

digital

StorageWorks Multivendor RAID Array Subsystems

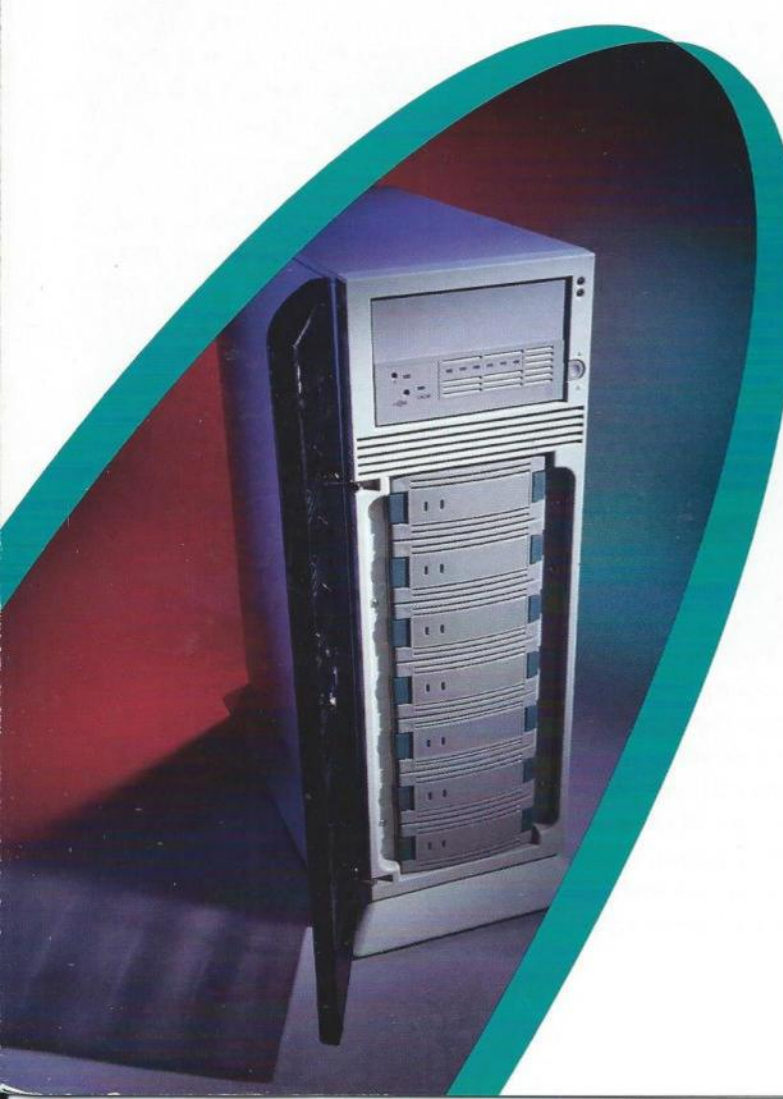
For continuous, quick access to mission-critical business data

StorageWorks

Your customers count on it to do business. Your employees need it to run the business.

When you depend on data access to stay in business, turn to StorageWorks RAID

Arrays. With a full range of subsystems and the most popular RAID levels, you're covered for every environment.



You can't afford to slow down — or stop — if a component or disk fails. So stay up-to-speed with StorageWorks RAID Array Subsystems. Disk mirroring and Parity RAID, combined with redundant, hot-swappable components and drives, ensure your data is available when you need it. While controller-based RAID, disk striping and battery protected write-back cache actually boost application performance.

Built-in benefits

- **Multi-platform** — fully tested on PCI- and EISA-based systems, and in UNIX® environments, including Hewlett-Packard®, IBM®, Sun Microsystems®, Windows NT®, Novell® NetWare® and Digital platforms.

- **Industry-leading performance** — all subsystems feature outstanding performance. Optional dual-redundant controllers nearly double the RAID Array 410's excellent performance.

- **Continuous data availability** — redundant controllers and components, hot-swappable hot spares, and RAID Levels 0, 1, 0+1, 5, and Adaptive 3/5 keep your data accessible.

- **Economical** — the new RAID Array 310 lowers entry level costs, for astonishingly high value.

- **Easy to use** — take the guesswork out of RAID with user-selectable RAID levels, simple configuration and maintenance, and user-friendly GUIs.

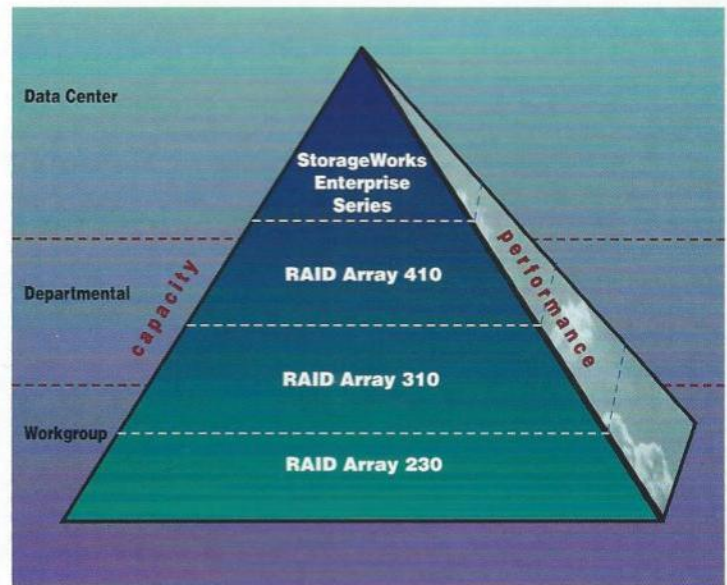
- **Award-winning** — The RAID Array 230 topped the charts at BYTE, LAN and PC Week magazines!

- **Investment protection** — with the modular StorageWorks design, you can configure to your needs, buy only the drives you need today, and add on more tomorrow. Plus universal StorageWorks disk drives move easily from one subsystem to the next, regardless of platform.

A full menu of availability

StorageWorks RAID subsystems ensure that your data stays accessible with a full range of availability features. Start with RAID technology, and add redundant, hot-swappable, hot spares and automatic drive reconstruction for continuous access to critical data. With drive reconstruction offloaded from the CPU, operations continue unaffected during reconstruction. Plus redundant, hot swappable components ensure there is no impact on data access if a component fails — and no downtime while you replace it.

StorageWorks RAID subsystems support the most popular levels of RAID. Since your data requirements may vary, all subsystems let you mix levels within your array. And all support a non-RAID disk array for data that doesn't require extra protection.



Disk mirroring — ideal for mission critical data, disk mirroring maintains duplicate data in mirrored sets of disks. If a disk fails, your application continues processing, without interruption, from the duplicate data.

Parity RAID — RAID Level 5 performs best for applications with high I/O request rates, while Level 3 is best suited to applications that transfer large files with lower request rates.

Digital's innovative Adaptive 3/5 RAID dynamically adjusts to changes in an application's workload — even when load characteristics change minute-by-minute. As a result, StorageWorks subsystems that offer Adaptive Level 3/5 eliminate the need to manually configure RAID sets for I/O or bandwidth, while providing excellent performance across a broad range of application types.

An array of performance-boosting features

Controller-based RAID frees your CPU to deliver application performance where it counts — to end-users.

Write-back cache deploys controller read cache for write operations, dynamically allocating memory as needed to both read and write operations. This feature lets applications continue without waiting for completions of writes to disk, while on board batteries protect cached write data from power interruptions. The result? Measurable I/O response time improvements — as high as 80% for write transactions.

Disk striping is standard with all StorageWorks RAID subsystems. Striping maps data across the entire disk array, breaking up "hot spots" that create performance bottlenecks and are created by frequent access to a chunk of data.



RAID Array 410 Subsystem

- Ideal for client/server, small data center, and large departmental environments

- **New!** Windows NT cluster support

- Multi-host support. Tested and supported in HP-UX®, IBM® AIX®, SunOS™, Solaris®, Windows NT (Intel™ and Alpha) and Digital UNIX environments

- 6-channel controller supports up to 100 GB in a RAID 410 subsystem. Or you can custom configure rackmountable controllers in data center cabinets for *multiple terabytes* of on-line capacity

- RAID levels 0, 1, 0+1, Adaptive 3/5 or non-RAID disk support

The RAID Array 410 subsystem is designed for mission-critical applications. For optimum availability and dramatically enhanced performance, the RAID Array 410 supports dual redundant controllers. Additionally, it comes complete with read and write-back cache, 100 hours battery backup for cache, and a StorageWorks RAID office enclosure with redundant fans and power supplies. Platform kits enable connection to the multiple host environments, and include adapter drivers, software licenses and utilities. The kits are available with and without host adapters. The subsystem notifies the host if a drive or controller fails, and also includes an environmental monitoring unit that provides visual and audio problem notification.

RAID Array 310 Subsystem

- Designed for medium-sized departments or large work-group environments

- **New!** Windows NT cluster support

- Tested and supported on a growing list of platforms, including Solaris, Digital UNIX, HP-UX, and Windows NT (Intel and Alpha)

- Supports from 10 to 30 GB, and can expand to 60 GB of on-line data

- RAID Levels 0, 1, 0+1, Adaptive 3/5, or non-RAID disk support

The low-cost RAID Array 310 offers many of the same features as the RAID Array 410, with comparable performance. Its 2-channel SCSI controller provides 16 MB of battery protected read and write-back cache. The subsystem provides redundant, hot-swappable power and cooling for up to 7 drives in a single deskside pedestal; an optional expansion pedestal lets you add another 7 drives. The RAID Array 310 subsystem comes complete with a controller, a deskside pedestal, software, and cables. Platform kits enable connection to the multiple host environments; they include adapter drivers, software licenses and utilities, and are available with or without adapters.



The RAID Array 230 Subsystem tops the charts

PC Magazine, June, 1996

*StorageWorks RAID Array
"Top of the List"*

LAN Magazine, April, 1996

Disk Array Product of the Year

**Byte Magazine,
September, 1995**

*Best Overall Disk Array
Best Database Server
Best Audio/Visual
Best Value*

RAID Array 230 and RAID Array 210 Subsystems

- Designed for small to midsize departments and workgroups
- The RAID Array 210 is tested and supported on Alpha and Intel EISA-based systems, including OpenVMS, Digital UNIX, Windows NT, and Novell NetWare
- The RAID Array 230 is tested and supported on Alpha PCI-based systems, including Digital UNIX, OpenVMS, Windows NT and Novell NetWare
- One-channel models support up to 30 GB of on-line data; three-channel models support up to 90 GB
- User-selectable RAID Levels 0, 1, 0+1, 5, or non-RAID disk array

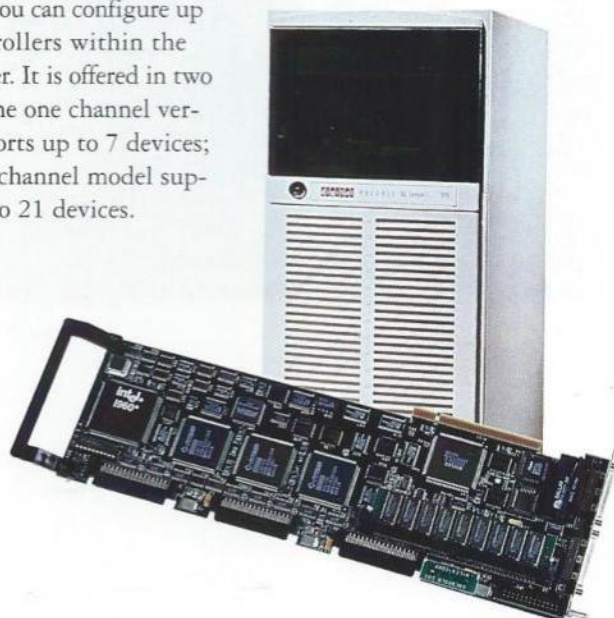
The RAID Array 230 and RAID Array 210 Subsystems offer excellent performance and exceptional ease-of-use, with backplane RAID controllers that provide user-selectable RAID and read/write cache. The RAID Array 230 supports user-selectable write-back cache with optional battery backup, for enhanced performance and data protection. The RAID Array 210 offers user-selectable write-behind cache for high performance and write-through cache for higher data availability and protection. Both subsystems support variable data reconstruction rates, so you can tune performance to your exact needs. Tag command queuing lets each drive process multiple commands simultaneously, for increased performance. Built-in diagnostics let you know if a component needs to be replaced. Each subsystem includes a controller, software, deskside enclosures and cables.

The controller...the heart of the subsystem

The heart of the subsystems are their controllers, which provide RAID and write-back cache functionality. Each controller is an intelligent storage server that integrates industry-standard SCSI-2 storage devices, including StorageWorks disk, tape, solid state disk and optical devices.

The RAID 410 controller is available separately, letting you custom configure your storage solution in a departmental or, for multiple terabytes of on-line storage, in data center cabinets. The controller supports up to 42 devices. Dual-redundant controllers are supported under Digital UNIX and OpenVMS Alpha, and support up to 36 devices per controller.

The RAID 230 backplane controller is also offered separately so you can build a totally custom solution. For increased capacity, you can configure up to 4 controllers within the same server. It is offered in two models: the one channel version supports up to 7 devices; the three-channel model supports up to 21 devices.



Models and options**Model No. Description****RAID Array 410 Subsystem**

All RAID Array 410 subsystems include a RAID 410 controller, five power supplies and six cooling fans for N+1 redundancy, and an environmental monitoring unit.

SWXRA-YZ	Includes one 2.1 GB disk drive and RAID cabinet
SWXRA-YY	Includes one 4.3 GB disk drive and RAID cabinet
SWXRA-YN	Rackmount subsystem. Includes one 4.3 GB disk drive and 24 device shelf. Requires departmental or data center cabinet.
SWXRC-05 (Multivendor)	RAID Array 410 controller. With 32 MB read and write-back cache.
HSZ40-Bx (Digital)	RAID license, and SCSI interface. Supports up to 42 drives.

RAID Array 310 Subsystem

SWXRA-Z1	Includes RAID 310 controller, FWD SCSI connection, pedestal enclosure with 7 disk bays, dual power and cooling modules, Environmental Monitoring Unit, one serial cable and two serial line adapters.
----------	---

RAID Array 310 expansion kit

SWXRA-Z2	StorageWorks pedestal enclosure for seven additional disk bays, dual power and cooling modules, cabling. Requires SWXRA-Z1.
----------	---

RAID Array 410 and RAID Array 310 platform kits

RAID Array 410 and RAID Array 310 kits are available for numerous hardware platforms and operating system environments. Platform kits enable connectivity to each supported platform.

RAID Array 230 Subsystem

All RAID Array 230 subsystems include a controller kit, StorageWorks wide deskside pedestal enclosure, and an additional power supply.

SWIRA-CD	Multivendor 1-channel, includes three 1.05 GB wide disk drives
SWIRA-CG	Multivendor 1-channel, includes three 2.1 GB 7200 RPM wide disk drives
SWIRA-CF	Multivendor 1-channel, includes three 4.3 GB 7200 RPM wide disk drives
KZPSC-AA	Alpha and Intel, 1-channel. Drives ordered separately.
SWIRA-CH	Multivendor 3-channel, includes three 2.1 GB 7200 RPM wide disk drives
SWIRA-CK	Multivendor 3-channel, includes three 4.3 GB 7200 RPM wide disk drives
KZPSC-AA	Alpha and Intel, 3-channel. Drives ordered separately.

RAID 230 controller kits

SWIKX-CA	1-channel	PCI RAID backplane controller with 4 MB cache, management utilities, operating system
SWIKX-CB	3-channel	drives for Novell NetWare 3.12/4.1 and Windows NT (Intel) 3.5.1, necessary cables (narrow and wide) and documentation.

RAID Array 210 Subsystems

All RAID Array 210 Subsystems include the EISA RAID controller, StorageWorks deskside pedestal enclosure, and additional power supply.

SWIRA-BA	Multivendor, 1-channel, includes three 1.05 GB disk drives
KZESC-AA	Digital Alpha, 1-channel, includes software and documentation kit for OpenVMS, Digital UNIX, and Windows NT, 4 MB cache. Requires SCSI cables.
SWIRA-BC	Multivendor, 3-channel, includes three 2.1GB, 7200 RPM disk drives.
KZESC-BA	Digital Alpha, 3-channel, includes software and documentation kit for OpenVMS, Digital UNIX, and Windows NT, 4 MB cache. Requires SCSI cables.

RAID 210 controller kit

SWIKX-BA	1 channel	Includes EISA RAID controller, Novell NetWare 3.12/4.1 and Windows NT (Intel)
SWIKX-BB	3 channel	3.51 drivers, RAID software and license, necessary cabling, and documentation.
CK-SWXCRAA		Cable and bulkhead connector kit for KZESC-BA.
MS100-AA		16 MB cache memory for KZESC. Replaces 4 MB SIMM on KZESC backplane RAID controller.
MS100-AB		32 MB cache memory for KZESC. Replaces 4 MB SIMM on KZESC backplane RAID controller.

Specifications				
	RAID 410	RAID 310	RAID 230	RAID 210
Host interface	FWD SCSI-2	FWD SCSI-2	PCI	EISA
Host transfer rate (MB/second)	20	20	14	10
Disk channels	6	2	1,3	1,3
Maximum I/O (I/Os per second)	4,350 per controller	3,000	2,000	2,000
Rackmount option	yes	no	no	no
Dual controller	yes	no	no	no
# LUNs per controller, max	8, 32 total	8, 32 total	8	8
EMU (Environmental monitor)	yes (power, temp)	yes (power, temp)	yes	yes
RAID levels supported	0,1,0+1, Adaptive 3/5	0,1,0+1, Adaptive 3/5	0,1,0+1, 5	0,1,0+1,5
Maximum disks	42 per controller	14 (with expansion)	21 (3 channel)	21 (3 channel)
Controller cache	32 MB	16 MB	4-32 MB	4-32 MB
Write-back cache	yes	yes	yes	no
Battery backup for cache	yes	yes	optional	no
Serviceability	Hot-pluggable	Hot-pluggable	Hot-pluggable	Hot-pluggable
Subsystem dimensions				
Height (mm/in)	838.2/33	542.5/21.4	565/22.2	565/22.2
Width (mm/in)	476.25/18.75	244.3/9.6	209/8.2	209/8.2
Depth (mm/in)	482.6/19	523.5/20.6	442/17.0	442/17.0
Weight (empty, kg/lbs)	106.65/242	19.5/43	16.26/35.8	16.26/35.8
Drives Supported	StorageWorks 4.3, 2.1, 1.05, wide and narrow, fast SCSI-2, 5400 and 7200 RPM disk drives			
Environmental				
Operating temperature	10° C to 40° C			
Non-operating temperature	-40° C to 66° C			
Relative humidity	10% to 80%			
Regulatory approvals	FCC-A,UL, CSA, TUV, and CE-Mark			
Subsystem electrical rate	410: 100-120/220-240V ac, 50/60 Hz, single phase, 2/6 amperes 310: 100-120/220-240V ac, 50-60 Hz single phase 230: 94-264V ac (auto-ranging) 210: 94-264V ac (auto-ranging)			

Call Us

For more information on StorageWorks Multivendor RAID Arrays, please contact your local sales representative or call one of the following numbers:

Location	Phone	FAX
US and Canada	1-800-STORWORK	
Europe	31-24-3529955	31-24-3529696
Japan	81-3-5349-7100	81-3-5349-7421
United Kingdom	0500 827140	
Australia/New Zealand	61-2-561-6123	61-2-561-5650
Hong Kong	852-805-3274	852-805-4201
Singapore	65-299-7188	62-295-1296

Online address

The Storage InfoCenter <http://www.storage.digital.com>

Digital believes the information in this publication is accurate as of its publication date; such information is subject to change without notice. Digital is not responsible for inadvertent errors. Digital conducts its business in a manner that conserves the environment and protects the safety and health of its employees, customers, and the community.

Digital, the DIGITAL logo, OpenVMS, and StorageWorks and the StorageWorks logo are trademarks of Digital Equipment Corporation.

Hewlett-Packard and HP-UX are registered trademarks of Hewlett-Packard Corporation. Sun, Sun Microsystems, and Solaris are registered trademarks, and SunOS is a trademark, of Sun Microsystems, Inc. Windows NT is a trademark of Microsoft Corporation. Novell and NetWare are registered trademarks of Novell, Inc. AIX and IBM are registered trademarks of International Business Machine, Inc.