

### Overview

The HP StorageWorks Virtual Array is a low-cost, high capacity, high performance, 2 Gb Fibre Channel virtual disk array that delivers industry leading uptime. It is an ideal choice for environments requiring heterogeneous operating systems including HP-UX, other UNIX® servers, and Wintel servers. You can mix and match drives of different size, and add capacity instantly. HP's hot swap technology and redundant components reduce planned downtime. The virtual array architecture simplifies management and administration of the array. File or LUN creation occurs quickly, without worrying about the underlying physical technology.

The HP StorageWorks Virtual Array 7110 (va7110) supports over 6.5 TB with up to 45 disks. The va7110 has one host port per array controller to enable configurations with no single point of failure. These ports support either 1 Gb or 2 Gb Fibre Channel devices to protect your investment in connectivity infrastructure.

The HP StorageWorks Virtual Array 7410 (va7410) supports over 15 TB with up to 105 disks. The va7410 has four host ports to enable simplified and more extensive server and storage area network (SAN) connectivity. These ports support either 1 Gb or 2 Gb Fibre Channel devices. With four back-end disk ports and faster array controllers, the va7410 is capable of up to 34,000 cached I/Os per second and up to 330 MBps sequential throughput.

### Unique Customer Benefits/Value

- RAID 1+0 and RAID 5DP: The virtual architecture is designed to dynamically store data in high performance RAID 1+0 mode or cost-effective RAID 5DP mode based on the IO patterns of applications. Most frequently used information is stored in RAID 1+0, least frequently used information is stored in RAID 5DP. As usage patterns dynamically change, the virtual array migrates the way data is stored to adapt - the performance of RAID 1 and the cost of RAID 5.
- RAID 1+0 striping of every LUN across all disks: In a very large redundancy group, striping across all disks reduces the number of LUNs required to achieve a balanced workload and eliminates "hot spots". This self-tuning performance insures consistency in meeting application Service Level Agreements.
- 24x7 performance tuning: The balancing between RAID levels occurs dynamically, without any human intervention. This eliminates downtime for reconfiguration to eliminate performance problems. This self-tuning performance also insures consistency in meeting application Service Level Agreements.
- Mirrored ECC cache: HP's virtual storage architecture implements a tightly coupled mirrored-memory design. This provides greater availability and higher performance in shared environments.
- End-to-end checksum data: Ensures that silent data corruptions can't get passed from the server to the array or from the array to the server.
- Metadata recovery: The actual physical location of data is maintained in logical-to-physical maps in cache memory. These maps are periodically "checkpointed" and copied to disk, similar to database transactions and checkpointing.
- Hot pluggable, redundant components: Disks, power supplies and fans are redundant, and can be replaced on-line. In fact, the virtual technology even allows disks to be replaced in any location with disks of different sizes, eliminating a common data-loss scenario from service.
- Active/active controller operation: Any controller can access any data without performance penalty. This allows I/O load balancing.
- Ordering of complete integrated configurations with a single part number, plus disk drives, is easy and helps ensure that the storage solution completely meets the customer requirements when it arrives.
- Easy to use management tools and integration into upper-level enterprise management tools like OpenView allow web-based management anytime, anywhere.

### Product Highlights

#### Fibre Channel (FC) Technology

The Virtual Array takes advantage of the benefits of FC in distance, performance and connectivity. The use of optical fibre cabling allows arrays to be up to 500 meters from a server or SAN. The Virtual Array supports both 1 Gb and 2 Gb on all host, or front-end paths, and 2 Gb on all disk, or back-end paths. Storage Area Networks (SANs) can be constructed using 8, 16, 32 or 64-port FC switches for fabric connectivity. Fibre channel disk interfaces enable support of up to 45 drives with the 7110, and up to 105 drives with the 7410. Each drive is connected to each controller through a separate loop, enabling dual redundant FC loop connections, and eliminating the connection as a single point of failure.

#### Storage density

The high density configuration (3U for arrays and JBOD expansion cabinets) provides over 15 TB in a single cabinet using 72 GB disks (disk and controller enclosures included) with a footprint of only 5.9 square feet (0.55 square meter) of floor space utilized in 42U cabinet, and over 30 TB in a single cabinet using 146 GB disks (14 enclosures (2 arrays, 12 disk expansion cabinets), 210 drives). The internal design of the cabinet allows easy serviceability ensuring Non-Stop high availability.

#### Multi-Vendor Platform

Support for industry-leading Operating System platforms including: Microsoft® Windows® NT®, Windows 2000 (Advanced Server), Datacenter, Windows.NET (when available), SUN Solaris, HP-UX, IBM-AIX, Linux and NetWare.

#### No-Single-Point-of-Failure

Redundant, hot pluggable architecture and value added software eliminates single-points-of-failure from server to storage in clustered or single server configurations with multi-pathing.

#### Clustered Server and High Availability System Support

Dual and multi-node cluster support is provided for host level fault tolerance and high system availability. MC Service Guard support is provided on HP-UX; VERITAS Cluster support and SUN Cluster support is provided on SUN Solaris; Microsoft Cluster Server (MSCS) is provided for ProLiant and other x86 platforms for Microsoft Windows NT Enterprise Edition and Windows 2000 Advanced Server; and HACMP is supported on IBM AIX.

#### Multi-Server Shared Support for Storage Consolidation

Heterogeneous and homogeneous host support provides the ability to share storage between multiple servers. The Virtual Array provides LUN access control through Secure Manager assuring that a host cannot access data belonging to a different host. SAN-based data zoning is also supported.

#### Solution Capacity

| Model   | Minimum Drives | Number of Drive Bays | Maximum Capacities (GB) |       |       |        |
|---|----------------|----------------------|-------------------------|-------|-------|--------|
|   |                |                      | 18 GB*                  | 36 GB | 72 GB | 146 GB |
| Virtual Array 7110  | 4              | 15                   | 270                     | 540   | 1080  | 2190   |
| Virtual Array 7410  | 10             | 15                   | 270                     | 540   | 1080  | 2190   |
| Virtual Array (1) 7110 + DS2405 Expansion (1) va7110, (2) ds2405                  |                | 45                   | 810                     | 1620  | 3240  | 6570   |
| Virtual Array (1) 7410 + DS2405 Expansion, (1) va7410, (6) ds2405 Expansion Model |                | 105                  | 1890                    | 3780  | 7560  | 15330  |

\*18GB drives are supported from older arrays for investment protection, but will not be orderable after January 1, 2003.

#### Fibre Channel Switch Support

Support for 8-, 16-, 32- and 64-port FC switches operating at 1 Gb and 8- 16-, 32- and 64-port FC SAN switches operating at 2 Gb allow the full benefits of a storage area network (SAN), providing exceptional connectivity while increasing the effective bandwidth of the network. Supported SAN features include zoning for communication isolation.

#### Transfer Speeds

The Virtual Array 7410 has two FC ports per controller. The VA7110 has one FC port per controller. Each controller-to-host interface is 2 Gb enabled. The controllers are also compatible with 1 Gb and 2 Gb FC switches, HBAs, servers and other storage solutions.

### Product Highlights

|   |  |
|---|--|
| <b>Easy Installation</b>                                  | The Virtual Array can be ordered with the array components (controller, cache and disks) integrated into the array enclosure and ready for field racking (A suffix), as a diskless enclosure (AE suffix) for integration in the field or customer site, or pre-installed into racks at the factory (suffix AZ). After unpacking, they can be plugged into power sources, connected to the FC SAN, enabled and configured.  |
| <b>Fault Tolerance</b>                                    | Redundant drive enclosure power supplies, blowers, controllers, mirrored cache, cache battery backup, and hot spare disks ensure fault tolerance against system outages and data loss.   |
| <b>High Availability</b>                                  | All Virtual Array models provide redundant cooling, power redundancy and environmental monitoring. Drives and most solution components are hot swappable. Each solution is configured with dual controllers that operate in dual redundant mode. In the event of a path failure, the alternate path to the controller can be utilized with the use of Auto Path software. The DS2405 FC drive enclosure also supports dual redundant FC loops that provide load balancing and redundant paths should either FC loop become unavailable.  |
| <b>Hot Pluggable Support</b>                              | The Virtual Array Enclosure and ds2405 FC Drive Enclosure support hot plug (power on) removal or insertion of FC disk drives.  |
| <b>Performance</b>  | Fibre Channel host connections provide up to 200 MB/s bandwidth for each path. Each va7410 controller has two Fibre Channel host ports (four ports in a redundant pair of controllers) assuring the availability of bandwidth for the most stringent applications. In addition, up to 2 GB of cache per controller pair ensures high performance. Mirrored write caching capability maintains optimal performance while assuring data integrity in the event of a failure.   |
| <b>Scalability</b>  | A controller pair will support up to 128 host connections and up to 1024 LUNs.   |
| <b>Operating Systems Supported – Single and Clustered</b> | <ul style="list-style-type: none"><li>● HP HP-UX</li><li>● Windows NT, Windows 2000, Windows Server 2003</li><li>● SUN Solaris</li><li>● IBM AIX</li><li>● Linux</li><li>● NetWare</li><li>● MPE/iX</li></ul> <p>Contact your HP authorized reseller or HP sales representative for specific details about version numbers, host bus adapters and infrastructure support.</p>  |
| <b>Additional Software for the Virtual Array Family</b>   | <p>HP StorageWorks Command View – SDM manage, diagnose and monitor the performance of the array</p> <p>HP StorageWorks Integration Pack – integrates Command View SDM into HP OpenView NNM for HP-UX or Windows, HP TopTools, CA-Unicenter-TNG, Tivoli Netview and BMC Patrol</p> <p>HP StorageWorks Business Copy VA – enables LUN copying with the array</p> <p>HP StorageWorks Secure Manager VA – enables LUNs to be locked into a secure shared environment</p> <p>HP StorageWorks Auto Path – enables I/O path fail-over in a single server for Windows, HP-UX and Linux</p> |
| <b>Total Cost of Ownership</b>                            | The new Virtual Array has one of the highest density disk storage solutions in the industry. Additionally, the unique virtual architecture enables up to a 2x reduction in storage management costs.   |

### Models

|  | Description                                | Option Number/<br>Comments                                 | Product<br>Number |
|--|--|--|-------------------|
| <b>HP StorageWorks Virtual Array 7110 and 7410</b> | va7110 with Dual Controller, 1024 MB Cache | #ABA North America<br>Power Cord –<br>English Localization | A7294A/AZ/AE      |
|  | va7110 with Dual Controller, 2048 MB Cache | #ABA North America<br>Power Cord –<br>English Localization | A7296A/AZ/AE      |
|  | va7410 with Dual Controller, 1024 MB Cache | #ABA North America<br>Power Cord –<br>English Localization | A6267A/AZ/AE      |
|  | va7410 with Dual Controller, 2048 MB Cache | #ABA North America<br>Power Cord –<br>English Localization | A6268A/AZ/AE      |
| <b>Virtual Array Family Modules</b>                | Virtual Array Enclosure                    | #ABA North America<br>Power Cord –<br>English Localization | A6183A/AZ/AE      |
|  | Virtual Array Controller 7110              | OD1  | A7293A            |
|  | Virtual Array Controller 7410              | OD1  | A6218A            |
|  | 512MB Cache for Virtual Array Processor    | OD1  | A6186A            |
|  | 1024MB Cache for Virtual Array Processor   | OD1  | A6187B            |
|  | Enterprise Class 36 GB 15K RPM FC HDD      | OD1  | A6192A            |
|  | Enterprise Class 73 GB 10K RPM FC HDD      | OD1  | A6193A            |
|  | Enterprise Class 73 GB 15K RPM FC HDD      | OD1  | A7288A            |
|  | Enterprise Class 146 GB 10K RPM FC HDD     | OD1  | A7289A            |
|  | DS2405 Disk Enclosure                      | #ABA North America<br>Power Cord –<br>English Localization | A6250A/AZ/AE      |
|  |  |  |                   |
|  | Fiber Optic Cable 2-meters LC 50/125 M/M   |  | C7524A            |

### Models

|                             |   |   |        |
|-----------------------------|---|---|--------|
| <b>Virtual Array Family</b> | Command View SDM 1 host License To Use (LTU) and software media kit. Device management for the va7000 Family    | Manage, diagnose, and monitor the performance of the array.   | T1001A |
|                             | Enterprise Integrations 1 host LTU and software media kit   | Enables Command View SDM in OpenView NNM, HP TopTools, CA-Unicenter-TNG, Tivoli Netview and BMC Patrol. Supports HP SEMI 1.0 for HP modular storage and tape devices. | T1002A |
| <b>Optional Software</b>    | Secure Manager, 50 GB host LTU and software media kit. (Required for enablement) (Not combinable – 50 GB max)   | Enables LUNs to be locked into a secure shared environment, and allow/disallow server access.   | T1003A |
|                             | Secure Manager 500 GB LTU   |   | T1004A |
|                             | Secure Manager 1 TB LTU   |   | T1005A |
|                             | Secure Manager 5 TB LTU   |   | T1006A |
|                             | Business Copy VA, 50 GB host LTU and software media kit. (Required for enablement) (Not combinable – 50 GB max) | Enables LUN copying within the array. Requires the same physical space to be available in the array as the LUN(s) being copied.                                       | T1007A |
|                             | Business Copy VA 500 GB LTU   |   | T1008A |
|                             | Business Copy VA 1 TB LTU   |   | T1009A |
|                             | Business Copy VA 5 TB LTU   |   | T1010A |
|                             | Auto Path for Windows 2000 1-host LTU and software media kit. (Required for enablement)                         | Enables I/O path fail-over to protect from SAN or HBA failure in a single server.   | T1011A |
|                             | Auto Path for Windows 2000 – 1-host LTU   |   | T1012A |
|                             | Auto Path for Windows 2000 – 5-host LTU   |   | T1013A |
|                             | Auto Path for Windows NT 4.0 – 1-host LTU and software media kit (Required for enablement)                      |   | T1039A |
|                             | Auto Path for Windows NT 4.0 – 1-host LTU   |   | T1040A |
|                             | Auto Path for Windows NT 4.0 – 5-host LTU   |   | T1041A |
|                             | Auto Path for HP-UX 11.0, 11i – 1-host LTU and software media kit (Required for enablement)                     |   | T1060A |
|                             | Auto Path for HP-UX 11.0, 11i – 1 -host LTU   |   | T1061A |
|                             | Auto Path for HP-UX 11.0, 11i – 5-host LTU  |   | T1062A |

### Service and Support, HP Care Pack and Warranty Information

#### Warranty

- 2-year, 8x5, 4-hour on-site response on hardware
- 2-year, 8x5, phone-in-assistance and LTU upgrade on Command View SDM

#### Hardware and mission critical support/warranty upgrade offerings

- 1 to 3-year, 24x7, 4-hour on-site response
- 1 to 5-year Storage Critical Support (SCS for VA), providing proactive services with assigned account team, core array management services and selectable technical consulting delivery, and reactive services including 6-hour call-to-repair and 24x7x365 for hardware and software.
- Business Continuity Support (BCS), with services that include assigned account team, operational assessment, change management assistance, system monitoring, and preventive assistance with the High Availability Observatory (HAO).

#### Software support offerings (for optional software packages)

- 1-, 2- or 3-year, 8x5, phone-in assistance (PIA) and LTU upgrade

#### Installation and Startup Services

The Installation and Startup Service package provides installation of StorageWorks Virtual Array products. It is required for the VA. It includes:

- Pre-Installation planning
- Hardware Installation
- Software enablement
- LUN design and implementation
- Customer documentation
- Customer orientation

For detailed support and services product and ordering information, refer to the storage hardware and implementation services at <http://www.hp.com/hps/storage/>.

**NOTE:** This Web site is available in English only.

### Family Information

|   | Virtual Array 7110   | Virtual Array 7410          |
|---|--|-----------------------------|
| Drive Interface                                     | Dual ported 2 Gb FC-AL   | Dual ported 2 Gb FC-AL      |
| Cache per controller                                | 1024 MB min, 2048 MB max   | 1024 MB min, 2048 MB max    |
| RAID Support  | RAID0+1, AutoRAID  | RAID0+1, AutoRAID           |
| Channels  | Two 2 Gb FC-AL   | Four 2 Gb FC-AL             |
| Maximum Drives per enclosure                        | 15   | 15                          |
| Maximum drives with optional expansion enclosures   | 45   | 105                         |
| Maximum Capacity per enclosure                      | 2.2 TB (with 146 GB disks)   | 2.2 TB (with 146 GB disks)  |
| Maximum Capacity with optional expansion enclosures | 6.6 TB (with 146 GB disks)   | 15.3 TB (with 146 GB disks) |
| Redundant Controllers                               | Yes  |                             |
| Drive Capacities                                    | 36 GB 10K rpm<br>72 GB 10K rpm<br>146 GB 10K rpm<br>36 GB 15K rpm<br>72 GB 15K rpm |                             |

**Configuration Information** Contact your HP authorized reseller or HP sales representative for assistance in building a specific configuration.

### Technical Specifications

|   |                         |                                   |                                     |
|---|-------------------------|-----------------------------------|-------------------------------------|
| VA7110 and VA7410<br>Controller Enclosure | Physical Specifications | Height                            | 5 in (12.7 cm)                      |
|   |                         | Width                             | 17.6 in (44.7 cm)                   |
| Electrical Specifications                 |                         | Depth                             | 26 in (66.04 cm)                    |
|   |                         | Net Weight Max                    | 34 lb (15.4 kg)                     |
|   |                         | Shipping Weight Max               | 130.1 lb (59.0 kg)                  |
|   |                         | Voltage (Auto-Ranging)            | 100-127 VAC, 200-240 VAC            |
|   |                         | Frequency                         | 50/60 Hz                            |
|   |                         | Current (Maximum; 2 power inputs) | 8.2 A @ 100 VAC, 3.6 A @ 200 VAC    |
|   |                         | Inrush Current (Peak)             | 36 A                                |
|   |                         | Power Consumption                 | 670 W                               |
|   |                         | Heat Dissipation                  | 196 BTU/hr                          |
|   |                         | VA Rating (Maximum Configuration) | 720 VA                              |
| Environmental Specifications              | Temperature             | Operating Range                   | 41° to 95° F<br>(5° to 35° C)       |
|   |                         | Recommended Range                 | 68° to 78° F<br>(20° to 25.5° C)    |
|   |                         | Non-Operating                     | -40° to 158° F<br>(-40° to 70° C)   |
|   | Temperature Gradient    | Operating Range                   | 36° F (20° C) per hour              |
|   |                         | Recommended Range                 | 36° F (20° C) per hour              |
|   |                         | Non-Operating                     | 36° F (20° C) per hour              |
|   | Relative Humidity       | Operating Range                   | 15% to 80% @ 28° C (dry bulb)       |
|   |                         | Recommended Range                 | 30% to 50% @ 28° C (dry bulb)       |
|   |                         | Non-Operating                     | 10% to 90% @ 28° C (dry bulb)       |
|   | Shock                   | Operating Range                   | 4 g, 11 ms half sine                |
|   |                         | Non-Operating                     | 4 g, 11 ms half sine                |
|   | Vibration               | Operating Range                   | 0.21 g rms, 5- to 500-Hz random     |
|   |                         | Non-Operating                     | 2.09 g rms, 5- to 500-Hz random     |
|   |                         |                                   | 0.5 g peak, 5- to 500-Hz swept sine |
|   | Altitude                | Operating Range                   | 0 to 10,000 ft<br>(0 to 3,048 m)    |
|   |                         | Recommended Range                 | 0 to 10,000 ft<br>(0 to 3,048 m)    |
|   |                         | Non-Operating                     | 0 to 15,000 ft<br>(0 to 4,572 m)    |
|   | Acoustic (ISO 9296)     | Operating Range                   | 8.0 bels                            |
|   |                         | Recommended Range                 | 8.0 bels                            |



### Technical Specifications

|                       |                              |   |  |  |  |
|-----------------------|------------------------------|---|--|--|--|
|                       | Regulatory Compliance        | Radiated and Conducted Emissions                            | FCC Class A, EN 55022: 1998, CISPR-22: 1997 Level A, and GB9254: 1998  |  |  |
|                       |                              | Immunity  | EN 55024: 1998/CISPR-24: 1997  |  |  |
|                       |                              | Harmonic Current  | IEC 61000-3-2: 1998/EN 61000-3-2: 1995 + A14   |  |  |
|                       |                              | Voltage Fluctuations and Flicker                            | IEC 61000-3-3: 1994/EN 61000-3-3: 1995   |  |  |
|                       |                              | Product Safety  | EN 60950: 1991, Second Edition + A1, A2, A3, and A4<br>CAN/CSA - C22.2 No. 60950-00, Third Edition<br>UL 1950: Third Edition IEC 60825-1: 1993 + A1/EN 60825-1: 1994 + A11 Class 1 (Laser/LED)<br>GB4943: 1995 |  |  |
|                       |                              |   |  |  |  |
|                       |                              |   |  |  |  |
| VA7xx0 Disk Enclosure | Physical Specifications      | Height  | 5 in (12.7 cm)   |  |  |
|                       |                              | Width   | 17.6 in (44.7 cm)  |  |  |
|                       |                              | Depth   | 20 in (50.8 cm)  |  |  |
|                       |                              | Net Weight Max  | 84.5 lb (38.3 kg)  |  |  |
|                       |                              | Shipping Weight Max   | 101.5 lb (46.0 kg)   |  |  |
|                       | Electrical Specifications    | Voltage (Auto-Ranging)                                      | 100-127 VAC, 200-240 VAC   |  |  |
|                       |                              | Frequency   | 50/60 Hz   |  |  |
|                       |                              | Current (Maximum; 2 power inputs)                           | 8.2 A @ 100 VAC, 3.4 A @ 200 VAC   |  |  |
|                       |                              | Inrush Current (Peak)                                       | 3.92 A @ 269 VAC   |  |  |
|                       |                              | Power Consumption   | 473 W @ 120 VAC, 457 W @ 240 VAC   |  |  |
|                       | Environmental Specifications | Heat Dissipation  | 1443 BTU/hr  |  |  |
|                       |                              | VA Rating (Maximum Configuration)                           | 473 VA @ 120 VAC, 457 VA @ 240 VAC   |  |  |
|                       |                              | Temperature   | Operating Range  | 41° to 95° F (5° to 35° C)   |  |
|                       |                              |   | Recommended Range  | 68° to 78° F (20° to 25.5° C)  |  |
|                       |                              |   | Non-Operating  | -40° to 158° F (-40° to 70° C)   |  |
|                       |                              | Temperature Gradient  | Operating Range  | 36° F (20° C) per hour   |  |
|                       |                              |   | Recommended Range  | 36° F (20° C) per hour   |  |
|                       |                              |   | Non-Operating  | 36° F (20° C) per hour   |  |
|                       |                              | Relative Humidity   | Operating Range  | 15% to 80% @ 28° C (dry bulb)  |  |
|                       |                              |   | Recommended Range  | 30% to 50% @ 28° C (dry bulb)  |  |
|                       |                              |   | Non-Operating  | 5% to 95% @ 149° F (65° C)   |  |
|                       |                              | Shock   | Operating Range  | 4 g, 11 ms (20 low-impulse pulses)   |  |
|                       |                              |   | Non-Operating  | 20 g, 30 ms trapezoidal (non-transport) 1-inch edge drops per side (transport) |  |
| Vibration             | Operating Range              | 0.21 g rms, 5- to 500-Hz random                             |  |  |  |
|                       | Non-Operating                | 2.09 g rms, 5- to 500-Hz random<br>0.5 g peak, 5- to 500-Hz |  |  |  |

Technical Specifications

|                                  |                                  |  |  |
|----------------------------------|----------------------------------|--|--|
| Regulatory Compliance            | Altitude                         | Operating Range  | swept sine<br>0 to 10,000 ft<br>(0 to 3,048 m) |
|                                  |                                  | Recommended Range  | 0 to 10,000 ft<br>(0 to 3,048 m)               |
|                                  |                                  | Non-Operating  | 0 to 15,000 ft<br>(0 to 4,572 m)               |
|                                  | Acoustic (ISO 9296)              | Operating Range  | 8.0 bels                                       |
|                                  |                                  | Recommended Range  | 8.0 bels                                       |
|                                  | Radiated and Conducted Emissions | FCC Class A, EN 55022: 1998, CISPR-22: 1997 Level A, and GB9254: 1998  |  |
|                                  |                                  | Immunity   |  |
|                                  |                                  | EN 55024: 1998/CISPR-24: 1997  |  |
|                                  |                                  | Harmonic Current   |  |
|                                  |                                  | IEC 61000-3-2: 1998/EN 61000-3-2: 1995 + A14   |  |
| Voltage Fluctuations and Flicker |                                  | IEC 61000-3-3: 1994/EN 61000-3-3: 1995   |  |
| Product Safety                   |                                  | EN 60950: 1991, Second Edition + A1, A2, A3, and A4<br>CAN/CSA - C22.2 No. 60950-00, Third Edition<br>UL 1950: Third Edition IEC 60825-1: 1993 + A1/EN 60825-1: 1994 + A11 Class 1 (Laser/LED)<br>GB4943: 1995 |  |

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