

RAID Adapter Analysis

This StorFacts™ Report analyzes current IBM RAID adapters. Features discussed include the following:

Raid Enablement Adapter

- FC5728 / FC5726
- FC5727 / FC5709 / FC1976 / FC1908 / FC1907

Raid Adapter

- FC5737 / FC5703 / FC1975 / FC1913
- FC5711



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RAID Overview

Short for **Redundant Array of Independent (or Inexpensive) Disks**, a category of disk drives that employ two or more drives in combination for fault tolerance and performance.

There are number of different RAID levels:

- **Level 0 -- Striped Disk Array without Fault Tolerance:** Provides *data striping* (spreading out blocks of each file across multiple disk drives) but no redundancy. This improves performance but does not deliver fault tolerance. If one drive fails then all data in the array is lost.
- **Level 1 -- Mirroring and Duplexing:** Provides disk mirroring. Level 1 provides twice the read transaction rate of single disks and the same write transaction rate as single disks.
- **Level 2 -- Error-Correcting Coding:** Not a typical implementation and rarely used, Level 2 stripes data at the bit level rather than the block level.
- **Level 3 -- Bit-Interleaved Parity:** Provides byte-level striping with a dedicated parity disk. Level 3, which cannot service simultaneous multiple requests, also is rarely used.
- **Level 4 -- Dedicated Parity Drive:** A commonly used implementation of RAID, Level 4 provides block-level striping (like Level 0) with a parity disk. If a data disk fails, the parity data is used to create a replacement disk. A disadvantage to Level 4 is that the parity disk can create write bottlenecks.
- **Level 5 -- Block Interleaved Distributed Parity:** Provides data striping at the byte level and also stripe error correction information. This results in excellent performance and good fault tolerance. Level 5 is one of the most popular implementations of RAID.
- **Level 6 -- Independent Data Disks with Double Parity:** Provides block-level striping with parity data distributed across all disks.
- **Level 0+1 – A Mirror of Stripes:** Not one of the original RAID levels, two RAID 0 stripes are created, and a RAID 1 mirror is created over them. Used for both replicating and sharing data among disks.



StorFacts™ Report

5737

Dual Channel RAID Adapter

The PCI-X DDR Dual Channel Ultra320 SCSI RAID LVD only Adapter (#5737) is a 64-bit 3.3 volt, bootable high performance Ultra320 SCSI RAID Adapter providing RAID 0, 5, 6, or 10 capability, and can address up to thirty 16-bit SCSI physical disk drives on two independent SCSI buses.

To increase the data writing performance, a 90 MByte non-volatile fast-write cache is a resident part of this adapter. The 90 MByte fast-write cache can provide a significant improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.

The Dual Channel Ultra320 SCSI RAID Adapter has two independent ultra320 SCSI buses. There are two internal ports and two external ports. The two internal ports are shared with the two external ports. The SCSI busses can drive either an internal port or an external port. The internal ports can be used to provide an internal RAID solution on certain supporting pSeries systems with internal multiple disk drives or packs of drives. Internally attached Ultra320 devices designed to run at 320 MB can run up to 320 MB per second on systems that have internal backplanes that are capable of supporting Ultra320 speeds.

In order to achieve an Ultra320 SCSI bus data rate of up to 320 MB per second and maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. All attaching devices should be Ultra320 LVD devices to utilize the 320 MB per second performance, however, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. This card does not support single-ended (SE) devices.

When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array (attached to either the internal or the external ports) are required to be formatted to 522-byte sectors. 522-byte sectors provide additional CRC error checking for improved data integrity. A menu option provide in the AIX supporting software, which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512-byte sectors.

Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. In addition, there are some disk drives, which do not support 522 Byte Sectors format. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist. For disk microcode updates, go to the following Web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>



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5737, Continued

Two VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD external subsystems.

Limitations:

- Even though the Dual Channel Ultra320 SCSI RAID Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.

Minimum System Firmware Required:

System firmware level required is SF235_185 or greater. Firmware level SF235_185 adjusts the PCI slots to run in Single Data Rate (SDR) mode. Enablement of Double Data Rate (DDR) slots to run at DDR mode is planned to be provided in an upcoming firmware enhancement.

For Double Data Rate (DDR), check for firmware upgrade at URL

<http://techsupport.services.ibm.com/server/mdownload2/download.html>

Running the adapter on a system with firmware level lower than SF235_185 is not supported.

- Attributes provided: Attachment of internal and external SCSI devices
- Attributes required: One PCI or PCI-X DDR bus slot



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5728

Dual Channel RAID Enablement Adapter

The Dual Channel SCSI RAID Enablement Card (#5728) is a bootable high performance SCSI RAID Enablement feature providing RAID 0,5, or 10 capability to select pSeries systems with the appropriate supporting integrated SCSI adapter and internal multiple disk drives or packs of drives.

To increase the data writing performance, a 40 MByte nonvolatile fast- write cache is provided as a resident part of this feature. The 40 MByte fast-write cache can provide an improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.

When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array are required to be formatted to 522 byte sectors. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors. Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist. For disk microcode updates, go to the following Web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

Limitation: Even though the supporting integrated adapter with the Dual Channel SCSI RAID Enablement Card has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.

- Attributes provided: Internal disk drives can be configured as an array.
- Attributes required: System with supporting integrated SCSI adapter and disk drives.



StorFacts™ Report

5727

Dual Channel RAID Enablement Adapter

The Dual Channel SCSI RAID Enablement Card (#5727) is a bootable high performance SCSI RAID Enablement feature providing RAID 0, 5, or 10 capability to select pSeries systems with the appropriate supporting integrated SCSI adapter and internal multiple disk drives or packs of drives. To increase the data writing performance, a 40 MByte nonvolatile fast-write cache is provided as a resident part of this feature. The 40 MByte fast-write cache can provide an improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters. When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array are required to be formatted to 522 byte sectors. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors. Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist. For disk microcode updates, go to the following Web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

Limitation: Even though the supporting integrated adapter with the Dual Channel SCSI RAID Enablement Card has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.

- Attributes provided: Internal disk drives can be configured as an array.
- Attributes required: System with supporting integrated SCSI adapter and disk drives.



StorFacts™ Report

5726

Dual Channel RAID Enablement Adapter

The Dual Channel SCSI RAID Enablement Card (#5726) is a bootable high performance SCSI RAID Enablement feature providing RAID 0, 5, or 10 capability to select pSeries systems with the appropriate supporting integrated SCSI adapter and internal multiple disk drives or packs of drives. To increase the data writing performance, a 40 MByte non-volatile fast-write cache is provided as a resident part of this feature. The 40 MByte fast-write cache can provide an improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters. When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors. Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist. For disk microcode updates, go to the following Web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

Limitation: Even though the supporting integrated adapter with the Dual Channel SCSI RAID Enablement Card has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.

- Attributes provided: Internal disk drives to be configured as an array.
- Attributes required: System with supporting integrated SCSI adapter.



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5711

Dual Channel RAID Adapter

The PCI-X Dual Channel Ultra320 SCSI RAID Blind Swap Adapter (#5711) is a 64-bit 3.3 volt, bootable high performance Ultra320 SCSI RAID Adapter providing RAID 0, 5, or 10 capability and can address up to thirty 16-bit SCSI physical disk drives on two independent SCSI buses.

To increase the data writing performance, a 40 MByte non-volatile fast-write cache is provided as a resident part of this adapter. The 40 MByte fast-write cache can provide a significant improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.

The Dual Channel Ultra320 SCSI RAID Blind Swap Adapter has two independent ultra320 SCSI buses. There are two internal ports and two external ports. The two internal ports are shared with the two external ports. The SCSI busses can drive either an internal port or an external port. The internal ports can be used to provide an internal RAID solution on certain supporting pSeries systems with internal multiple disk drives or packs of drives. Internally attached Ultra320 devices are designed to run at a data rate of up to 320 MB per second on systems that have internal backplanes that are capable of supporting Ultra320 speeds.

In order to achieve an Ultra320 SCSI bus data rate of up to 320 MB per second and also maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. To fully utilize this 320 MB per second performance, all attaching devices should also be Ultra320 LVD devices. But, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. For lower speed single-ended (SE) devices, the SCSI bus will switch to single-ended (SE) performance and interface to all devices on that SCSI bus at the lower SE bus data rate of the device.

When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array (attached to either the internal or external ports) are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors. Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist.



StorFacts™ Report

5711, Continued

For disk microcode updates, go to the following web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

Two industry standard VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD and SE external subsystems. A .3 meter converter cable, VHDCI to P, Mini-68 pin to 68-pin, (#2118) can be used with older external SE devices or subsystems to allow connection to the VHDCI connector on the PCI-X Dual Channel Ultra320 SCSI RAID Blind Swap Adapter.

The two external ports provide connectivity to an IBM 2104-DS4 Expandable Storage Plus Drawer or 2104-TS4 Expandable Storage Plus Tower at up to 320 MB/s SCSI bus data rate configured as either a non-array or an array of disks. Also the two external ports provide non-array connectivity to numerous other SCSI external subsystems. Check the external subsystem sales/web pages for verification of connectivity support with this adapter.

Limitations:

- The two external ports provide connectivity to an IBM 2104-DU3 Expandable Storage Plus Drawer or 2104-TU3 Expandable Storage Plus Tower at up to 160 MB/s SCSI bus data rate as well as connectivity to an IBM 2104-DL1 Expandable Storage Plus Drawer or 2104-TL1 Expandable Storage Plus Tower at up to 80 MB/s SCSI bus data rate, but is limited to only non-array configuration support.
- The two external ports do not support the connection to the IBM 7131-105 IBM Multi-Storage Tower Model 105.
- Even though the Dual Channel Ultra320 SCSI RAID Blind Swap Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.
- Disk drives internal to the pSeries system shipped prior to September 1, 2003 require a disk drive microcode update to run at Ultra320 speed. To obtain the appropriate microcode update, go to the following web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>



StorFacts™ Report

5709

Dual Channel RAID Enablement Adapter

The Dual Channel SCSI RAID Enablement Card (#5709) is a bootable high performance SCSI RAID Enablement feature providing RAID 0,5, or 10 capability to select pSeries systems with the appropriate supporting integrated SCSI adapter and internal multiple disk drives or packs of drives.

To increase the data writing performance, a 40 MByte non-volatile fast-write cache is provided as a resident part of this feature. The 40 MByte fast-write cache can provide an improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.

When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors. Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist. For disk microcode updates, go to the following web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

Limitations:

- Even though the supporting integrated adapter with the Dual Channel SCSI RAID Enablement Card has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.
- Disk drives internal to the pSeries system shipped prior to September 1, 2003 require a disk drive microcode update to run at Ultra320 speed. To obtain the appropriate microcode update, go to the following web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>



StorFacts™ Report

5703

Dual Channel RAID Adapter

The PCI-X Dual Channel Ultra320 SCSI RAID Adapter (#5703) is a 64-bit 3.3 volt, bootable high performance Ultra320 SCSI RAID Adapter providing RAID 0, 5, or 10 capability and can address up to thirty 16-bit SCSI physical disk drives on two independent SCSI buses.

To increase the data writing performance, a 40 MByte non-volatile fast-write cache is provided as a resident part of this adapter. The 40 MByte fast-write cache can provide a significant improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.

The Dual Channel Ultra320 SCSI RAID Adapter has two independent ultra320 SCSI buses. There are two internal ports and two external ports. The two internal ports are shared with the two external ports. The SCSI busses can drive either an internal port or an external port. The internal ports can be used to provide an internal RAID solution on certain supporting pSeries systems with internal multiple disk drives or packs of drives. Internally attached Ultra320 devices are designed to run at a data rate of up to 320 MB per second on systems that have internal backplanes that are capable of supporting Ultra320 speeds.

In order to achieve an Ultra320 SCSI bus data rate of up to 320 MB per second and also maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. To fully utilize this 320 MB per second performance, all attaching devices should also be Ultra320 LVD devices. But, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. For lower speed single-ended (SE) devices, the SCSI bus will switch to single-ended (SE) performance and interface to all devices on that SCSI bus at the lower SE bus data rate of the device.

When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array (attached to either the internal or external ports) are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors. Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist.



StorFacts™ Report

5703, Continued

For disk microcode updates, go to the following web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

Two industry standard VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD and SE external subsystems. A .3 meter converter cable, VHDCI to P, Mini-68 pin to 68-pin, (#2118) can be used with older external SE devices or subsystems to allow connection to the VHDCI connector on the PCI-X Dual Channel Ultra320 SCSI RAID Adapter.

The two external ports provide connectivity to an IBM 2104-DS4 Expandable Storage Plus Drawer or 2104-TS4 Expandable Storage Plus Tower at up to 320 MB/s SCSI bus data rate configured as either a non-array or an array of disks. Also the two external ports provide non-array connectivity to numerous other SCSI external subsystems. Check the external subsystem sales/web pages for verification of connectivity support with this adapter.

Limitations:

- The two external ports provide connectivity to an IBM 2104-DU3 Expandable Storage Plus Drawer or 2104-TU3 Expandable Storage Plus Tower at up to 160 MB/s SCSI bus data rate as well as connectivity to an IBM 2104-DL1 Expandable Storage Plus Drawer or 2104-TL1 Expandable Storage Plus Tower at up to 80 MB/s SCSI bus data rate, but is limited to only non-array configuration support.
- The two external ports do not support the connection to the IBM 7131-105 IBM Multi-Storage Tower model 105.
- Even though the Dual Channel Ultra320 SCSI RAID Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.
- Disk drives internal to the pSeries system shipped prior to September 1, 2003 require a disk drive microcode update to run at Ultra320 speed. To obtain the appropriate microcode update, go to the following web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

- Attributes provided: Attachment of internal and external SCSI devices
- Attributes required: One PCI or PCI-X bus slot



StorFacts™ Report

1976

Dual Channel RAID Enablement Adapter

The Dual Channel SCSI RAID Enablement Card (#1976) is a bootable high performance SCSI RAID Enablement feature providing RAID 0, 5, or 10 capability to select pSeries systems with the appropriate supporting integrated SCSI adapter and internal multiple disk drives or packs of drives.

To increase the data writing performance, a 16 MByte non-volatile fast-write cache is provided as a resident part of this feature. The 16 MByte fast-write cache can provide an improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.

When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors.

Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist. For disk microcode updates, go to URL:

<http://techsupport.services.ibm.com/server/mdownload/>

Limitations:

- Even though the supporting integrated adapter with the Dual Channel SCSI RAID Enablement Card has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.
- Disk drives internal to the pSeries system shipped prior to September 1, 2003 require a disk drive microcode update to run at Ultra320 speed. To obtain the appropriate microcode update, go to the following web page URL:

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StorFacts™ Report

1975

Dual Channel RAID Adapter

The PCI-X Dual Channel Ultra320 SCSI RAID Adapter is a 64-bit 3.3 volt, bootable high performance Ultra320 SCSI RAID Adapter providing RAID 0, 5, or 10 capability and can address up to thirty 16-bit SCSI disk drives on two buses.

To increase the data writing performance, a 40 MByte non-volatile fast-write cache is provided as a resident part of this adapter. The 40 MByte fast-write cache can provide a significant improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.

The Dual Channel Ultra320 SCSI RAID Adapter has two independent ultra320 SCSI buses. There are two internal ports and two external ports. The two internal ports are shared with the two external ports. The SCSI busses can drive either an internal port or an external port. The internal ports can be used to provide an internal RAID solution on certain supporting pSeries systems with internal multiple disk drives or packs of drives. Internally attached Ultra320 devices are designed to run at a data rate of up to 320 MB per second on systems that have internal backplanes that are capable of supporting Ultra320 speeds.

In order to achieve an Ultra320 SCSI bus data rate of up to 320 MB per second and also maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. To fully utilize this 320 MB per second performance, all attaching devices should also be Ultra320 LVD devices. But, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. For lower speed single-ended (SE) devices, the SCSI bus will switch to single-ended (SE) performance and interface to all devices on that SCSI bus at the lower SE bus data rate of the device.

When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array (attached to either the internal or external ports) are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors.

Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist. For disk microcode updates, go URL:

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StorFacts™ Report

1975, Continued

Two industry standard VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD and SE external subsystems. A .3 meter converter cable, VHDCI to P, Mini-68 pin to 68-pin, (#2118) can be used with older external SE devices or subsystems to allow connection to the VHDCI connector on the PCI-X Dual Channel Ultra320 SCSI RAID Adapter.

The two external ports provide connectivity to an IBM 2104-DS4 Expandable Storage Plus Drawer or 2104-TS4 Expandable Storage Plus Tower at up to 320 MB/s SCSI bus data rate configured as either a non-array or an array of disks Also the two external ports provide non-array connectivity to numerous other SCSI external subsystems. Check the external subsystem sales/web pages for verification of connectivity support with this adapter.

Limitations:

- The two external ports provide connectivity to an IBM 2104-DU3 Expandable Storage Plus Drawer or 2104-TU3 Expandable Storage Plus Tower at up to 160 MB/s SCSI bus data rate as well as connectivity to an IBM 2104-DL1 Expandable Storage Plus Drawer or 2104-TL1 Expandable Storage Plus Tower at up to 80 MB/s SCSI bus data rate, but is limited to only non-array configuration support.
- The two external ports do not support the connection to the IBM 7131-105 IBM Multi-Storage Tower Model 105.
- Even though the Dual Channel Ultra320 SCSI RAID Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.
- Disk drives internal to the pSeries system shipped prior to September 1, 2003 require a disk drive microcode update to run at Ultra320 speed. To obtain the appropriate microcode update, go to the following web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

- Attributes provided: Attachment of internal and external SCSI devices
- Attributes required: One PCI or PCI-X bus slot



StorFacts™ Report

1913

Dual Channel RAID Adapter

The PCI-X DDR Dual Channel Ultra320 SCSI RAID LVD only Adapter (#1913) is a 64-bit 3.3 volt, bootable high performance Ultra320 SCSI RAID Adapter providing RAID 0, 5, 6, or 10 capability, and can address up to thirty 16-bit SCSI physical disk drives on two independent SCSI buses.

To increase the data writing performance, a 90 MByte non-volatile fast-write cache is a resident part of this adapter. The 90 MByte fast-write cache can provide a significant improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.

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In order to achieve an Ultra320 SCSI bus data rate of up to 320 MB per second and maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. All attaching devices should be Ultra320 LVD devices to utilize the 320 MB per second performance, however, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. This card does not support single-ended (SE) devices.

When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array (attached to either the internal or the external ports) are required to be formatted to 522-byte sectors. 522-byte sectors provide additional CRC error checking for improved data integrity. A menu option provide in the AIX supporting software, which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512-byte sectors.

Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. In addition, there are some disk drives, which do not support 522 Byte Sectors format. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist.



StorFacts™ Report

1913, Continued

For disk microcode updates, go to the following Web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

Two VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD external subsystems.

Limitations:

- Even though the Dual Channel Ultra320 SCSI RAID Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.

Minimum System Firmware Required:

System firmware level required is SF235_185 or greater. Firmware level SF235_185 adjusts the PCI slots to run in Single Data Rate (SDR) mode. Enablement of Double Data Rate (DDR) slots to run at DDR mode is planned to be provided in an upcoming firmware enhancement.

For Double Data Rate (DDR), check for firmware upgrade at URL:

<http://techsupport.services.ibm.com/server/mdownload2/download.html>

Running the adapter on a system with firmware level lower than SF235_185 is not supported.

- Attributes provided: Attachment of internal and external SCSI devices
- Attributes required: One PCI or PCI-X DDR bus slot



StorFacts™ Report

1908

Dual Channel RAID Enablement Adapter

The Dual Channel SCSI RAID Enablement Card (#1908) is a bootable high performance SCSI RAID Enablement feature providing RAID 0, 5, or 10 capability to select pSeries systems with the appropriate supporting integrated SCSI adapter and internal multiple disk drives or packs of drives.

To increase the data writing performance, a 40 MB nonvolatile fast- write cache is provided as a resident part of this feature. The 40 MB fast-write cache can provide an improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.

When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors.

Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist. For disk microcode updates, go to the following Web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

Limitation: Even though the supporting integrated adapter with the Dual Channel SCSI RAID Enablement Card has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.

- Attributes provided: Internal disk drives can be configured as an array.
- Attributes required: System with supporting integrated SCSI adapter and disk drives.



StorFacts™ Report

1907

Dual Channel RAID Enablement Adapter

The Dual Channel SCSI RAID Enablement Card (#1907) is a bootable high performance SCSI RAID Enablement feature providing RAID 0, 5, or 10 capability to select pSeries systems with the appropriate supporting integrated SCSI adapter and internal multiple disk drives or packs of drives. To increase the data writing performance, a 40 MByte non-volatile fast-write cache is provided as a resident part of this feature. The 40 MByte fast-write cache can provide an improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters. When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors.

Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist. For disk microcode updates, go to the following Web page URL:

<http://techsupport.services.ibm.com/server/mdownload/>

Limitation: Even though the supporting integrated adapter with the Dual Channel SCSI RAID Enablement Card has ports that run at ultra320 SCSI speeds (up to 320 MBytes/s), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.

- Attributes provided: Internal disk drives can be configured as an array.
- Attributes required: System with supporting integrated SCSI adapter and disk drives.



StorFacts™ Report

Maximum Disk > p5 Servers

p5 Servers	Max Disk > Base System		Max Disk > I/O Drawers		Max Disk > Combined	
	Disk Bays	Capacity > TB's	Disk Bays	Capacity > TB's	Disk Bays	Capacity > TB's
7037-A50	3	0.90	-	-	3	0.90
9115-505	2	0.60	-	-	2	0.60
9110-510	4	1.20	-	-	4	1.20
9110-51A	4	1.20	-	-	4	1.20
9111-520	8	2.40	48	14.40	56	16.80
9131-52A	8	2.40	48	14.40	56	16.80
9113-550	8	2.40	96	28.80	104	31.20
9133-55A	8	2.40	96	28.80	104	31.20
9116-561	12	3.60	-	-	12	3.60
9117-570	24	7.20	240	72.00	264	79.20
9118-575	2	0.60	16	4.80	18	5.40
9119-590	-	-	128	38.40	128	38.40
9119-595	-	-	192	57.60	192	57.60



StorFacts™ Report

Maximum Disk > pSeries Servers

pSeries	Max Disk > Base System		Max Disk > I/O Drawers		Max Disk > Combined	
	Disk Bays	Capacity > TB's	Disk Bays	Capacity > TB's	Disk Bays	Capacity > TB's
7026-B80 (640)	5	1.50	-	-	5	1.50
7028-6C1 (610)	6	1.80	-	-	6	1.80
7028-6C4 (630)	4	1.20	24	7.20	28	8.40
7028-6E1 (610)	6	1.80	-	-	6	1.80
7028-6E4 (630)	4	1.20	-	-	4	1.20
7029-6C3 (615)	8	2.40	-	-	8	2.40
7029-6E3 (615)	8	2.40	-	-	8	2.40
7038-6M2 (650)	4	1.20	96	28.80	100	30.00
7039-651 (655)	2	0.60	16	4.80	18	5.40
7040-671 (670)	-	-	48	14.40	48	14.40
7040-681 (690)	-	-	128	38.40	128	38.40



StorFacts™ Report

Maximum Disk

OpenPower	Max Disk > Base System		Max Disk > I/O Drawers		Max Disk > Combined	
	Disk Bays	Capacity > TB's	Disk Bays	Capacity > TB's	Disk Bays	Capacity > TB's
9123-710	4	1.20	-	-	4	1.20
9124-720	8	2.40	96	28.80	104	31.20

IntelliStation	Max Disk > Base System		Max Disk > I/O Drawers		Max Disk > Combined	
	Disk Bays	Capacity > TB's	Disk Bays	Capacity > TB's	Disk Bays	Capacity > TB's
7047-185	3	0.90	-	-	3	0.90
9111-285	4	1.20	-	-	4	1.20
9114-275	4	1.20	-	-	4	1.20

I/O Drawer	Max Disk > I/O Drawers	
	Disk Bays	Capacity > TB's
2104-DS4	14	4.20
7031-D24	24	7.20
7040-61D	16	4.80
7311-D20	12	3.60
9119-5791	16	4.80
9119-5794	8	2.40