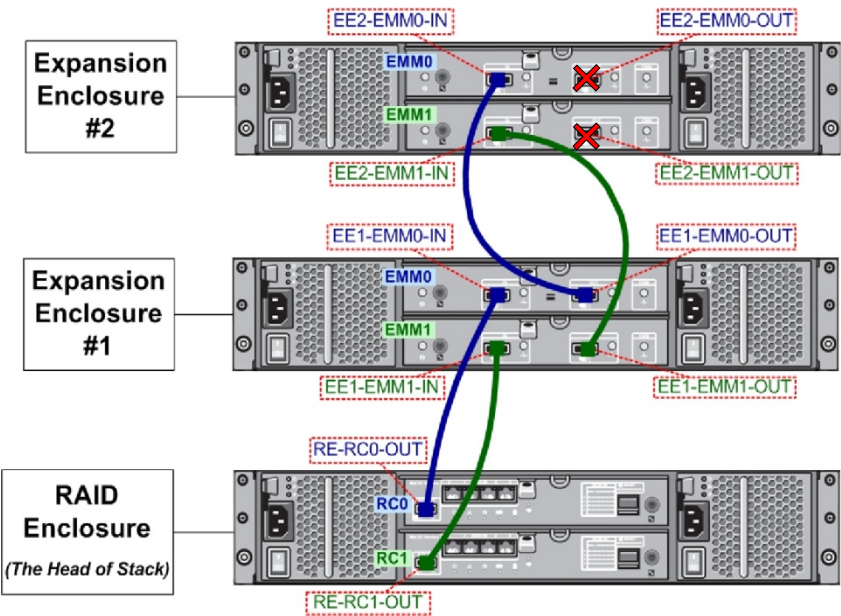


Figure 7. Two Enclosures: Configurations C20, C21, C22

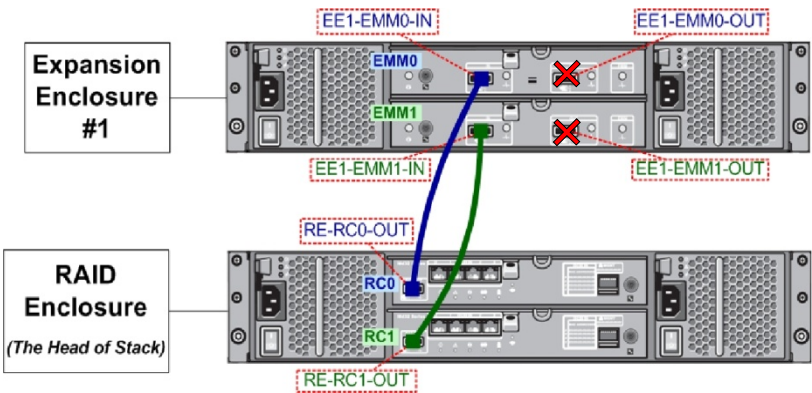


Figure 8. Single Enclosure: Configurations C23, C24

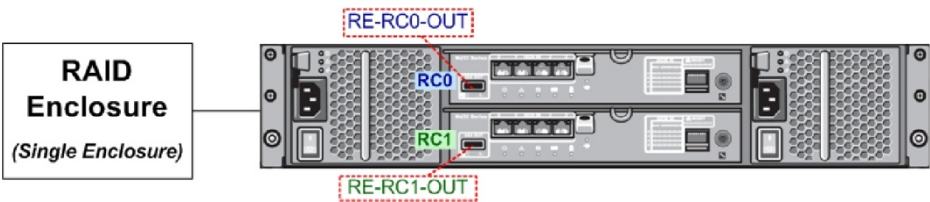
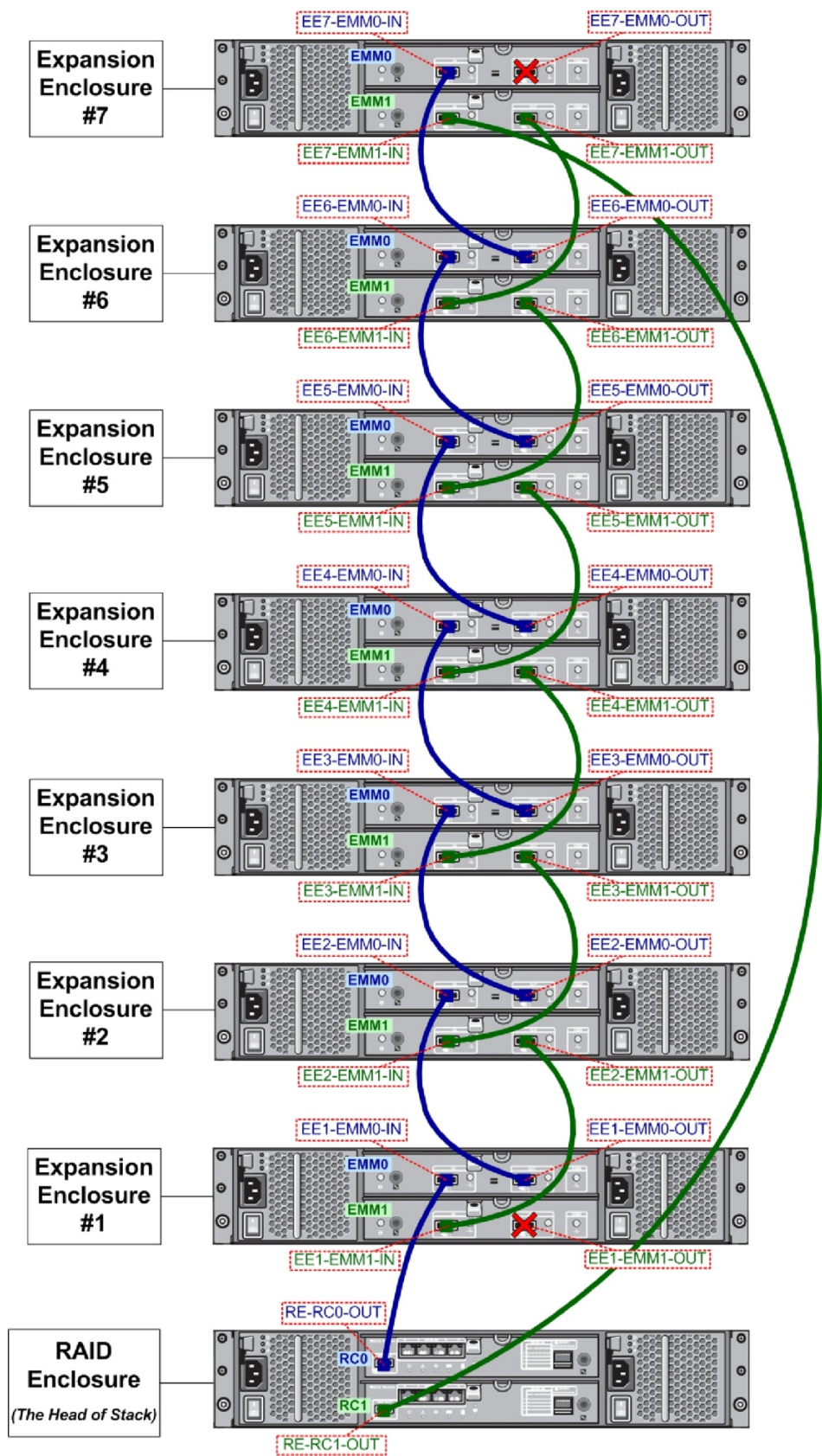
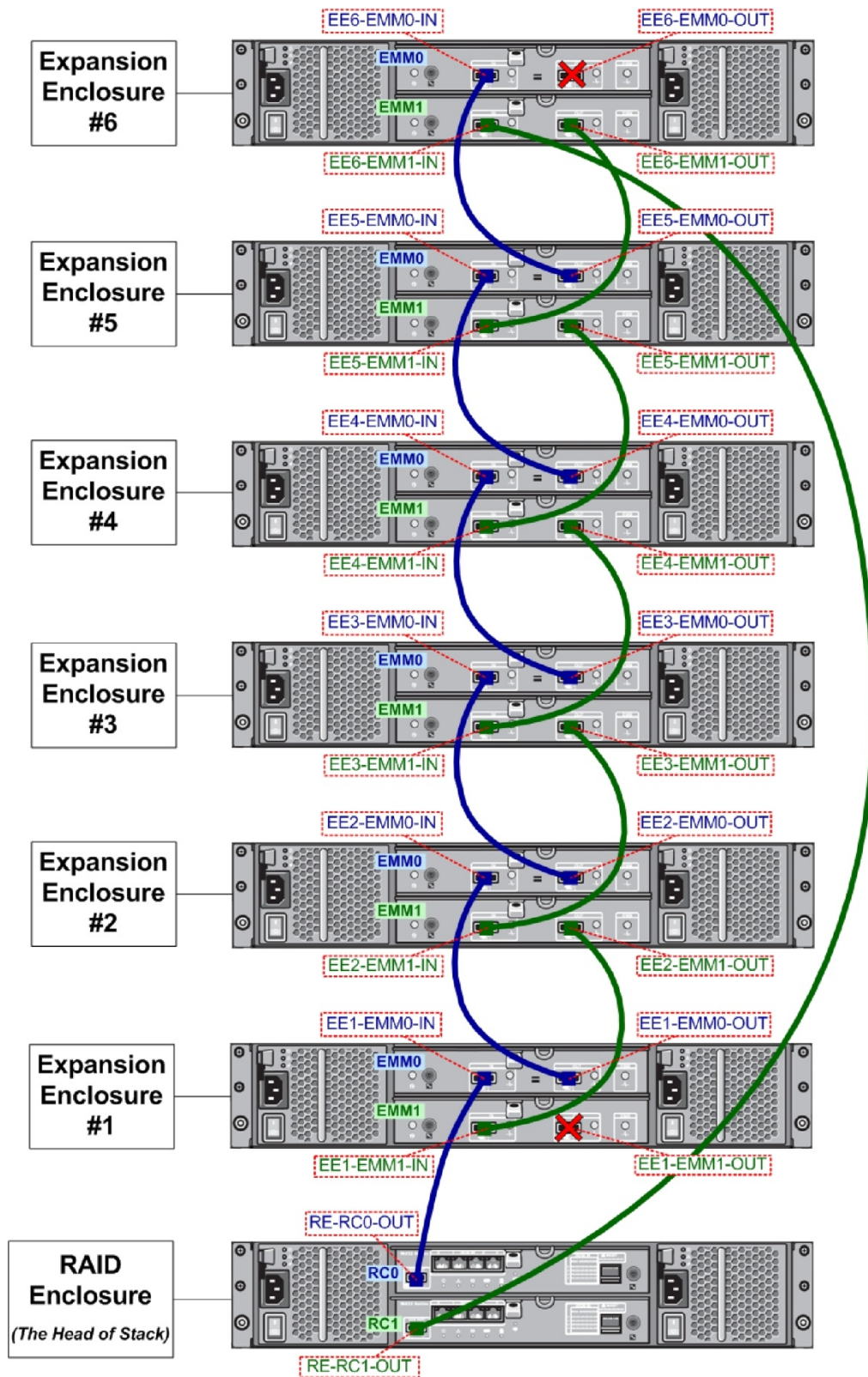


Figure 9. Fault-tolerant Asymmetric Cabling Scheme: Configurations C01



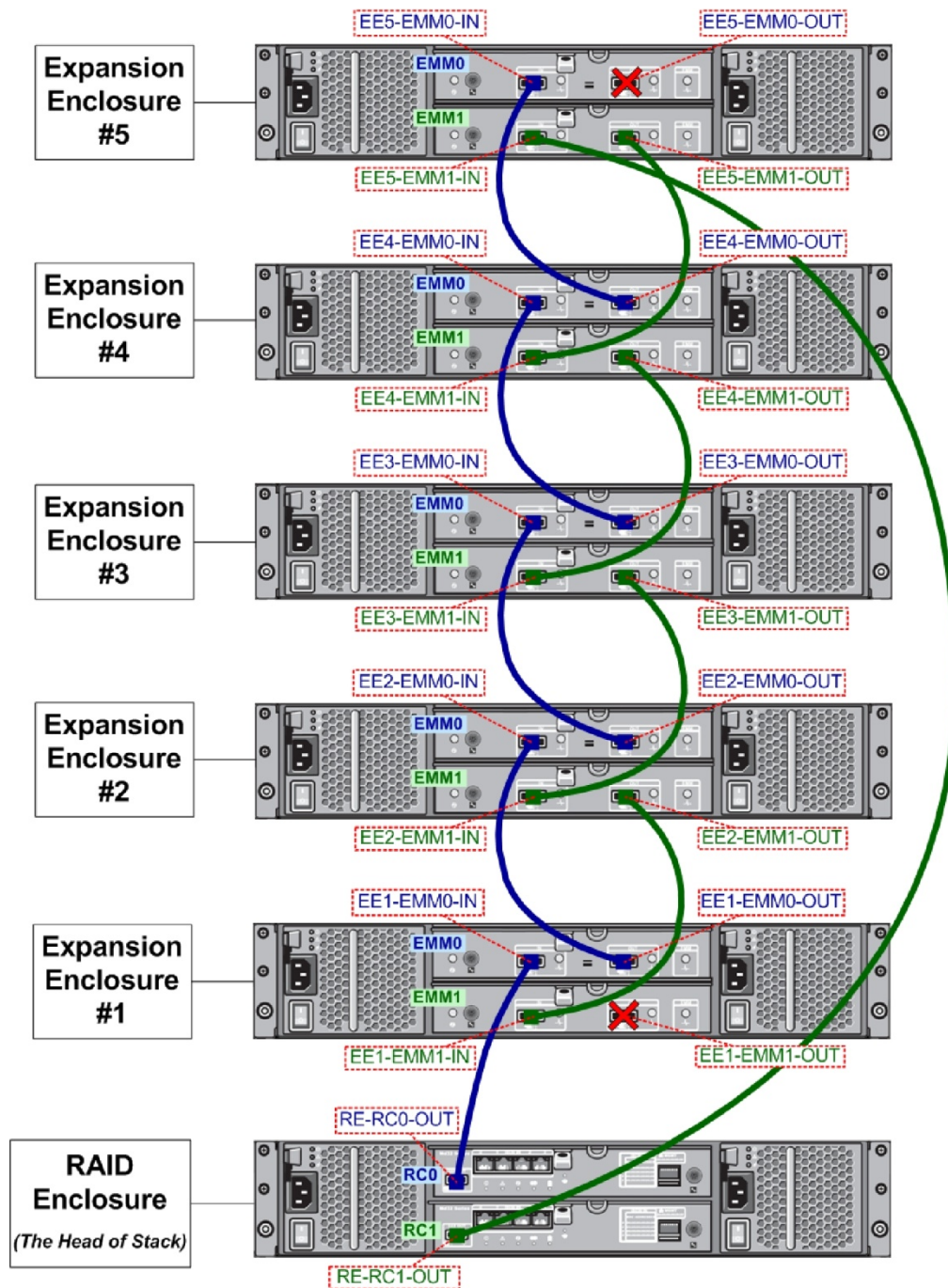


**Figure 10.** Fault-tolerant Asymmetric Cabling Scheme: Configurations C02, C03

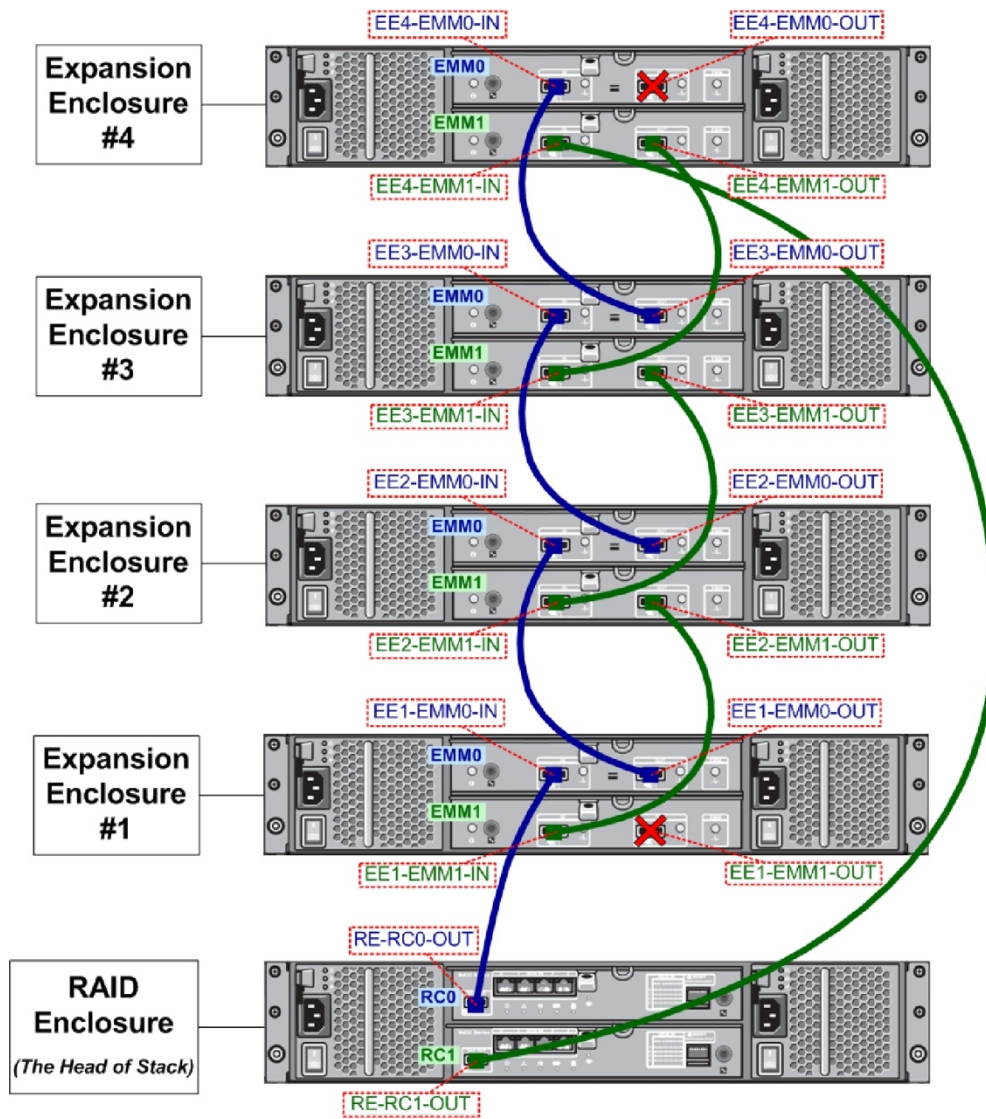




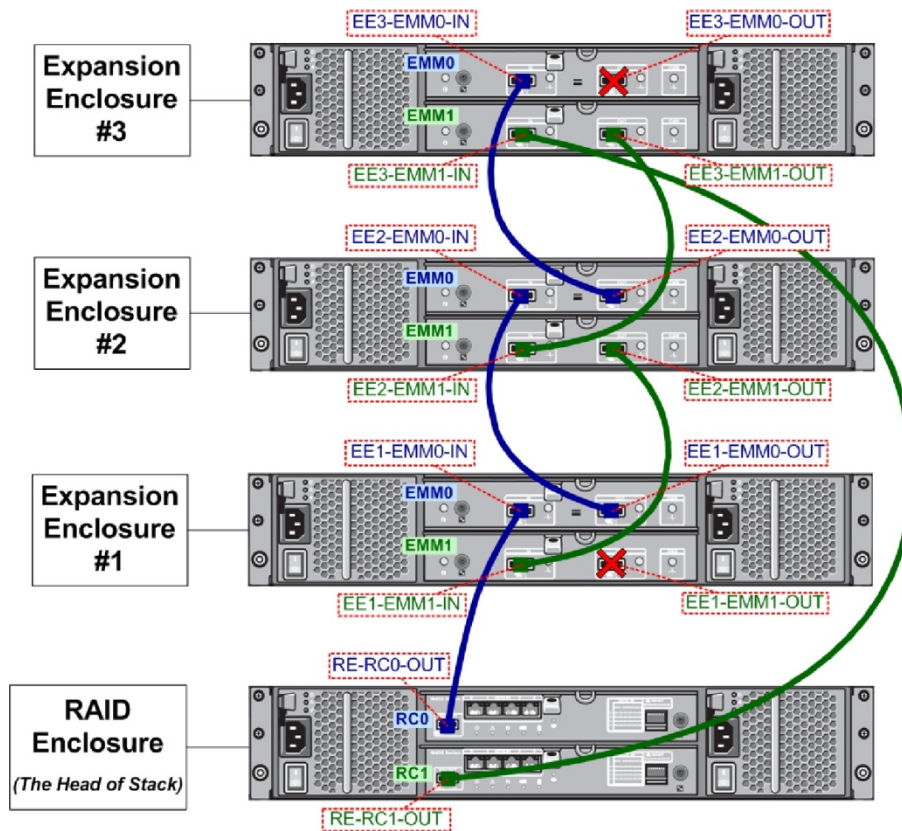
**Figure 11.** Fault-tolerant Asymmetric Cabling Scheme: Configurations C04, C05, C06



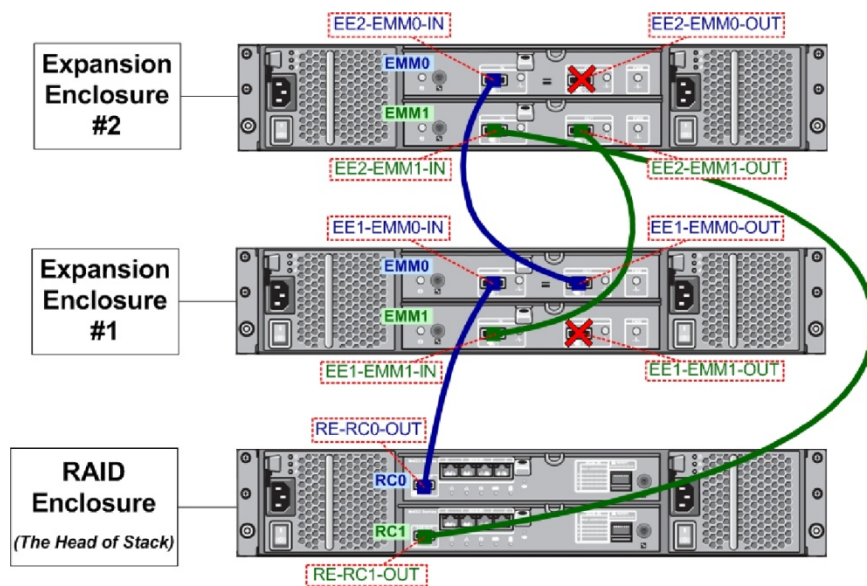
**Figure 12.** Fault-tolerant Asymmetric Cabling Scheme: Configurations C07, C08, C09, C10



**Figure 13.** Fault-tolerant Asymmetric Cabling Scheme: Configurations C11,C12,C13,C14,C15



**Figure 14.** Fault-tolerant Asymmetric Cabling Scheme: Configurations C16, C17, C18, C19



**Figure 15. SAS Cable Labels**

(Cut out the labels and attach them to the ends of the SAS cables)

RE-RC0-OUT	RE-RC1-OUT		
EE1-EMM0-IN	EE1-EMM0-OUT	EE1-EMM1-IN	EE1-EMM1-OUT
EE1-EMM0-IN	EE1-EMM0-OUT	EE1-EMM1-IN	EE1-EMM1-OUT
EE2-EMM0-IN	EE2-EMM0-OUT	EE2-EMM1-IN	EE2-EMM1-OUT
EE2-EMM0-IN	EE2-EMM0-OUT	EE2-EMM1-IN	EE2-EMM1-OUT
EE3-EMM0-IN	EE3-EMM0-OUT	EE3-EMM1-IN	EE3-EMM1-OUT
EE3-EMM0-IN	EE3-EMM0-OUT	EE3-EMM1-IN	EE3-EMM1-OUT
EE4-EMM0-IN	EE4-EMM0-OUT	EE4-EMM1-IN	EE5-EMM1-OUT
EE4-EMM0-IN	EE4-EMM0-OUT	EE4-EMM1-IN	EE5-EMM1-OUT
EE5-EMM0-IN	EE5-EMM0-OUT	EE5-EMM1-IN	EE5-EMM1-OUT
EE5-EMM0-IN	EE5-EMM0-OUT	EE5-EMM1-IN	EE5-EMM1-OUT
EE6-EMM0-IN	EE6-EMM0-OUT	EE6-EMM1-IN	EE6-EMM1-OUT
EE6-EMM0-IN	EE6-EMM0-OUT	EE6-EMM1-IN	EE6-EMM1-OUT
EE7-EMM0-IN	EE7-EMM0-OUT	EE7-EMM1-IN	EE7-EMM1-OUT
EE7-EMM0-IN	EE7-EMM0-OUT	EE7-EMM1-IN	EE7-EMM1-OUT