

## P2000 G3 MSA System Cable Configuration Guide

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### About this document

This document is for the person who installs, administers, and troubleshoots servers and storage systems. HP assumes that you are qualified in servicing and installing computer equipment, and are trained in recognizing hazards in products and hazardous energy levels. For complete information on installing and configuring your product, please see the user guide provided with your HP StorageWorks P2000 G3 MSA System. User documents are provided on the Software Support/Documentation CD shipped with the product. For the latest version of a document, see the HP Manuals website: <http://www.hp.com/support/manuals>.

This document contains cable configuration information for HP StorageWorks P2000 G3 MSA Systems.

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### Configuration notes

- Any number or combination of LUNs can be shared among a maximum of 64 host ports as long as the total adds up to no more than 512 LUNs per P2000 G3 system (single or dual controller configuration).
- A maximum of eight (8) enclosures (including the array enclosure) OR one hundred forty-nine (149) drives are allowed in the array configuration.
- In order to maximize performance, do not mix 6Gb and 3Gb disk drives in the same enclosures.

For Windows computers that are cabled directly to the P2000 G3 controller CLI port, a special device driver file must be downloaded and installed on the Windows computer prior to using the CLI port. This device driver file can be found on the Software Support/Documentation CD that is included with your system and at <http://www.hp.com/go/p2000>: click **HP Support & Drivers**, select your product, click **Download drivers and software**, select your Windows operating system, and then select **Driver - Storage Controller**.

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#### NOTE:

Directly cabling to the CLI port is an out-of-band connection because it communicates outside of the data paths used to transfer information from a computer or network to the controller enclosure. An in-band connection can also be used to configure a new controller. If it is, cabling to the CLI port might not be necessary. This method uses the Discovery utility on the Software Support/Documentation CD that is included with your system and is the best way to discover the controllers' IP addresses automatically so that you can use them to log into and manage your controllers using a Web browser for the SMU Web-based interface or telnet for the CLI command-line interface.

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### Connecting the P2000 G3 MSA System to remote management hosts

The management host directly manages systems out-of-band over an Ethernet network.

1. Connect an Ethernet cable to the Ethernet management port on each P2000 G3 MSA controller.

- Connect the other end of each Ethernet cable to a network that your management host can access (preferably on the same subnet).

## Connecting drive enclosures to the P2000 G3 MSA System

The P2000 G3 MSA System supports four models of drive enclosures:

- HP StorageWorks P2000 6Gb 3.5" 12-drive enclosure
- HP StorageWorks D2700 6Gb drive enclosure
- HP StorageWorks MSA2000 3Gb 3.5" 12-drive enclosure
- HP StorageWorks MSA70 3Gb drive enclosure

P2000 G3 MSA System controller enclosures support both 3Gbps and 6Gbps internal disk drive and expander link speeds. Mixing 3Gbps drive enclosures with 6Gbps drive enclosures is supported; however, the mixed-connect drive enclosure environment can result in performance limitations unless configured properly. For more information, see the following white papers at <http://www.hp.com/go/p2000>:

- HP StorageWorks MSA2000 G1 or G2 and P2000 G3 MSA Best Practices*
- Upgrading the HP StorageWorks MSA2000 G1 to the P2000 G3 MSA*
- Upgrading the HP StorageWorks MSA2000 G2 to the P2000 G3 MSA*

Observe the following guidelines when connecting drive enclosures to the P2000 G3 MSA System:

- Use only supported SAS 4x cables.
- Mini-SAS to mini-SAS 0.5m cables are provided with the P2000 6Gb 3.5" 12-drive enclosure and D2700 6Gb drive enclosure (one per controller).
- If longer cables are needed than those supplied with enclosure, they must be purchased separately. See the MSA Quick Specs for details.
- The maximum length cable allowed to connect enclosures in any configuration is 2m.
- A maximum of eight (8) enclosures (including the array enclosure) OR one hundred forty-nine (149) drives are allowed in the array configuration.

**NOTE:** The figures in this document show only P2000 G3 FC controllers in the array enclosure. Cabling requirements for connecting enclosures containing P2000 G3 FC/iSCSI and P2000 G3 SAS controllers to all supported drive enclosures are identical.

## SAS expansion cable requirements

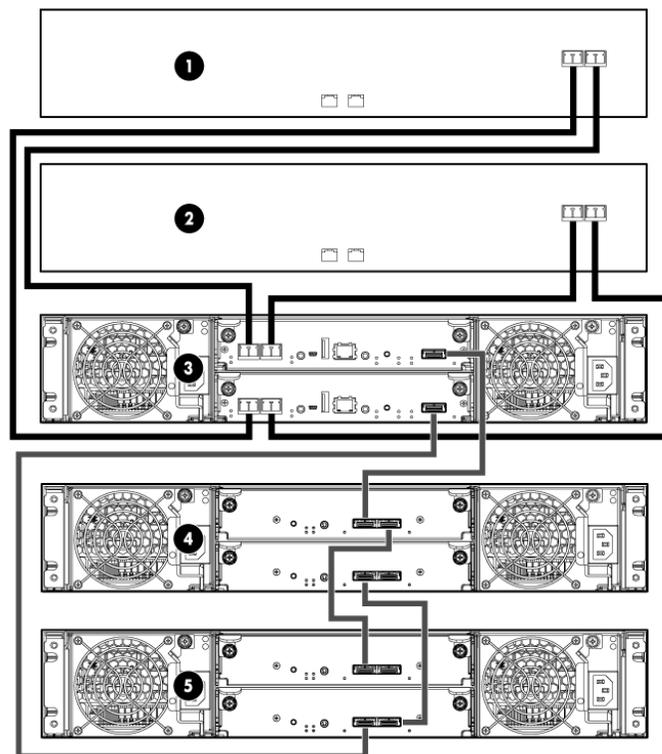
The following table provides SAS expansion cable requirements for P2000 G3 MSA controllers and drive enclosures connection combinations.

Component 1	Component 2	Type of cable needed
P2000 G3 Controller	P2000 6Gb 3.5" 12-drive I/O module	mini-SAS to mini-SAS 0.5m (supplied)

Component 1	Component 2	Type of cable needed
P2000 G3 Controller	D2700 6Gb I/O module	mini-SAS to mini-SAS 0.5m (supplied)
P2000 6Gb 3.5" 12-drive I/O module	P2000 6Gb 3.5" 12-drive I/O module	mini-SAS to mini-SAS 0.5m (supplied)
P2000 6Gb 3.5" 12-drive I/O module	D2700 6Gb I/O module	mini-SAS to mini-SAS 0.5m (supplied)
D2700 6Gb I/O module	D2700 6Gb I/O module	mini-SAS to mini-SAS 0.5m (supplied)

## Complete system example

The following figure shows an example of a typical dual-controller, direct-connect array configuration with two servers accessing the storage. Two servers (1 and 2) are direct-connected to a dual-controller HP StorageWorks P2000 G3 MSA System (3) using Fibre Channel cables. The P2000 G3 is in turn connected to two dual-controller HP StorageWorks P2000 6Gb 3.5" 12-drive enclosures (4 and 5) using mini-SAS to mini-SAS cables in fault-tolerant fashion to ensure maximum fault tolerance protection. Data throughput of the array performs at the 6Gbps internal disk drive and expander link speed rate.



**Figure 1 Full array configuration example**

For more information on server direct-connect and switch-connect cable configurations, see the *HP StorageWorks P2000 G3 MSA System Installation Instructions*.

## Fault-tolerant and straight-through cabling

P2000 G3 MSA System firmware supports both fault-tolerant and straight-through SAS cabling. Fault-tolerant cabling allows any drive enclosure to fail or be removed while maintaining access to other enclosures. When connecting multiple drive enclosures, use fault-tolerant cabling to ensure the highest level of fault tolerance. Some mixed-connect cabling configurations might require the use of straight-through cabling, which does not provide the same level of fault-tolerance as fault-tolerant cabling, but does provide some performance benefits as well as ensuring that all disk are visible to the array.

The following figures shows a P2000 G3 MSA System connected to two D2700 6Gb drive enclosures using fault-tolerant cabling. I/O modules A on the drive enclosures are shaded green. I/O modules B on the drive enclosures are shaded red. Fault-tolerant cabling requires that you connect P2000 G3 controller A to I/O module A of the first drive enclosure and cascade this connection on to I/O module A of the last drive enclosure (shown in green). Likewise, you must connect P2000 G3 controller B to I/O module B of the last drive enclosure and cascade this connection on to I/O module B of the first drive enclosure (shown in red).

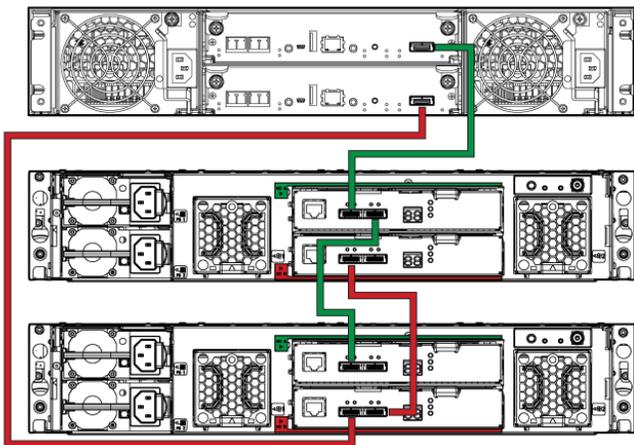


Figure 2 Fault-tolerant cabling example

The following figure shows a P2000 G3 MSA System connected to two D2700 6Gb drive enclosures using straight-through cabling. Straight-through cabling requires that you connect P2000 G3 controller A to I/O module A of the first drive enclosure which is in turn connected to I/O module A of the last drive enclosure (shown in green). P2000 G3 controller B is connected to I/O module B of the first drive enclosure which is in turn connected to I/O module B of the last drive enclosure (shown in red).

### ⓘ IMPORTANT:

Fault-tolerant cabling provides the highest level of fault-tolerance protection for the array. Please note that while using straight-through cabling can sometimes provide increased performance in the array, it also increases the risk of losing access to one or more enclosures in the event of an enclosure failure or removal.

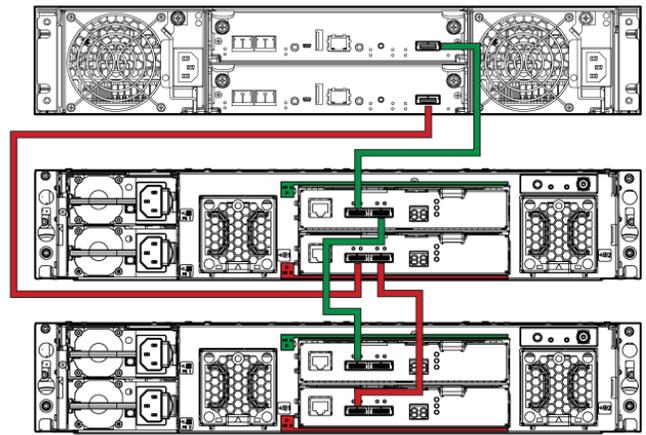


Figure 3 Straight-through cabling example

## P2000 G3 single drive enclosure expansion configurations

The following illustrations show examples of expanding storage from a P2000 G3 controller enclosure to a single drive enclosure.

### Adding a single P2000 6Gb drive enclosure

The following figure shows a dual-controller P2000 G3 MSA System connected to a dual-controller P2000 6Gb drive enclosure in both single path configuration (1) and a dual path configuration (1 and 2). Data throughput in the array performs at the 6Gbps rate, as both the controller enclosure and the drive enclosure support 6Gbps speeds (assuming that all disk drives in the array are also 6Gb drives).

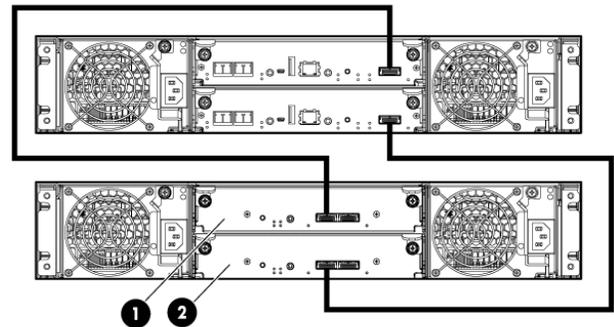


Figure 4 P2000 G3 connected to a single P2000 6Gb drive enclosure

### Adding a single D2700 6Gb drive enclosure

The following figure shows a dual-controller P2000 G3 MSA System connected to a dual-controller D2700 6Gb drive enclosure in both single path configuration (1) and a dual path configuration (1 and 2). Data throughput in the array performs at the 6Gbps rate, as both the controller enclosure and the drive enclosure support 6Gbps speeds (assuming that all disk drives in the array are also 6Gb drives).

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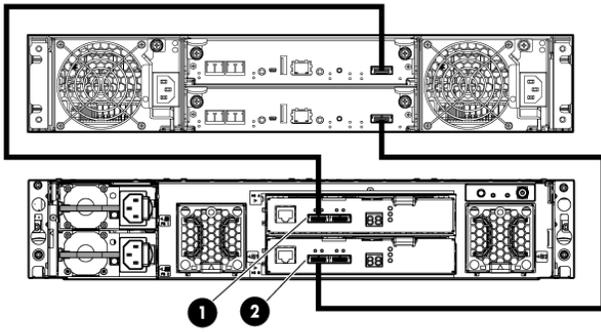


Figure 5 P2000 G3 connected to a single D2700 6Gb drive enclosure

## P2000 G3 homogeneous expansion configurations

The following illustrations show examples of expanding storage from P2000 G3 controller enclosures to multiple homogeneous drive enclosures; that is, drive enclosures of the same model.

### Adding multiple D2700 6Gb drive enclosures

The following figure shows a dual-controller P2000 G3 MSA System (1) connected to two D2700 6Gb drive enclosures with dual I/O modules (2 and 3). Data throughput in the array performs at the 6Gbps rate, as both the controller enclosure and the drive enclosures support 6Gbps speeds (assuming that all disk drives in the array are also 6Gb drives).

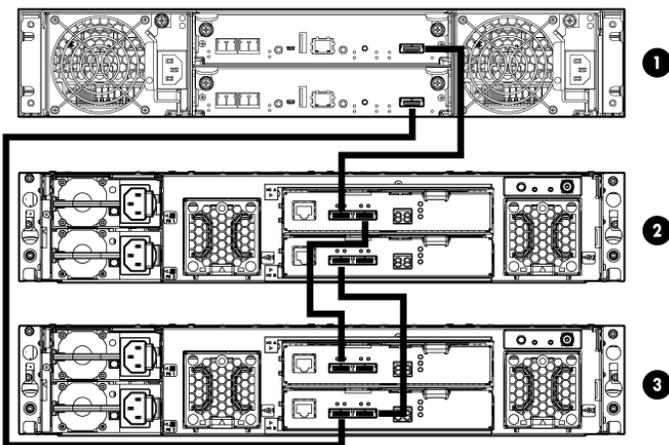


Figure 6 P2000 G3 connected to multiple D2700 6Gb drive enclosures

## P2000 G3 Mixed-connect expansion configurations

The following illustrations show examples of expanding storage from P2000 G3 array enclosures to multiple drive enclosures of different models.

### Adding a P2000/D2700 mixed-connect configuration

The following figure shows a dual-controller P2000 G3 MSA System (1) connected to a P2000 6Gb drive enclosure (2) and D2700 6Gb drive enclosure (3). Data throughput in the array performs at the 6Gbps rate,

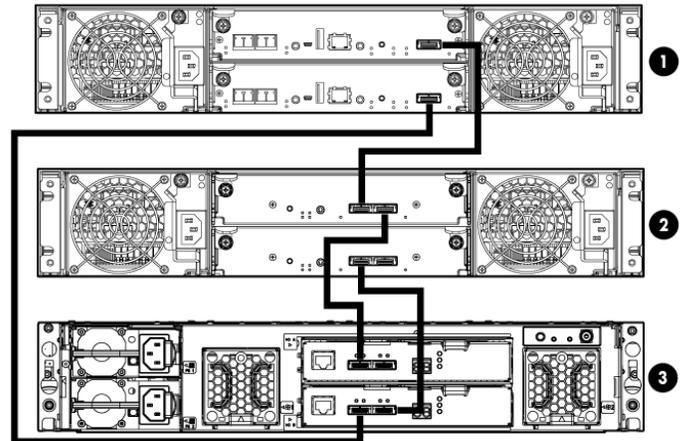


Figure 7 P2000 G3 connected to a P2000/D2700 mixed-connect configuration

## P2000 G3 maximum number of drives example

The following figure shows an example of an array configuration that demonstrates the maximum number of drives (149) that are allowed in an array configuration.

A P2000 G3 MSA System (1) is connected to five D2700 6Gb drive enclosures (2 through 6). Each D2700 drive enclosure contains 25 disk drives and the P2000 G3 MSA SFF controller enclosure contains 24 disk drives. Combined, the total number of disk drives in array configuration add up to the maximum 149 drives allowed. Note that the total of six enclosures stays within the maximum number of enclosures allowed limitation (eight). Data throughput in the array performs at the 6Gbps rate, as both the controller enclosure and the drive enclosures support 6Gbps speeds (assuming that all disk drives in the array are also 6Gb drives).

### NOTE:

When adding more than two drive enclosures, you may be required to purchase additional 1m or 2m cables. Spanning 3, 4, or 5 drive enclosures requires 1m cables.

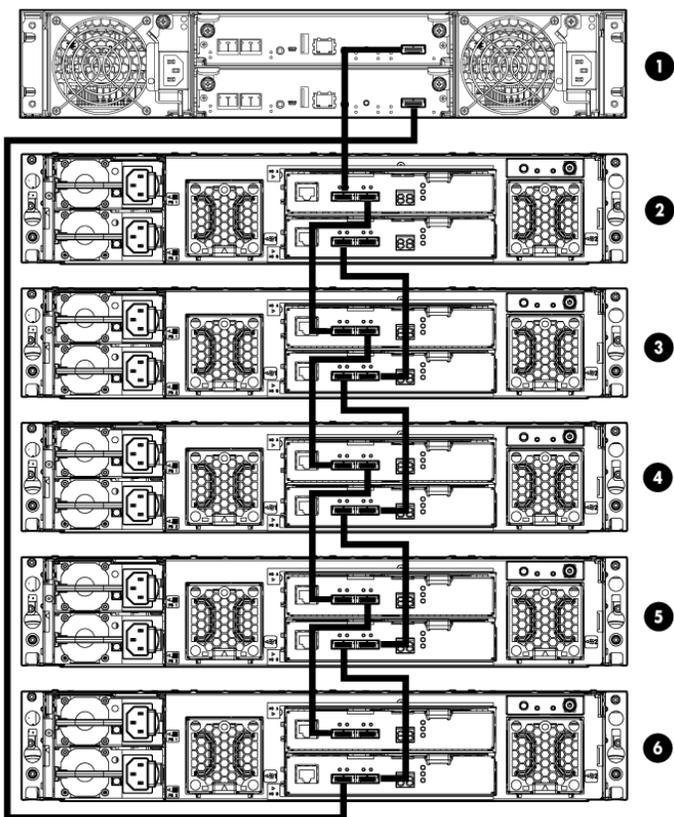


Figure 8 P2000 G3 connected to five D2700 drive enclosures (149 disk drives)

## P2000 G3 maximum number of enclosures example

The following figure shows an example of an array configuration that demonstrates the maximum number of enclosures (8, including the controller enclosure) that are allowed in an array configuration.

A P2000 G3 MSA LFF System (1) is connected to seven P2000 6Gb 12-drive enclosures (2 through 8). Note that the total of 96 drives in the array stays within the maximum number of drives allowed limitation (149). Data throughput in the array performs at the 6Gbps rate, as both the controller enclosure and the drive enclosures support 6Gbps speeds (assuming that all disk drives in the array are also 6Gb drives).

 **NOTE:**

When adding more than two drive enclosures, you are required to purchase additional 1m or 2m cables. Spanning 6 or 7 drive enclosures requires 2m cables.

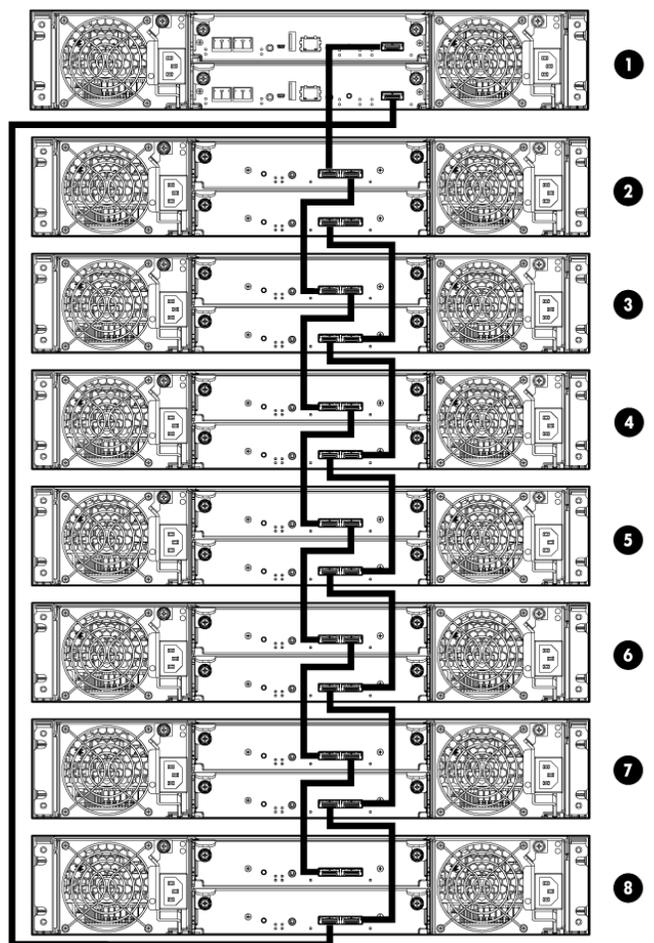


Figure 9 P2000 G3 connected to seven P2000 6Gb drive enclosures (8 total 12-drive enclosures)

## Additional information sites

MSA products: <http://www.hp.com/go/msa>

Storage products: <http://www.hp.com/storage>

Servers: <http://www.hp.com/go/servers>

SAN infrastructure: <http://www.hp.com/go/san>

Web Based Enterprise Services: <http://h18023.www1.hp.com/support/svctools/webes/index.html>