

# HP StorageWorks MSA2000 Family MPIO DSM installation guide

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# Installing the MPIO DSM

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Multipathing solutions, such as the Microsoft Multipath Input/Output (MPIO) solution, are designed to provide failover protection through the use of redundant physical path components (cables, adapters, and switches) between the server and the storage device. Multipathing also permits the redistribution of the read/write load among multiple paths, reducing bottlenecks and balancing work loads.

## Which MPIO DSM Should You Install?

- If you are using **Windows Server 2008**, install and configure the native MPIO DSM included with Windows Server 2008. See “Windows Server 2008” on page 6 for information on how to install and configure it to support the MSA2000 Family of storage products.
- If you are using **Windows Server 2003 and your array is the 2012i Modular Smart Array** (iSCSI), the required MPIO DSM is included in the Microsoft iSCSI Software Initiator. Note that the MSA2000 Family MPIO DSM and the MPIO DSM included with the Microsoft iSCSI Software Initiator can be installed side-by-side on the same server if both the 2012i and 2012fc Modular Smart Arrays are installed.
- If you are using **Windows Server 2003**, install the MSA2000 Family MPIO DSM, which works in conjunction with the Microsoft MPIO solution, and includes driver and utilities for managing multipathing on your array. See “Windows Server 2003” on page 10 for information on how to install and configure it.

# Windows Server 2008

This section describes how to install and configure the native MPIO DSM that is included with Windows Server 2008. Information about using the Windows Server 2008 Device Manager to verify installation is included, although no further configuration is required after the MPIO DSM is installed.

## Upgrading From Windows Server 2003

If you have installed the MSA2000 Family MPIO DSM and are upgrading a Windows Server 2003 host to Windows Server 2008, it is recommended that you uninstall the MSA2000 Family MPIO DSM.

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**Note** – While it is possible to upgrade to Windows Server 2008 with the MSA2000 Family MPIO DSM installed, it is not a supported configuration. If the MSA2000 Family MPIO DSM remains installed on a Windows Server 2008 system, it can be removed using Programs & Features from the Control Panel.

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1. Shut down the host.
2. Disconnect the storage array.

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**Note** – Although it is not necessary to disconnect the storage array from the host while uninstalling and installing the MPIO DSM, depending on the number of paths and LUNs in the configuration, the process may complete significantly faster with the array disconnected.

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3. With the storage array disconnected, boot the host.
4. Use Add/Remove Programs to uninstall the MSA2000 Family MPIO DSM.
5. Reboot the host to complete the removal of the MSA2000 Family MPIO DSM.
6. Perform the upgrade to Windows Server 2008.
7. Perform the steps in “Installing and Configuring the Windows Server 2008 MPIO DSM” on page 7.
8. Reconnect the storage array to the host.

# Installing and Configuring the Windows Server 2008 MPIO DSM

Perform the following steps to install and configure the native MPIO DSM included with Windows Server 2008.

1. Open a command prompt window and run the following command:

```
servermanagercmd -install multipath-io
```

The MPIO software is installed. The MPIO Control Panel applet can then be used to configure support for specific devices instead of using `mpclaim`.

2. Run the following command:

---

**Note** – As soon as the `mpclaim` command completes, the **host will be rebooted**.

---

```
mpclaim -r -i -d "HP      MSA2 "
```

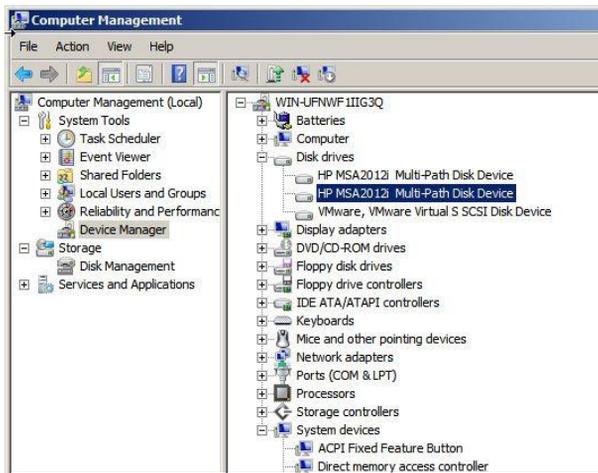
There must be **exactly six spaces** between HP and MSA2.

Once the MPIO DSM is installed, no further configuration is required; however, after initial installation, you should use Windows Server 2008 Device Manager to ensure that the MPIO DSM has installed correctly as described in “Managing MPIO LUNs” on page 8.

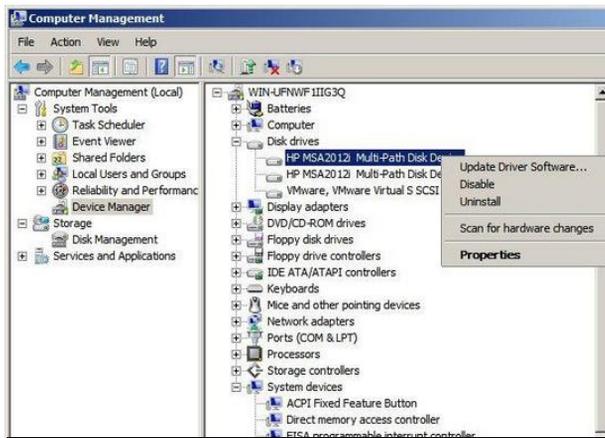
# Managing MPIO LUNs

The Windows Server 2008 Device Manager enables you to display or change devices, paths, and load balance policies, and enables you to diagnose and troubleshoot the DSM. After initial installation of the MPIO DSM, use Device Manager to verify that it has installed correctly.

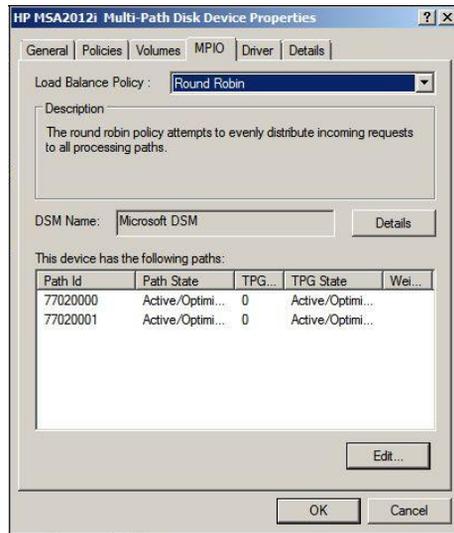
If the MPIO DSM was installed correctly, each MSA2000 storage volume visible to the host will be listed as a multi-path disk drive as shown in the following example.



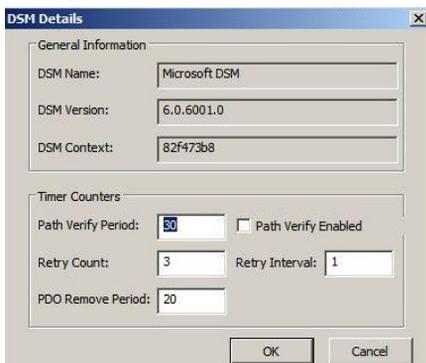
To verify that there are multiple, redundant paths to a volume, right-click the Multi-Path Disk Device and select Properties.



Click the MPIO tab to view the MPIO property sheet, which enables you to view or change the load balance policy and view the number of paths and their status.



The Details tab shows additional parameters.



# Windows Server 2003

This section describes how to install and configure the MSA2000 Family MPIO DSM for Windows Server 2003. Information about using the MPIO command-line utility is included for advanced users who might want to change existing parameters.

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**Note** – The MSA2000 Family MPIO DSM does not apply to the 2012i Modular Smart Array. The Microsoft iSCSI Software Initiator includes the MPIO DSM that is required for iSCSI. However, both DSMs can be side-by-side on the same server if both the 2012i and 2012fc Modular Smart Arrays are installed.

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## Installation Requirements

The MPIO DSM requires the following software:

- Windows Server 2003 (Service Pack 2)

## Known Issues

This section lists the known issues for the MSA2000 Family MPIO DSM and the Microsoft MPIO Driver Subsystem, which is installed along with the MPIO DSM.

### MSA2000 Family MPIO DSM

- Removing the MSA2000 Family MPIO DSM (prior to version 2.3) may cause other DSMs to fail.

**Workaround:** Unless you are planning on reinstalling a new version immediately after removing the MSA2000 Family MPIO DSM, do not remove it; otherwise, reinstall another DSM after removing the MSA2000 Family MPIO DSM.

- Uninstalling the MSA2000 Family MPIO DSM package may fail with a message referring to `ikernel.exe`. This is caused by the InstallShield software and may occur if another software package created with InstallShield is added to the system.

**Workaround:** Reinstall the package that you want to remove to repair the damage caused by InstallShield, and then uninstall the MSA2000 Family MPIO DSM package.

## Microsoft MPIO Driver Subsystem

- Uninstall of the DSM does not always work. You may need to reboot your system to remove the DSM.
- During MPIO installation, the call to `UpdateDriverForPlugAndPlayDevices` restarts the disk stacks. However, if MPIO is being installed on a system with mirrored disks, the disks appear as “failed redundancy.” This happens only if disk management applications (that use the `dmaadmin` service) are running at the time of MPIO installation. Close all disk management applications (including but not limited to, `diskmgmt.msc` and `diskpart.exe`) prior to installing MPIO. To prevent the mirrored disks from showing up as “failed redundancy,” ensure that the `dmaadmin` service is not running at the time of MPIO installation.
- Other port filter drivers may interfere with the proper function of MPIO solutions. Microsoft does not recommend the use of these drivers.

## Downloading the MSA2000 Family MPIO DSM

Download the MSA2000 Family MPIO DSM software bundle from <http://www.hp.com/go/msa>. Select MSA SAN Arrays, select your product, and go to Related products.

## Installing the MPIO Drivers and Utilities

To use the MPIO DSM, you must first install the drivers and utilities.

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**Note** – If you are upgrading the MPIO DSM, you do not have to uninstall the existing module.

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**Note** – The time it takes to complete MPIO DSM installation, initial scan, and detection of devices depends on the complexity of the system configuration, the number of LUNs, and the number of devices connected to the host. Some operations can take several seconds per LUN per path.

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1. Double-click the `msa2000-mpio-dsm` folder, which is created after you unzip the MPIO DSM software bundle you downloaded.
2. Double-click or run `Setup.exe`.
3. From the Welcome dialog, click Next.
4. Read the copyright and license information and click Yes to continue.
5. From the Choose Destination Location dialog, install to the default folder and click Next.

The drivers are installed in:

```
C:\Program Files\Hewlett-Packard\HP MPIO DSM\MSA2000
```

### **Overwriting MPIO Drivers and Utilities**

The Microsoft MPIO Driver Subsystem is installed along with the DSM. The install program checks for an existing MPIO Driver Subsystem, specifically for the installation of three Microsoft drivers (`mpio.sys`, `mpdev.sys`, and `mpspfltr.sys`). If a previous version of any of these drivers has already been installed on the system, you may be prompted to choose whether to overwrite the existing drivers with the ones supplied by the MPIO DSM package.

6. From the Information dialog, click OK to continue.

The MPIO DSM is installed, and if necessary, the drivers are installed.

The installer program displays a splash screen showing its progress, which automatically closes after the drivers are installed.

7. The Wizard Complete dialog is displayed and if required, you are prompted to reboot your computer to complete the setup.

Once the MPIO DSM is installed, no further configuration is required. For information on changing existing parameters, see “Using the `dsmcli` Command-Line Utility” on page 13.

## Using the `dsmcli` Command-Line Utility

The DSM command-line interface enables you to display or change devices, paths, and load balance policies, and enables you to diagnose and troubleshoot the DSM.

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**Note** – The `dsmcli` command-line utility described in this section does not apply to Windows Server 2008.

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To run `dsmcli` from the Windows Start menu, click Start > All Programs Hewlett-Packard >MSA2000 > MPIO Configuration.

To run `dsmcli` from the command-line prompt, open a command line window, navigate to the directory in which the MPIO DSM was installed (C:\Program Files\Hewlett-Packard\HP MPIO DSM\MSA2000 by default), and enter the following command:

```
dsmcli
```

The `dsmcli>` command line prompt is displayed. From the `dsmcli>` prompt, the following commands are available:

- `clear`
- `devinfo`
- `help`
- `pathinfo`
- `policies`
- `primary`
- `weight`
- `mpiolist`
- `pgr`

The `help` command displays a help file with available `dsmcli` command options.

## clear

The `clear` command clears the performance counters. Performance counter information (for example, BytesRead, BytesWritten, NumberReads, and NumberWrites) can be viewed by executing the `pathinfo` command, which is explained in “`pathinfo`” on page 16.

```
dsmcli> clear

Clear all counters: OK
```

## devinfo

The `devinfo` command displays device information or enables you to change the load balance policy for the specified device.

```
devinfo [ SerialNumber | all ] [ policy | {failback-on | failback-off} ]
```

where:

- *SerialNumber* is the serial number of the device and *policy* is the load balance policy that you want to use for the specified device. See “policies” on page 17 for a list of currently supported load balance policies.
- *all policy* sets the load balance policy of all devices.
- *SerialNumber {failback on | failback off}* sets the failback status of the specified device.
- *all {failback-on | failback off}* sets the failback status of all devices.

The failback feature is only valid when the load balance mode is `FailOver`. You can enable or disable the failback feature for a device. By default, failback is enabled when the device is in `FailOver` mode.`elp`.

## Example

```
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	RoundRobin	2	N/A
1	AF68DE12-01	RoundRobin	2	N/A
2	EB3FDE12-01	RoundRobin	2	N/A
3	1A69DE12-01	RoundRobin	2	N/A
4	3869DE12-01	RoundRobin	2	N/A

```
dsmcli> dev 9B68DE12-01 failover
```

```
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	FailOver	2	failback-off
1	AF68DE12-01	RoundRobin	2	N/A
2	EB3FDE12-01	RoundRobin	2	N/A
3	1A69DE12-01	RoundRobin	2	N/A
4	3869DE12-01	RoundRobin	2	N/A

```
dsmcli> dev 9B68DE12-01 failback-on
```

```
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	FailOver	2	failback-on
1	AF68DE12-01	RoundRobin	2	N/A
2	EB3FDE12-01	RoundRobin	2	N/A
3	1A69DE12-01	RoundRobin	2	N/A
4	3869DE12-01	RoundRobin	2	N/A

```
dsmcli> dev all Weighted
```

```
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	Weighted	2	N/A
1	AF68DE12-01	Weighted	2	N/A
2	EB3FDE12-01	Weighted	2	N/A
3	1A69DE12-01	Weighted	2	N/A
4	3869DE12-01	Weighted	2	N/A

## pathinfo

The `pathinfo` command displays path information or enables you to change the status of the path.

To display information about all paths, run the following command:

```
pathinfo
```

HbaWWPN (initiator's ID) and CtrlPortWWPN (controller port's ID) are the two end points of a path.

To display information about a specific path, specify the serial number or the worldwide port name (WWPN) of the HBA:

```
pathinfo [ SN serial_number | HBA HBA_wwpn ]
```

where *serial\_number* is the serial number of the path and *HBA\_wwpn* is the worldwide port name of the HBA.

The status of the path can be set to `online`, `standby`, or `failed`:

```
pathinfo HBA_wwpn [ online | standby | failed ]
```

where *HBA\_wwpn* is the worldwide port name of the HBA.

- Online – The path is active and can perform the I/O operation.  
Primary: True = active
- Standby – The path will perform the I/O operation if the active path fails.  
Primary: False = standby
- Failed – You can fail the path to simulate the physical error.

## Example

```
dsmcli> pathinfo sn AF68DE12-01
```

```
Policy:          RoundRobin
SerialNumber:    AF68DE12-01
PathId:          02010102
Weight:          0
Primary:         false
ScsiAddress:     02000102
HbaWWPN:         10000000C92F464E
CtrlPortWWPN:   217000C0FF0A4052
State:           Online
BytesRead:       177152
BytesWritten:    36864
NumberReads:     46
NumberWrites:    9
```

```
dsmcli> pathinfo 10000000C930E202 standby
dsmcli> pathinfo
```

```
Policy:          RoundRobin
SerialNumber:    9B68DE12-01
PathId:          03010001
Weight:          0
Primary:         false
ScsiAddress:     03000001
HbaWWPN:         10000000C930E202
CtrlPortWWPN:   217000C0FF0A4052
State:           Standby
BytesRead:       184832
BytesWritten:    90112
NumberReads:     51
NumberWrites:    21
```

## policies

The `policies` command displays the currently supported load balance policies. Each LUN can have its own load balance policy. Possible values include the following:

- **FailOver** – No load balancing is performed. There is a single active path and the rest of the paths are standby paths. The active path is used for sending all I/O. If the active path fails then one of the standby paths is used.

- RoundRobin (default) – All paths are active paths. They are used for sending I/O in a round-robin fashion.
- Dynlq – Uses the path with the least number of active requests.
- Weighted – Each path is assigned a weight and I/O is sent on the path with the lowest weight. If the path with the lowest weight fails, then the path with the next lowest weight is used.
- LeastBlocks – Uses the path with the fewest pending I/O blocks.

See “devinfo” on page 14 for information on changing the policy.

### Example

```
dsmcli> policies  
  
FailOver  
RoundRobin  
Dynlq  
Weighted  
LeastBlocks
```

### primary

The `primary` command sets the primary path to the specified path ID.

```
primary pathID
```

where *pathID* is the new primary path ID.

## Example

In the following example, before executing the command, `primary 02010104`, Primary is shown as `false`; after running the command, Primary is shown as `true`.

```
dsmcli> primary 02010104
dsmcli> pathinfo

Policy:          FailOver
SerialNumber:    EB3FDE12-01
PathId:          02010104
Weight:          0
Primary:         true
ScsiAddress:     02000104
HbaWWPN:         10000000C92F464E
CtrlPortWWPN:   217000C0FF0A4052
State:           Online
BytesRead:       193536
BytesWritten:    1871360
NumberReads:     93
NumberWrites:    1752
```

## weight

The `weight` command sets the weight of the specified path. I/O is sent to the path with the lowest weight. If that path fails, I/O is sent to the path with the next lowest weight, and so on.

```
weight pathID weight
```

where *pathID* is the specified path ID and *weight* is the assigned weight. The recommended weight range is 0–100.

---

**Note** – The `weight` command is valid only when the weighted load balance policy is available (see “policies” on page 17 for the list of currently supported load balance policies).

---

## Example

```
dsmcli> weight 03010104 10  
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	Weighted	2	N/A
1	AF68DE12-01	Weighted	2	N/A
2	EB3FDE12-01	Weighted	2	N/A
3	1A69DE12-01	Weighted	2	N/A
4	3869DE12-01	Weighted	2	N/A

```
dsmcli> pathinfo
```

```
Policy:           Weighted  
SerialNumber:    3869DE12-01  
PathId:          03010104  
Weight:          10  
Primary:         false  
ScsiAddress:     03000104  
HbaWWPN:        10000000C930E202  
CtrlPortWWPN:   207800C0FF0A4052  
State:           Online  
BytesRead:       196608  
BytesWritten:    87552  
NumberReads:     55  
NumberWrites:    23
```

## mpiolist

The `mpiolist` command displays specified MPIO WMI objects. It shows the information of the local host only.

```
mpiolist WMI_object
```

where:

- *WMI\_object* is either the name of a WMI or object or one of the types (digit 0–5) described in the following table:

<code>mpiolist</code> Option	Parameter
0	MSDisk_Driver_Performance
1	MPIO_DISK_INFO
2	MPIO_PATH_INFORMATION
3	MPIO_CONTROLLER_CONFIGURATION
4	MPIO_TIMERS_COUNTERS
5	MPIO_GET_DESCRIPTOR

## Example

```
dsmcli> mpiolist 1
<ROOT\wmi>
  MPIO_DISK_INFO
    InstanceName* = "Root\MPIO\0000_0"
    NumberDrives = 0x5
    DriveInfo =
      instance of MPIO_DRIVE_INFO {
        NumberPaths = 0x2
        Name = "MPIO Disk0"
        SerialNumber = "60CFF00E50321A69DE121000"
        DsmName = "StorageWorks HPMSA2000 Family Multi-Path Device
Specific Module"
      }
      instance of MPIO_DRIVE_INFO {
        NumberPaths = 0x2
        Name = "MPIO Disk1"
        SerialNumber = "60CFF00E50323869DE121000"
        DsmName = "StorageWorks MSA2000 Family Multi-Path Device
Specific Module"
      }
      instance of MPIO_DRIVE_INFO {
        NumberPaths = 0x2
        Name = "MPIO Disk2"
        SerialNumber = "60CFF00E50419B68DE121000"
        DsmName = "StorageWorks MSA2000 Family Multi-Path Device
Specific Module"
      }
      instance of MPIO_DRIVE_INFO {
        NumberPaths = 0x2
        Name = "MPIO Disk3"
        SerialNumber = "60CFF00E5041AF68DE121000"
        DsmName = "StorageWorks MSA2000 Family Multi-Path Device
Specific Module"
      }
      instance of MPIO_DRIVE_INFO {
        NumberPaths = 0x2
        Name = "MPIO Disk4"
        SerialNumber = "60CFF00E5041EB3FDE121000"
        DsmName = "StorageWorks MSA2000 Family Multi-Path Device
Specific Module"
      }
    }
```

## pgr

Used for diagnostic and troubleshooting purposes only, the `pgr` (Persistent Group Reservations) command enables you to determine whether the DSM is currently using SCSI-2 Reserve and Release commands or SCSI-3 Persistent commands. It also enables you to specify which commands the DSM is to use.

Typically, SCSI Reserve and Release commands are used in clustered environments where it is necessary to limit access to a target device to only one host at a time. Persistent Reservation refers to a set of SCSI-3 commands that replace the original Reserve and Release commands with a more sophisticated mechanism that provides better support for SAN and multipath configurations.

The `pgr` command shows whether the DSM is currently using SCSI-3 Persistent commands and the PGR key. If the `pgr` command is enabled, the DSM uses SCSI-3 Persistent commands. If the command is disabled, the DSM uses SCSI-2 Reserve and Release commands to reserve and release volumes on behalf of clustering software. The key is used to identify the host.

```
dsmcli> pgr
Persistent Reservation: Enable
                        Key: T-W2K3-H
```

The `pgr` command also enables you to specify which commands the DSM is to use. The change is not active until the system is rebooted.

```
pgr [ enable | disable ]
```

where:

- `enable` specifies that the DSM use SCSI-3 Persistent commands
- `disable` specifies that the DSM use SCSI-2 Reserve and Release commands

## pgr list

The `pgr list` command displays the current persistent reservation status for all disk drives as seen by the current host. This information is used by service technicians when troubleshooting a problem.

## Example

```
dsmcli> pgr list
\\.\PhysicalDrive1 registered keys:
00 00 00 38 00 00 00 10 54 2D 57 32 4B 33 2D 48 ...8....T-W2K3-H
54 2D 57 32 4B 33 2D 48 T-W2K3-H
\\.\PhysicalDrive1 reservations:
00 00 00 38 00 00 00 00 ...8....
\\.\PhysicalDrive2 registered keys:
00 00 00 38 00 00 00 10 54 2D 57 32 4B 33 2D 48 ...8....T-W2K3-H
54 2D 57 32 4B 33 2D 48 T-W2K3-H
\\.\PhysicalDrive2 reservations:
00 00 00 38 00 00 00 00 ...8....
\\.\PhysicalDrive3 registered keys:
00 00 00 CD 00 00 00 10 54 2D 57 32 4B 33 2D 48 .....T-W2K3-H
54 2D 57 32 4B 33 2D 48 T-W2K3-H
\\.\PhysicalDrive3 reservations:
00 00 00 CD 00 00 00 10 54 2D 57 32 4B 33 2D 48 .....T-W2K3-H
00 00 00 00 00 06 00 00 .....
\\.\PhysicalDrive4 registered keys:
00 00 00 45 00 00 00 10 54 2D 57 32 4B 33 2D 48 ...E....T-W2K3-H
54 2D 57 32 4B 33 2D 48 T-W2K3-H
\\.\PhysicalDrive4 reservations:
00 00 00 45 00 00 00 00 ...E....
```

`pgr tur`

You can send a “test unit ready” command to the device to show its status.

```
pgr tur devicename
```

## Example

```
dsmcli> pgr tur \\.\PhysicalDrive3
result: 0 status: 0x0 sense: 0x0d 0x50 0x68
dsmcli> pgr tur \\.\PhysicalDrive4
result: 0 status: 0x0 sense: 0x0d 0x50 0x68
```

# Uninstalling the MSA2000 Family MPIO DSM

To uninstall the MPIO DSM, perform the following steps.

1. Choose Start > Control Panel > Add/Remove Programs.
2. Choose HP StorageWorks MSA2000 Family Multi-Path DSM and click Change/Remove.
3. Respond appropriately to the prompts.

The progress of the uninstall procedure is displayed in a splash screen, which automatically closes after the drivers are uninstalled.

---

**Note** – If there are no other DSMs on the server, the uninstall procedure uninstalls the Microsoft MPIO drivers as well as the MSA2000 Family MPIO DSM. If there are other DSMs on the server, only the MSA2000 Family MPIO DSM is removed.

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