HITACHI
DATA SYSTEMS

Product Support Plan
9200 Midrange Disk Subsystem (Hitachi DF500)

HDS Document Number FE90DF529-2

Preface

This document is designed to provide HDS, HDS distributor, and Value Added Reseller personnel technical reference information on the 9200 Storage Subsystem. It will discuss plans and procedures that will enable field staff to install and maintain this subsystem. Each customer will have slightly different requirements, but the information and steps outlined in this document should ensure the 9200 is successfully planned for, and installed.

This document was created using Microsoft Word '97, and is available on the HDS Intranet at:

http://hdsnet.hds.com/techpub/9200/fe-90df529/df5292.pdf

and for Distributors and Channel Partners via the HDS Extranet:

https://channelone.hds.com

If you would like a copy sent via Internet Mail, please forward your request to Dave Eldridge, Dave.Eldridge@hds.com in Europe or Kevin.Probst@hds.com in the Americas or AP.

Please refer to the Preface section of this document for obtaining an online copy of this document.

Summary of changes to this document

This is the third revision, and updates support for 2Gb FC interfaces, LA support for 18GB - 15K drives on an RPQ basis, also adds HPM for Solaris, and the new "black" HDS 19" Rack.

Trademarks

REVISION CONTROL INFORMATION

Review Schedule Year 1

Planned Review	Review Completed
March, 2001	March, 2001
June, 2001	June, 2001
September, 2001	

Review Schedule Year 2

Planned Review	Review Completed
March, 2002	

Note: This document will be reviewed according to the above schedule, by the last day of the indicated months or earlier if product schedules and features dictate.

Please send any corrections or suggestions for this manual directly to Dave Eldridge, Dave.Eldridge@hds.com in Europe or Kevin.Probst@hds.com in the Americas or AP.

Please refer to the Preface section of this document for obtaining an online copy of this document.

Table of Contents

List of Tables

List of Figures

Chapter 1 HDS 9200 Storage Subsystem

1.1 9200 Introduction

The 9200 (Hitachi DF500 Series) 9200 Storage Subsystem is the successor to the highly popular 5800 (Hitachi DF400 Series) Storage Subsystem. The 9200 implements a new "modular" architecture. It has been designed to address the need for large capacity data storage, high-speed data transfer, high reliability and specifically targets the High-End SMP/Cluster Server environment. The 9200 has similar serviceable components as the 5800 product. The main *new* features and functions of the 9200 compared to the 5800 are:

Increased Performance

- Modular Design (separate RK and RKA units)
- RISC PowerPC 750 processor 300mhz
- 256MB to 2GB/controller cache
- High Throughput back-end (4) FC-AL paths
- Fibre Channel Disk Drive connectivity
- Cache Bus 128bit (805MB/s)
- Host Data Bus (2) 64bit PCI buses (266MB/s)
- 36 and 72 GB drives (10K RPM)
- 18 GB (15K) available on RPQ only
- Up to 5 Global Spare drives

Increased Capacity

- Up to 100 drives, (1 RK + 9 RKA (additional drive units))
  - Basic RK Unit consists of 1-2 CTL assy(s) and (10) drives
  - Additional RKA Units consist of (10) disk drives w/o CTL assy(s)

Increased Connectivity Options

- Fibre Channel optical I/F provides up to 100MB/s (F_ port and FL_ port)
- Fibre Channel optical I/F (new interfaces provides up to 200MB/s support)
- Ultra SCSI I/F provides up to 40 MB/s
- Ultra-2 (LVD) I/F provides up to 80MB/s

Multi-port configuration

- Multi-ports function enables storage consolidation in Heterogeneous environments with or without HA software
- Each port of the 9200 can be connected to varied type host platforms (see note.)

Note: Each port of the 9200 can now be connected to both SUN and WinNT/2K "type" of host servers. (with the use of LUN Security and fabric switch).

Chapter 2 Product Information

2.1 Overview of the Hitachi 9200 Disk Subsystem Product

The Hitachi 9200 product is a storage subsystem that supports the RAID 0, 0+1, 1 and 5 standards. RAID stands for **R**edundant **A**rray(s) of **I**ndependent **D**isks. The RAID architecture allows for high throughput and fault tolerance of disk failures. The 9200 primarily uses Fibre Channel interfaces (optical multi-mode), but can also be configured with SCSI Ultra fast/wide or Ultra-2 LVD interfaces, all provide attachment to Windows NT/2000, IBM, SUN, HP and other workstations and servers. This means that it does not need to be a "compatible" product as long as the appropriate disk geometry can be described in the appropriate "disk control file" within the host operating system and the appropriate SCSI, or Fibre Channel optical interface support is available on the target host system. The 9200 comes in two modular components types, RK which consists of one to two controllers and 10 disk drives and the RKA unit which is an additional drive bay of 10 disk drives.

The 9200 **R**ack-mount pac**k**age (RK) can serve up to (9) RKA units for a total of one hundred active disk drives, of the one hundred drives up to five can be designated as Global Hot Spares drives. The RKAs are daisy-chain attached to the controlling RK unit by means of the two "Enclosure Assemblies" and the optical cables that are present with every RK and RKA unit . The base RK unit consists of a frame, one controller with an embedded FC interface, one battery assembly, one floppy disk drive, two enclosure assemblies and two power cords. An optional second controller can be added, with cache capacity of up to 2 GB per controller. Two AC/DC power supplies maximum may be installed. One standard dedicated, plus one hot spare. The power requirement for both the RK and RKA is either standard **110V** or **220V 50/60Hz AC** power. The 9200 is intended to rack mount in the HDS 19" or industry standard 19" rack. Rail kits for the 9200 RK and RKAs to install in the HDS 19" rack are available to order. A Universal rail kit is also available for mounting in other vendor racks. **(see Table 8.4)**

The 9200 RKA can support one SCSI or two Fibre Channel interfaces per controller, one Fibre Channel interface is standard on and imbedded on the controller, and one is optional. There is **NO** intermix of SCSI and Fibre Channel interfaces. If the RK is converted for SCSI attachment the Fibre Channel interface that is embedded on the controller becomes non-functional. Both the RK and RKA units can be converted to stand-alone with the purchase of an optional kit/s **(H1F - RK and H2F -RK+RKA)**

The 9200 feature an outstanding Mean Time Between Data Loss, which has been calculated to be 20 million hours, (over 2000 years). Data integrity is achieved by the 9200's controller automatically creating and adding a unique 8-byte data assurance code (Reed Solomon) to the data from the host, which is then written to disk along with the data. An automatic creation check for the data assurance code is performed on the data bus of the controller, to validate the transaction.

The 9200 disk subsystem enables automatic recovery from a disk drive failure with no cessation of operation (in RAID 1, 0+1&5 modes). With the remote assistance of Worldwide Technical Support, the failed drive can be easily identified and replaced by the user or Customer Engineer, without requiring tools or special training. Once replaced, the new drive is brought back on-line immediately using a background operation. If an optional "Hot Spare" drive/s is installed, RAID and Data integrity can be assured, since any failed drive location is automatically assumed by the "Hot Spare" drive and RAID and data reconstruction (a correction copy) takes place via an automated background operation. When the faulty drive is replaced, the "new drive" is automatically recognized by the system and a background transfer of RAID and data integrity takes place (a copy back). Data is automatically reconstructed in real time.

Optionally, without dedicating the system for preventive maintenance the customer or Customer Engineer can replace disk drives, power supplies, controllers, and cooling fans.

The 9200's controller has a Motorola PowerPC 750e – 300mhz processor installed along with support circuitry and dedicated memory. An integrated RS232 maintenance port is integrated on the controller, which via a PC connected to this port, and running the Resource Manager 9200 software, allows you to access almost all diagnostics and set-up functions.

A LAN port is integrated on each controller to assist in remote system management. This SNMP capable RJ-45 10Base T Ethernet LAN port provides an SNMP MIB-2 capability to the 9200. Resource Manager 9200 can also be used to manage the 9200 across a network via this port.

The 9200 has a redundant battery backed up cache that can vary in size between 256 Megabytes and 2 Gigabytes (depending on model and cache options installed). The batteries keep the cache protected in the event of a power failure from 48 to 150 hours depending on the installed cache size. The 9200 also utilizes special algorithms to ensure high cache hit ratio to improve data throughput.

The 9200 can be ordered with Ultra fast/wide Differential, Ultra-2 (LVD) I/Fs or Fibre Channel I/Fs. The 9200 use standard 68pin connectors on both the Ultra SCSI and Ultra-2 (LVD) I/F's.

There are (2) new interfaces available on the 9200. The 2 Gbps Fibre Channel interface board (DF-F500-DF2G2) it has downward compatibility with the 1 Gbps Fibre Channel Interface daughterboard (DF-F500-DFFM5 or DF-F500-DFFM6).

The 1 Gbps Fibre Channel Interface board of DF500 (DF-F500-DFFM6) is an Interface board that supports the F-Port and has downward compatibility with the DF-F500-DFFM5.

Note: SCSI interfaces are now GA.

Note: I/F = interface

2.2 SCSI Channel General Information

The 9200 attaches to the host system via a SCSI connection. The initials SCSI (pronounced 'skuzzy') stands for **S**mall **C**omputer **S**ystem **I**nterface.

There are many different types of SCSI interfaces, including Narrow, Wide, Single-Ended, Differential, Ultra, and Ultra-2.

Single-Ended and Differential SCSI devices may not be mixed on the same SCSI bus without a special conversion device (not recommended).

Wide and Narrow devices can be mixed on the same SCSI bus with special cables and/or adapters (generally requires a 68 to 50 pin adapter cable). There are speed limitations that result depending on the device types and cabling.

In addition each SCSI addressed device can internally have a number of Logical Units (LUN's). The 9200 subsystems support 8 LUN's per subsystem in LUN mode, or 16 per subsystem with Multi-Target. This Multi-Target mode configuration allows each defined LUN in the subsystem to be assigned a SCSI Target-ID, which appears to the attached host(s) as a physical device, not as a LUN. The benefits of Multi-Target configurations are that the devices attached to one controller are not visible to the host(s) attached to the other controller, and vice-versa. A total of 15 devices can be configured in this mode, but you cannot assign more than 8 to any one controller. In addition, the 9200 subsystem now supports up to a total of 64 LUNs by using an extension of Multi-Target mode known as LUN mapping, this can only be accomplished with the advanced configuration tools included in Resource Manager 9200.

A SCSI bus must have a terminator installed at each end. The SCSI controller card in the host normally has one of the two terminators placed on it. Since SCSI devices are connected in a daisy-chain fashion, the last device connected on the SCSI bus must also be terminated. Failure to correctly terminate or the removal of a terminator while the SCSI bus is active, may result in data corruption, system crashes and other system problems.

It is also recommended that the 9200 be powered on first, followed by other external devices before powering up of the host system. Power on of the other devices should wait until the 9200 is fully powered up. The 9200 has a 40 second to 3 minute power up cycle. Observing this rule should prevent a host system failing to detect SCSI devices during boot-up, this can result in the host system failing to boot up correctly or recognize the 9200 devices. The SCSI interfaces that are optional on the 9200 system have a termination jumper that is factory set to auto-terminate. The cables that are optionally shipped with the HDS 9200 units are high-quality cables that meet or exceed SCSI specifications. In some cases, a customer might require specialized cables. These specialized cables could include longer lengths than HDS stock, or cables made with special materials or characteristics for unusual environments. HDS Product Support can assist with "recommendations" in these situations.

2.2.1 Single-Ended SCSI

Single-Ended (SE) SCSI requires that all devices be attached on a bus that has a maximum length of 6 meters (19.67 feet). The specification for a Narrow single-ended SCSI bus allows eight devices to be connected together. Each device is given its own address from 0 to 7. The specification for a Wide single ended SCSI bus allows for sixteen devices to be connected together. Each device is given its own address from 0 to 15. The SCSI controller card in the host system takes one of the addresses, normally 7.

2.2.2 Differential SCSI

Differential SCSI is more resistant to noise and can increase the maximum length of the bus to 25 meters (81.97 feet). The specification for a differential SCSI bus allows sixteen devices to be connected together. Each device is given its own address from 0 to 15. The SCSI controller card in the host system takes one of the addresses, normally 7.

2.2.3 Ultra W/D SCSI **(available on 9200)**

Ultra SCSI boosts data transfer speed from the limit of 10 Mbytes per second for Fast SCSI-2 to 20 Mbytes per second. It also doubles the Fast Wide SCSI-2 data transfer rate from 20Mbytes per second to 40 Mbytes per second. Ultra SCSI is backward compatible with previous generations of SCSI and uses the same physical environment. Cables, connectors, and terminators that support SCSI can support Ultra SCSI.

However, due to the increased attenuation required for Ultra SCSI, the length restrictions for a Single-ended Ultra SCSI interface drops down from 6 meters to 3 meters.

2.2.4 Ultra-2 (Low Voltage Differential SCSI) **(available on 9200)**

A new transceiver technology, Ultra-2 Low-Voltage Differential (LVD), will combine the best features of single-ended and high-power differential transceivers. LVD will also enable higher speeds. To ease the migration to LVD, most new devices will support Universal transceivers, which include both single-ended, and LVD transceivers. LVD SCSI is also commonly referred to as Ultra-2 or Active-Negation SCSI. Low Voltage Differential (LVD) uses 3.3 volts rather than the 5 volts in the standard differential (high voltage differential). The maximum length is 12 meters.

2.3 Fibre Channel General Information

The intention of Fibre Channel (FC) is to develop practical, inexpensive, yet expandable means of quickly transferring data between workstations, mainframes, supercomputers, desktop computers, storage devices, displays and other peripherals. Fibre Channel is the general name of an integrated set of standards being developed by the American National Standards Institute (ANSI).

There are two basic types of data communication between host processors and peripherals:

- A channel provides a direct or switched point-to-point connection between the devices. Channels are typically hardware-specific and transports data at the high speed with low overhead.
- In contrast, a Network is a more general purpose and flexible set of communications where all devices agree on the method of communications. A network has relatively high overhead since it is more general purpose and supports a wider variety of communications, and consequently slower than a channel.

Networks can handle a more extensive range of tasks than channels as they operate in an environment of unanticipated connections, while channels operate amongst only a few devices with predefined addresses. Fibre Channel attempts to combine the best of these two methods of communication into a new I/O interface that meets the needs of channel users and network users.

Fibre channel is a high performance serial link supporting its own, as well as higher levels protocols such as the FDDI, SCSI, HIPPI and IPI. The Fibre Channel standard addresses the need for very fast transfers of large amounts of information. The fast (up to 1 Gbit/s) technology can be converted for Local Area Network technology by adding a switch (HUB, Router, etc.) that handles multipoint addressing. Another advantage of Fibre Channel is, that it gives users one port that supports both channel and network interfaces, unburdening the computer from a large number of I/O ports. FC provides control and complete error checking over the link.

2.3.1 Topology

Fibre Channel provides a logical point-to-point serial channel for the transfer of data between a buffer at a source device and a buffer at a destination device. In this way, Fibre Channel avoids the problems of handling different network communications protocols; it merely moves buffer contents from one port to another without regard to the format or meaning of the data. Fibre Channel only provides control of the transfer and simple error detection. Fibre Channel supports a number of possible topologies:

- Point-to-point: The simplest topology utilizes bi-directional point-to-point links that interconnect the N_Ports of a pair of Nodes.

- Fabric: A switching fabric may be present, in which case the links provide a bi-directional connection between a Node (N_Port) and the Fabric (F_Port). Since FC relies on port logging between Nodes and the Fabric, it is actually irrelevant whether the Fabric is a switch, a hub, or some other technology. Generic Fabric requirements and characteristics of the switch fabric are defined in the FC-FG and FC-SW standards, respectively.
- Loop: The newest Fibre Channel topology type is an arbitrated loop, defined in the FC-AL standard (X3.272). The Loop topology interconnects L_Ports at the Nodes and/or the Fabric via unidirectional links; the nomenclature NL_port and FL_Port refers to an N_Port or F_Port, respectively, that can support arbitrated loop functions in addition to the basic point-to-point functions. The loop protocol permits an L_Port to continuously arbitrate to access the medium to transmit to another L_Port; a fairness algorithm ensures that no L_Port is blocked from accessing the loop.

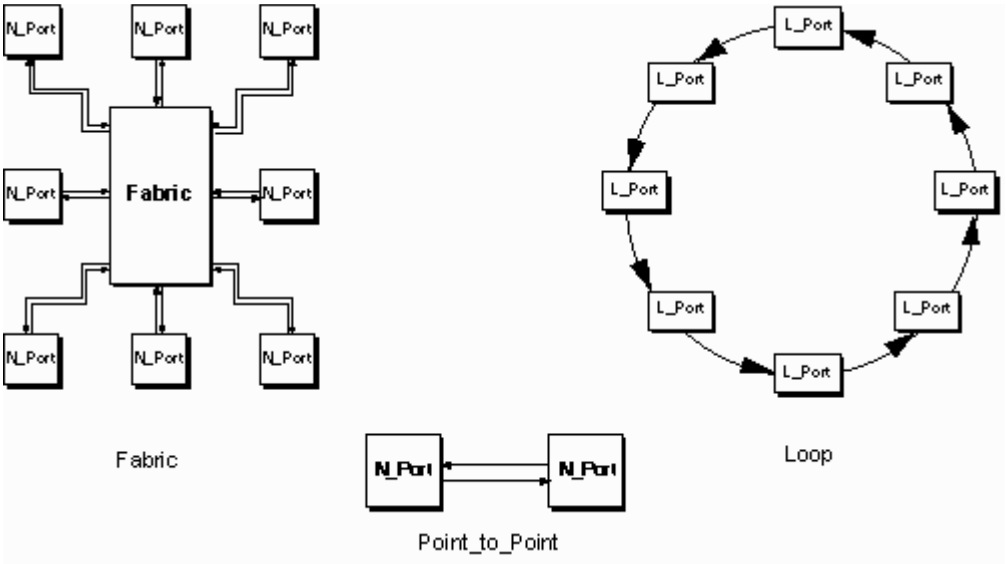


Figure 2.1 Fibre Connections

2.4 RAID Levels

Table 2.1 defines different RAID levels. Note that the 9200 supports **ONLY** the following: RAID 0 (Striping), RAID 1, RAID 5, RAID 0+1 also known as RAIDA.

Table 2.1 Raid Levels (* = Hitachi 9200 supported levels)

LEVEL	Implementation	Positive	Negative
RAID0*	(NOTE: Hitachi's RAID 0 implementation for the DF500 uses data striping) **2D-16D**	Maximum disk storage capacity Lowest cost per megabyte.	No Redundancy
RAID1*	Disk Mirroring. Each byte of data is written to two separate drives. **1D+1P**	Fault tolerance, if one drive goes out the other continues to function. Reads from the disk are faster than a single disk drive. Can easily be implemented by software on Host systems.	Write performance is slower than to a single disk. Highest cost of all the RAID levels because of complete disk redundancy.
RAID * 0+1 **Also called RAIDA by Hitachi**	Disk Mirroring AND disk striping combined (Note: The 9200 RAID 0+1 implementation will be to stripe two to eight drives and then mirror to the second set of drives. **2D+2P to 8D+8P**	High Performance and High Reliability	Higher cost compared to RAID 5.
RAID2	Disk striping by bits with error correction.	Good use of storage. Data protected by fault tolerance.	Slower failure recovery than RAID 1.
RAID3	Disk striping of data blocks with dedicated parity drive for error corrections.	Parallel disk I/0 for speed. Data protected by fault tolerance.	Only one short block of data may be written at a time.

Table 2.1 Raid Levels continued (* = Hitachi supported levels)

LEVEL	Implementation	Positive	Negative
RAID 4	Disk striping of data blocks with error correction capability and a dedicated parity drive.	Parallel disk I/O for speed (faster than RAID 3). Data protected by fault tolerance.	Similar to RAID 3 and less fault tolerant.
RAID 5*	Parity data and data blocks staggered striped over multiple disks. **2D+1P to 15D+1P**	Parallel disk I/O for speed. Data protected by fault tolerance. Multiple writes allowed to the array at a time.	Read/Write performance can be slower than a RAID 0 without an I/O cache.
RAID 6	(**Not defined** in the original RAID documents) RAID 6 is similar to RAID 5 but two parity sections for each block of data	Very high fault tolerance	Very expensive, performance is slightly slower than RAID 5 unless accompanied by an I/O cache.

Chapter 3 9200 Support Environments

3.1 Host Platform & System Support

The 9200 is designed to be attached to systems that use Fibre Channel interfaces, particular hosts that have passed a QA certification can be attached with the Fibre Channel interface. HDS colleagues should reference the Feature Availability Report (FAR), or eFAR at http://ntserv.hds.com/ssen/kb/kb.start.cfm this report is updated by Product Management and distributed by the Sales Operations group. Distributors and Channel Partners should reference this report via the Extranet at https://channelone.hds.com In addition Product Support has setup this Fibre Interop Index for the rapidly changing Fibre Channel and switch environment. http://sanweb01.hds.com/support/storage/9200/fibre/fci_index.htm Extranet access is the same as above.

There will be some platforms that will only be required in a particular country or geography and as such will not be supported on a worldwide basis. Other platforms may be requested in a specific geography, but HDS cannot support these environments until we have a Technical Support infrastructure in place to meet our customers' expectations for a high level of service and support. If you have any questions about support for a particular platform or feature in your geography, please consult with the MRC or your geographic Technical Support group (San Diego, Sefton Park, or Sydney). HDS have targeted a specific platforms and environments for the 9200 for a few very simple reasons:

- Hitachi (STR) must have qualified the environments.
- HDS must have Technical Support capabilities including people skills and equipment to ensure the highest level of support for our customers.
- HDS must have training available to HDS CS&S colleagues.
- HDS must have documentation to support the installation and use of the products.

The misconception that a subsystem supports “Fibre Channel” or “SCSI” and that this translates to support for a wide variety of hardware and software products and platforms is very difficult to resolve. UNIX systems in particular are very *proprietary* in the way that they deal with peripheral devices. The term “Open Systems” does not apply to the internal workings of many of these systems so a cautious approach to new platforms and devices is an absolute requirement for HDS.

If you have a customer who wants to connect to any systems that have not yet been qualified. It is critical that the customer be aware that HDS have not qualified and are not prepared to offer a high level of support outside qualified environments. HDS has a process through the RPQ or GFI process in the local Sales Operations group where new platform support requests should be directed. Each new platform or feature should be adopted based on the merits of the business it represents to HDS. Once a decision to proceed with a new platform or function has been made, qualification, education and technical support issues will be resolved before it goes to a customer environment.

3.2 Host Systems

The currently supported host systems and software levels needed for support are listed below. Additional platforms will be added in the future. The 9200 Product Management group update this data monthly and input this to a searchable online database called the eFAR located on HDSnet in the Knowledgebase.

Please ensure that the platform is listed in the eFAR and support is available in your geography.

Table 3.1 9200 Host Platform Support Table (SCSI)

Target Host Platform	Operating System	Quality Assurance Endorsed (QAE)	Comments
IBM RS6000/SP2 HDS SR/4300 Bull Escala/Estrella	AIX	Yes	AIX 3.2.5 AIX 4.1 AIX 4.2 AIX 4.3
SUN	SUN O/S, Solaris	Yes	SUN O/S V. 4.x Solaris 2.5.1, 2.6, 7,8
HP	HP-UX	Yes	HP-UX 9.04 HP-UX 10.x/11.x
Compaq	Digital UNIX – Tru64	Yes	DIGITAL UNIX 4.0
SGI	IRIX	Yes	IRIX 6.4
NCR	UNIX SVR4	Yes	MP-RAS 3.0
Intel Based Servers	Novell Netware	Yes	Netware 5.0
Intel Based Servers	Redhat Linux	Yes	Redhat Linux 6.1
Intel Based Servers	Turbo Linux	Yes	Turbo Linux 6.1
Intel Based Servers	MS NT	Yes	NT 3.51 NT 4.X
Intel Based Servers	MS Windows 2000	Yes	Windows 2000

Chapter 4 Service and Support

4.1 Product Support

The goal of all Worldwide Technical Supports groups is to solve the customer's problems over the telephone. Due to the modular construction of the 9200 series, most problems can be diagnosed and resolved over the telephone without on site assistance. This saves the customer and HDS time and money.

Skill Sets for HDS CS&S Colleagues

In the "Open Storage" marketplace, the skills that are required to handle basic installation and local technical support depend on the environments and customers that we sell into. For most customers who have the majority of their "Open Storage" attached to UNIX systems of some variety, a basic set of UNIX and "Open Networking" skills will be essential. These skills include:

- Basic UNIX command familiarity
- Shell Script familiarity
- UNIX "vi" and "ed" editor skills
- System Administration capabilities (System startup and shutdown, adding users, adding device nodes, inquiring on device node definitions, problem log viewing, etc.)
- Understanding of different access methods for UNIX storage (raw device access vs. filesystem access, RDBMS access capabilities, etc)
- System networking basics (including how to login from a remote terminal, how to "ping" the 9200 if it is LAN attached, how to determine if a host platform is receiving SNMP messages from the 9200, etc.)

For HDS CS&S colleagues who will be providing "Specialist" services including advanced installation and problem determination services, additional skills will be essential. Some of these skills include:

- Advanced UNIX commands and operational functions (how to switch run-levels, how to remap devices online, etc.)
- Robust Shell Script and "language" familiarity (perl, awk, grep, etc.)
- High Availability Feature familiarity (must be very familiar with the pros and cons of different architecture solutions for high availability in clustered and non-clustered solutions. This would include familiarity with mainstream products like Veritas, Oracle, Safepath, etc)

- UNIX System Performance and Tuning skills (must be able to determine where a system is bottlenecked and be able to pinpoint the source of the problem if it relates to a disk subsystem). This would include familiarization with third party performance monitors and SCSI/Fibre Analyzers.
- Training on HDS High Availability and other software products that relate to our storage products. This would include a high level of skill with Hitachi Path Manager and DAMP/Resource Manager to start, but will certainly extend into other areas like Veritas, Oracle, SAP, BAAN, etc.

4.2 Special Tools for CS&S Service Colleagues

There are only a few special tools that are anticipated to be required for support of 9200 subsystems by HDS CS&S Colleagues. These tools are generally not expected to be stocked at local branch offices, but will be held at WW Technical Support locations.

4.2.1 HDS Issued Notebook PC

The 9200 will require the use of the HDS Field Service Notebook Computers to perform error analysis and troubleshoot the 9200. The 9200 does **NOT** have a built-in SVP panel.

- The notebook PC can be connected to the 9200 using either Netscape or Internet Explore Web Browsers. The 9200 controllers present an HTTP web page to the browser.
- Connects via LAN with hub or direct connect to controller with cross-over LAN cable. **#IP0663-15p** (Qnty (1) of this cable will ship with the RK unit)
- The default IP address of the 9200 controllers is:

  192.168.0.16 - CTL0

  192.168.0.17 - CTL1
- Web access has both a Normal and Maintenance mode (available by pressing S-Reset button on the controllers. This takes the 9200 offline from the host. and will force a reboot of the array when switching back to Normal mode.)
- Compatibility with HDS Field Service Notebook Computers

Note: To successfully connect using a web browser there must be no "proxy servers" configured in the web browser network setup.

4.2.2 Resource Manager 9200

The Hitachi Disk Array Manager program is a JAVA application, available in both GUI and CLI for the 9200. This program is available for Windows, Solaris, SGI, and HP (cli only) Communication is via TCP/IP for LAN attachment. There is also a serial RS232 null-modem attachment feature. Support for the above referenced hosts is all included on one CD.
This management tool features include:

- Component status indication
- System parameter setting

- RAID group and LUN creation and formatting
- Statistical information and performance data display and reporting
- Error monitoring with email reporting
- Online trace collection
- Normal and online microcode update

Note: If you would like to use the serial connect option, the RS232 null-modem cable is available as #IP0814-1p (This is a 15' cable)

(Qnty (1) of this cable will also ship with every RK unit.)

4.2.3 SCSI / Fibre Channel Tools & Equipment

SCSI Analyzer - HDS has chosen to standardize on the Verisys SCSI-View SCSI analyzer for the following reasons:

- Ease of use
- Standard tool used by Hitachi STR, so trace information can be analyzed by the factory
- Compact form for field use
- Compatibility with HDS Field Service Notebook Computers

The Verisys SCSI-View analyzer is a unique PCMCIA based SCSI Analyzer that displays Performance, Phase Protocol, Command and Timing Views during capture.

- Supports SCSI 1, 2 and 3; Wide and ULTRA, ULTRA2 Model SV-3000
- Captures SCSI activity continually to disk
- Delivers detailed Performance analysis
- Displays Phase Protocol and Timing views (10ns resolution)
- Displays activity on screen (real time) during capture
- Triggers and Searches on unique events including: Data, Request Sense, Command and Message sequences
- Now Supports LVD Ultra SCSI (LVD Options)

Figure 4.1 Verisys SCSI-View Analyzer

For more details on the Verisys SCSI-View Analyzer, please reference their web site at the following URL address: http://www.verisys.com/brochure.htm

This type of tool is expected to be supplied and maintained by the WW Technical Support organization in each geography.

4.3 Fibre Channel Tools & Equipment

Fibre Channel Analyzer - HDS has chosen to standardize on Finisar GT/GTX Analyzers for the following reasons:

- Hitachi STR use the Finisar Fibre Channel Analyzer
- Single or multi-link configurations
- 254 Mbytes of data capture
- Real-time performance and error reporting
- FICON/SB2, and IP
- 1Gbit and 2Gbit compatible
- Industry Standard GT/GTX TraceView data display software
- Powerful SANMetrics software can be added for SCSI debug and performance analysis
- Event library for drag & drop trigger and filter setup
- Analog pass through or re-timed port connection
- Portable and desktop PC configurations

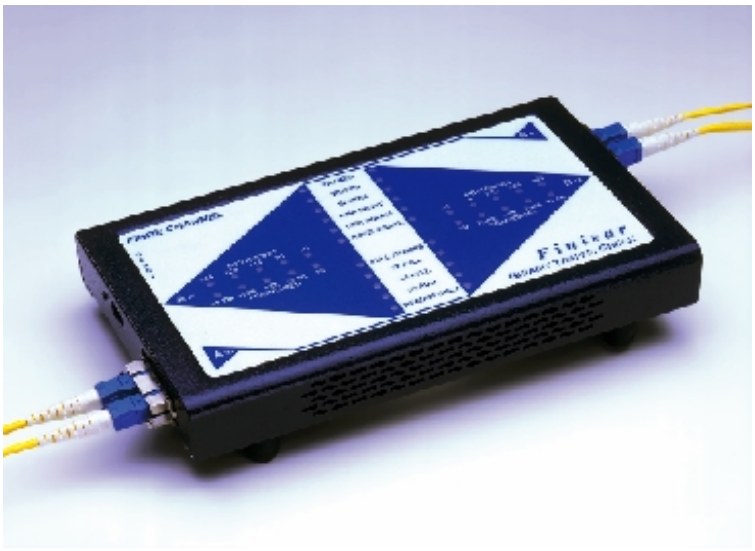
The Finisar Fibre Channel Analyzer is a PC based system that is supplied as a complete package from Finisar or their authorized distributors. It is used as a test or development tool, but can also be used in field locations. For more details on the Finisar Channel Analyzer, please reference their web site at the following URL address: http://www.finisar.com/

This type of tool is expected to be supplied and maintained by the WW Technical Support organization in each geography.

Fibre Channel Link Monitor - HDS has chosen to standardize on the Finisar Fibre Gigabit Link Check for the following reasons:

- Measures link traffic in Mbytes and Kframes per second
- Reports frame payload size mix
- Captures link errors
- Generates Fibre Channel data
- Tests cables
- Measures cable lengths
- Low cost
- 1Gbit, (2Gbit support under development)

Figure 4.2 Finisar Gigabit Link Check



This is a portable stand-alone device. Can be easily used for field testing and troubleshooting. For more details on the Finisar Gigabit Link Check, please reference their web site at the following URL address: http://www.finisar.com/

This tool is currently available as Fibre Channel Test Kit - **#IP01550C**
(this tester currently supports 1Gb interface speed only)

4.4 Other Tools & Equipment

Lift or Hoist - In most cases the 9200 will ship preconfigured and installed ino the HDS 19" rack. In the case of on-site upgrade special care and attention must be paid to avoid personal injury and damage to the equipment when installing into the rack. The 9200 must be installed into the HDS rack-mount enclosure, the HDS 19" rack. The 9200 subsystem is heavy and will require two men and/or the Genie lift to install. Please order the following Genie Lift. Please order both parts, lift and platform as this constitutes a complete Genie Lift.

Table 4.1 Tool IP Numbers

Lift (order both #)	Tool IP number
Genie Lift	**#IP01056**
Genie Lift Platform	**#IP01057**

4.5 International Support

4.5.1 Worldwide Technical Support - Europe

The long term support plan for Europe has not yet been finalized, although an implementation similar to that in the US is being considered. Until a decision has been made on this, European support will continue along the lines setup for existing Midrange products, with support being provided by the country CS&S support organizations. CS&S colleagues will be supported by Worldwide Technical Support – Europe, a group of highly skilled engineers who provide support via telephone when a CS&S colleague calls with a post-installation question or problem. This group works closely with Product Support to ensure that all technical resources that may be required to address a particular problem are available. The Technical Support – Europe group also uses an advanced problem reporting database, (similar to that used in the US), that allows them to capture relevant details about the inquiry or problem on first-call. This allows them to begin working toward a solution right away. The Technical Support – Europe group will work closely with the Product Support Manager, our colleagues in America, other Hitachi facilities and other vendors as required to resolve the call.

4.5.2 Worldwide Technical Support - Americas

The Worldwide Technical Support - Americas is located in San Diego, CA and provides support to HDS Field Colleagues, Distributors and Customers directly. The goal of the Technical Support - Americas group is to provide a highly skilled engineer via telephone when a customer or colleague calls with a post-installation question or problem. This group works very closely with the Product Support group to ensure that all technical resources that may be required to address a particular problem are available as required. The Technical Support - Americas group uses an advanced problem reporting database that allows them to capture relevant details about the inquiry or problem on first-call and begin working toward a solution right away.

4.5.3 Worldwide Technical Support - Asia Pacific

In Asia Pacific, the Technical Support - Asia Pacific group located in Sydney, Australia is responsible for providing technical support to all HDS colleagues and Distributor/Joint Venture partners for the 9200 products. This center is staffed with highly skilled technicians who can work with the customer or partner via telephone and is very closely tied in with both the European and Americas product and technical support groups.

4.6 Reporting and Problem/Technical Escalation

Any problems or questions requiring technical assistance should be conveyed to the appropriate support group. For the Americas and Canada this would be Worldwide Technical Support –Americas located in San Diego CA, The US support group can take calls directly from the customer, HDS colleagues, or from third-party Sales/Service partners. The support group will be responsible for recording all customer contacts. For Europe this would be via the country CS&S support groups to Worldwide Technical Support - Europe located in Stoke Poges, UK. The European country CS&S support groups can take calls directly from the customer or HDS colleagues. The country CS&S support group will be responsible for recording all customer contacts.

All problem logs on the 9200 series of product should ideally contain the following information:

- Customer Name.
- Machine Serial Number.
- Detailed configuration description, including FC or SCSI interface type.
- Operating system details of the host operating system(s).
- Microcode revision and Flash Prom Level
- Description of the problem, including warning lamps, error messages etc., and any actions taken.
- Determine the severity or the Problem and instigate an appropriate course of action.

Customers will be responsible for placing a problem call with the appropriate support group. All failures and installation problems need to be reported promptly.

4.7 Problem Ownership within HDS

Problem ownership is a very important business issue as it relates to customer responsiveness and satisfaction. With the change in the support organization within HDS, to have calls come directly from the customer into a Worldwide Technical Support function, it has left some confusion regarding problem ownership. The following very important process applies to this issue.

Americas & AP

- When a customer calls Worldwide Technical Support with a problem, the problem is owned by this group until the problem is resolved, or a local HDS CS&S resource is dispatched to the account.

- Once a local CS&S colleague has been involved in the issue, ownership transfers immediately to the local CS&S Customer Engineer/team and it is their responsibility to drive the problem to resolution. Worldwide Technical Support and any other resources brought in to assist with the problem are viewed as resources who are working on behalf of the local CS&S team, but they do not own the problem and it's resolution as it relates to the customer.

Europe

- Because customer calls are directed immediately into the country CS&S field support organization, ownership belongs to the local CS&S Customer Engineer/team and it is their responsibility to drive the problem to resolution. Worldwide Technical Support, (and any other resources brought in to assist with the problem), are viewed as resources who are working on behalf of the local CS&S team. They do not however own the problem and it's resolution as it relates to the customer.

4.7.1 Worldwide Technical Support - Europe

Problem escalation for the 9200 series of product in Europe will be:

- Country CS&S Support - These groups will be able to resolve the majority of customer problems. In the event that assistance is required, CS&S colleagues will contact:
- WW Technical Support – Europe – This group will be able to resolve the majority of customer problems over the telephone. In the event that further escalation is needed the Technical Support Engineer will contact:
- Technical Support Manager - The manager will be able to determine the most appropriate course of action to take, after discussing the call with the WW Technical Support engineer. This might include sending parts, requesting more information from the customer, replacement of the product, or the dispatch of Customer Engineer if the customer has a valid maintenance contract.
- Hitachi CTSC engineering liaison - Technical Support staff will coordinate technical and problem related information to Hitachi STR as required to support European customers. This escalation is under the control of the Technical Support-Europe organization, which ensures that highly critical problems are quickly communicated with the factory. The following details will be required to expedite resolution of a customer problem:
  - Customer Details
  - Configuration Details for Host platform and 9200 subsystem
  - Failure description in detail (what, where, when, etc.)
  - Trace and/or Dump from 9200 and/or host system

The information obtained will be distributed to all relevant departments.

Note: This is only a general overview. Please contact your local CS&S management in case of any changes or differences not reflected in this document.

4.7.2 Worldwide Technical Support - Americas

Problem escalation for the 9200 series of product in the Americas will be:

- WW Technical Support - Americas - This group will be able to resolve the majority of customer problems over the telephone. In the event that further assistance is needed, the Technical Support Engineer will contact:-
- WW Technical Support Manager - The manager will be able to determine the most appropriate course of action to take, after discussing the call with the WW Technical Support engineer. This might include sending parts, requesting more information from the customer, dispatch of a local Customer Engineer or the replacement of the product.
- Hitachi ESC engineering liaison - Technical Support staff will coordinate technical and problem related information to Hitachi STR as required to support customers. This escalation is under the control of the Technical Support-Americas organization, which ensures that highly critical problems are quickly communicated with the factory. The following details will be required to expedite resolution of a customer problem:
  - Configuration Details for Host platform and 9200 subsystem
  - Failure description in detail (what, where, when, etc.)
  - Trace and/or Dump from 9200 and/or host system

It is essential that an escalated call and resulting information be communicated to all interested parties. This will include the Account S.E, local CS&S team, the Technical Support - Americas group, and the customer. This "distribution of information" should be the responsibility of the Technical Support - Americas group, as they are responsible for addressing the customer's issue with the 9200.

Note: This is only a general overview. Please contact your local CS&S management in case of any changes or differences not reflected in this document.

4.7.3 Worldwide Technical Support - Asia Pacific

Problem escalation for the 9200 series of product will be:

- CS&S Field Service - Asia Pacific – The first point of contact in Asia Pacific will be the local CS&S Customer Engineers. (AP plan on creating a Tech. Support center capable of handling first call in the future)
- WW Technical Support - Asia Pacific - Technical Support will be able to resolve the majority of customer problems over the telephone. In the event that assistance is needed the engineer will contact:
- Technical Support Manager - The manager will be able to determine the most appropriate course of action to take, after discussing the call with the WW Technical Support Engineer. This might include sending parts, requesting more information from the customer, dispatching a local Customer Engineer or the replacement of the product.

- WW Technical Support - Americas/Europe - The Technical Support Manager has the option to escalate to the appropriate support group, either Europe or Americas if the problem requires skills that are outside the core skills of Asia Pacific, if this is off- hours or a critical situation this may be expedited directly to Hitachi through the ESC/CTSC liaison group.

- Hitachi ESC/CTSC Engineering Liaison - It is expected that the following data will be available to assist in the analysis of the problem:
  - Customer Details
  - Configuration Details for Host platform and 9200 subsystem
  - Failure description in detail (what, where, when, etc.)
  - Trace and/or Dump from 9200 and/or host system

It is essential that an escalated call and resulting information be communicated to all interested parties. This will include the Account S.E, local CS&S team, Worldwide Technical Support and the Customer. This "distribution of information" should be the responsibility of the Technical Support - Asia Pacific group, as they are responsible for addressing the customer's issue with the 9200.

Note: This is only a general overview. Please contact your local CS&S management in case of any changes or differences not reflected in this document.

4.8 Additional Sources of Technical Information

The ***HDS Intranet*** is being used to make information relating to Technical Tips, Alerts, and ECN/FCB readily available. Alerts and Technical Tips are available on the Intranet web and also distributed through the e-mail system. Please contact Worldwide Technical Support – Americas/Europe for help accessing this information.

In the Americas the **On-Line Systems Assurance Document System** is available on the 5800/9200 Home Page on the HDS Intranet, at **http://www.hdssd.hitachi.com/storage/9200/9200.html**

The European version is available via the HDSnet homepage at **http://hdsnet.hds.co.uk**

For HDS Partners and Distibutors, the **On-Line Systems Assurance Document System** is available via the HDS Extranet at **https://channelone.hds.com**

There is a very large variety and quantity of technical information available on the ***Internet*** that is relevant to the 9200 product. Product Features, Tutorials, FAQ's, and many other types of information are available to anyone with access to the Internet. There are literally thousands of sites with important information related to this area, and a good search engine (i.e. **http://www.altavista.com** should help in finding what is required. Examples of sites that would be valuable in the RAID/SCSI environment are listed in Table 5.1.

Table 5.2 Technical Information Sources

Site	Address/URL
Hewlett Packard Corporation	http://www.hp.com
IBM Corporation	http://www.ibm.com
SUN Microsystems	http://www.sun.com
Symbios Logic	http://www.symbios.com
Verisys SCSI Analyzers	http://www.verisys.com
Hitachi Data Systems Europe	http://www.hds.co.uk
Hitachi Data Systems Headquarters	http://www.hdshq.com
Hitachi Data Systems Asia Pacific	http://www.hds.com.au
Finisar (Fibre Channel Analyzer)	http://www.finisar.com
SCSI Trade Association	http://www.scsita.org
ANSI T10 Home Page (X3T10 Data)	http://www.symbios.com/x3t10

Chapter 5 9200 Installation Details

5.1 Installation Options

Basic, (US/AP), Minimal, (Europe) and Advanced Installation Options of 9200 subsystems are chargeable services available at the time a customer purchases the equipment. In the US/AP, these are optional, but are mandatory in Europe. HDS CS&S representatives are responsible for installing the 9200 system into the customer environment.

Pre-Install Planning - HDS CS&S should use a pre-installation checklist or Systems Assurance Document (SAD), to gather required customer data prior to arriving to install the equipment.

In Europe a Service Pack is shipped with every 9200 and includes a warranty registration form and SAD, plus warranty and maintenance documentation. It is important that all forms are completed and returned to HDS, giving at least 7 days notice prior to installation. HDS CS&S reserve the right to refuse to install the subsystem if all completed documentation has not been supplied.

For the Americas, the **On-Line Systems Assurance Document System** is available on the 9200 Home Page on the HDS Intranet at http://sanweb01.hds.com/support/storage/9200/9200.html The European Version is available through HDSnet home page, Select Products and Services follow the links through Ordering and Systems Assurance. These documents comply with the ISO9000 standards.

The European version is available at **http://hdsnet.hds.co.uk**

For HDS Partners and Distibutors, the **On-Line Systems Assurance Document System** is available via the HDS Extranet at **https://channelone.hds.com**

5.1.1 Basic Installation Option (Minimal – Europe)

Note: All first time installations must include a Systems Assurance Document to gather required customer data prior to arrival of equipment to be installed. (see above link to access document)

- Pre-Delivery Site Survey by telephone to confirm power availability, location, special access requirements, and to confirm that Advanced Install is not required.
- Physical placement by transportation company if requested
- Physical unpacking of 9200 subsystem and assembly/integration of any loose-pack options.
- Physical inspection of equipment after it is unpacked to ensure that no damage has occurred in shipping.
- Physical connection of power and SCSI cable interfaces to customer host system (if customer is not prepared to connect the system to their host, connecting the cable becomes the responsibility of the customer).

- ***Note: The connection to the customer system must be carefully coordinated with the customer, and should only take place once the customer has shutdown and powered off the host system.***
    - Connectivity test:
    - Disk Array management program (RM 9200) (Tool CD-00MT001-xx)

      (This is the Utility that ships with the microcode set, not the licensed version)
        - Setup target ID (customer must provide)
        - Setup 1 RAID Group and 1 LUN
        - Format the LUN
        - Using Host system diagnose tool, verify that host can display LUN.
        - Install and configure Hi-Track

***The Basic Installation should take 2-3 hours not including the Pre-Delivery Site Survey**

Items not included in Basic Installation

These installation features/components are not included in the Basic or Advanced installation:

- Install and configure SNMP (purchased separately).
- Volume Managers
- Cluster environment systems i.e. Microsoft Cluster Server, Hewlett Packet Service Guard.
- Installation of Resource Manager 9200 program licensed version

5.1.2 Advanced Installation Option

NOTE: All first time installations must include a Systems Assurance Document to gather required customer data prior to arrival of equipment to be installed. ((see above link to access document)

- Pre-Delivery Site Survey by telephone to confirm power availability, locations, and special access requirements.
- Physical placement by transportation company if requested
- Physical unpacking of 9200 subsystem and assembly/integration of any loose-pack options.
- Physical inspection of equipment after it is unpacked to ensure that no damage has occurred in shipping.
- Physical connection of power and SCSI cable interfaces to customer host system (if customer is not prepared to connect the system to their host, could add additional installation charges).

Note: The connection to the customer system must be carefully coordinated with the customer, and should only take place once the customer has shutdown and powered off the host system.

- Preparatory consultation to determine optimum configuration using pre-tested and/or preinstalled configurations. CS&S will perform with the assistance of EOSS TRC.
- Disk Array management program (RM 9200) (Tool CD-00MT001-xx)

(This is the Service Tool Utility that ships with the microcode set, not the licensed version)

- FULL CONFIGURATION: System parameters, raid groups and logical units.
- Format all logical units.
- Assist the customer with Host configuration, LUN configuration and installation of file system (does not include setting up volume managers i.e. Logical Volume Manager, Veritas Volume Manager, Logical Storage Manager, Solstice Disksuite, etc).

*The Advanced Installation should take 5-6 hours not including the Pre-Delivery Site Survey or LUN formatting

5.2 9200 De-Installation

It is very unlikely that HDS will be requested to do the de-installation of the 9200 disk product for a customer. However if HDS does the de-installation, then, within 24 hours (or the first working day if the de-installation occurs on a weekend) an information type entry must be made stating that the equipment is de-installed. A customer who de-installs the product is requested to contact HDS with this information. Failing this, the sales account team must notify the HDS Service team with the correct information to allow the installation database to be amended correctly.

5.3 Customer Problems

The customer (or his nominated agent) may contact Worldwide Technical Support to request assistance. Customers in the Americas and Europe who do not have a valid CS&S support contract, who contact a Customer Engineer or SE must be redirected to Worldwide Technical Support-Americas/Europe for support. Customers in Asia/Pacific that do not have local HDS offices or are dealing through distributors, will need to contact their distributor contacts to obtain Customer support. Customer calls reporting parts failures will be made under a Fault call incident type and will include: 1) Sense data, panel messages, status of the error condition LED's, or error log data 2) description of failed part 3) Type of impact such as IPL, degraded performance, loss of data 4) Customer and machine details etc.

Most error data that is collected on the 9200 series of disk product will indicate problems of a recoverable nature, or just an informational message. The customer contacts Worldwide Technical Support when this information is discovered.. The entry should be made under a fault incident type and should include sense data or error log data.

5.4 Engineering Change Notifications & Field Change Bulletins

Unless a major impact is likely to HDS's customers, ECN and FCB's will only be issued to customers who require the change. If an FCB or ECN is necessary then Worldwide Technical Support will coordinate the change for/with the customer. A Clarify case database entry should be made by the end of the first working day after any FCB/ECN activity is performed under a suitable heading. The entry should contain the FCB or ECN number. The following guidelines apply for all FCB's:

5.5 FCO/FCB Process

5.5.1 Mandatory FCO's /FCB's

For HDS service contracts - business as usual - free install.

For Channels and Warranty only customers, HDS will provide the material for mandatory FCO's/FCB's free of charge. The customer or channel partner will be responsible for the implementation of the materials supplied. (with assistance from Worldwide Technical Support)

Note: Certain contracted customers may be required to pay an installation charge for HDS to install FC0's/FCB's dependent on the agreement terms with a service provider.

5.5.2 Non-mandatory FCO's/FCB's

Controlled via Worldwide Technical Support on an 'as required' basis and charged accordingly. Installation service only provided (at a cost) for those customers holding a maintenance contract.

5.5.3 FCO/FCB notification

HDS CS&S colleges will be notified of FCO's/FCB's via the HDS email "Alert" process. The notification of FCO's/FCB's to warranty only, self-maintaining customers and channel partner is still "To Be Determined".

5.5.4 Ordering FCO/FCB parts

Please use the ECN/FCB order form available on the ESD intranet web site for the Americas and AP **http://hdsnet/esd/index2.html**. The request must state the part number (which will usually be the FCO/FCB release number) and the quantity required. Please indicate to whom and where the parts are to be sent, including any specific shipping request. For Europe FCO/FCB parts should be ordered through the local/regional logistics centers.

If you have any questions or comments, please address them via email to "ECC" for Americas, and AP customers, or "EDCSPARES" for Europe, or call directly to the EDC (European) or San Jose facility (Americas) and ask for the "Customer Service & Planning Logistics Supervisor - For Spares and FCO's.

5.5.5 Ordering FCO/FCB microcode

The Microcode order process is exactly the same as FCB's orders.

European Customers – Microcode should be ordered through the local/regional logistics centers specifying the part number and quantity required. For HDS colleagues, valid part numbers can be found via the EDC Intranet home page at **http://nl-edc-inet/default.htm** Partners and Distributors should access the Extranet at **https://channelone.hds.com** and follow the appropriate links to determine valid part numbers. Please indicate to whom and where the parts are to be sent.

Americas Customers - To request a copy of 9200 microcode**,** please use the ECN/FCB order form available on the ESD intranet web site at **http://hdsnet/esd/index2.html** Please indicate to whom and where the parts are to be sent, including any specific shipping request.

A/P Customers - To request a copy of 9200 microcode, send an email message to "ECC", mentioning the microcode level and quantity required. Please indicate to whom and where the parts are to be sent, including any specific shipping request.

5.5.6 Model or Feature Upgrade or Change

The customer site engineer is responsible to make all required database updates to the Clarify Install base. This is required at the time of installation and any case of feature change or upgrade.

This applies to all geographies.

Chapter 6 Maintenance Philosophy

6.1 Americas Midrange Service Strategy

If there is a failure on a 9200 product, the maintenance philosophy will be to try to resolve the failure without a component swap. Worldwide Technical Support – will work with either the customer or Customer Engineer, (as appropriate to regional support requirements), to achieve this. If necessary, Worldwide Technical Support - will authorize a replacement part to be shipped to the customer or Customer Engineer in order to replace the defective component(s). Customers or Customer Engineers wishing to return the entire unit or any part thereof will be issued with an RMA (Return Merchandise Authorization).

The 9200 is covered with the HDS exclusive 3 year limited warranty. A warranty booklet is available and can be ordered through Insync. This document contains information about the 3 year limited warranty, caring for the product, contacting Worldwide Technical Support, returning parts to HDS for repair, upgrading the warranty service, and after warranty service. Complete details can be found in the warranty document, and it is the final word on HDS service and support responsibilities. The warranty includes 3 year limited parts and 1 year of next business day onsite 8-5 service as in Week Day Basic service offering (see Table 6.1)

The 9200 comes with a three-year parts warranty. It covers normal use of the product and does not cover things like accidents, abuse and the like. If a part goes bad during this time then the customer or Customer Engineer will contact Worldwide Technical Support - Americas to arrange for a replacement. The customer or Customer Engineer will first receive a RMA (Return Materials Authorization) number from the group. Then the customer or Customer Engineer, with Worldwide Technical Support - Americas assistance, will ship the defective part to HDS. HDS will then ship via standard surface mail, the new or repaired part back to the customer site. Expedited repair, such as overnight is available for an additional charge. When the part arrives onsite, the customer or Customer Engineer will replace the failed component with assistance from Technical Support – Americas, if required.

The customer will first contact Worldwide Technical Support - Americas to diagnose the problem. Should they determine that an onsite HDS presence is needed, they will have a local Customer Engineer dispatched to the customer. The Customer Engineer will be responsible for ordering the correct part for the customer after communicating with the Technical Support – Americas group. The Customer Engineer will then contact the customer and Technical Support - Americas when the part has arrived, and will schedule a time to visit the customer to repair the 9200. After the repair is completed, the Customer Engineer will contact Technical Support - Americas to close the problem and will arrange for the return of the defective part.

Note: The Hi-Track service tool is now included in all service offering levels. The 'Hi-Track' system and the associated software will remain the property of HDS and is not available for sale to any 'third party'. Because of communication difficulties, some countries will require the customer to call the country 'Call Dispatch' desk initially before the call is passed to the Worldwide Technical Support Group

6.2 Europe Midrange Service Strategy

In Europe, the 9200 is offered with a 3 year limited parts warranty and a 1 year limited service warranty.

The Week Day Basic 1 year limited service warranty, (see Table 6.1), is only valid for customers within a 50-mile (80Km) radius, however HDSE will service outside of this area on a case by case basis. An additional charge may be levied for this. Hi track can also be included at the customers discretion. A warranty booklet giving details on the service is available on the HDS Intranet and Extranet web pages and can be ordered through Insync. In addition to the 1 year Week Day Basic Service Warranty, HDSE offers upgrades that allow the customer to enhance support coverage by choosing from the following Maintenance Service options, (although some restrictions apply):

- Service Warranty Upgrade to Week Day Basic Service for Year 2 and 3
- Service Warranty Upgrade to Standard Service for Years 1,2 and 3

The three year limited parts warranty provides “return to factory” (RTF) parts service to identify and correct any defects in material or workmanship, or failure of the Equipment to conform to HDS published specifications. Should a problem be encountered with the 9200, the HDS Call Center should be contacted at +44 (0) 1753 618899. The call center is available for parts replacement advice. They will verify warranty entitlement and assist in determining if the component is defective. If they agree and that a replacement is required, they will issue a Return Material Authorization, (RMA) number and return address. Upon receipt of the failing part, HDSE at its option, will repair or replace the part and then return it to the customer.

Note: *HDSE does not provide a “Time and Materials” repair service.*

Note: The 'Hi-Track' system and the associated software will remain the property of HDS and is not available for sale to any 'third party'..

6.2.1 Asia Pacific Midrange Service Strategy

If there is a failure on a 9200 product, the maintenance philosophy varies by region. In locations where HDS has a presence through a local office, the customer will work with the assigned Customer Engineer to resolve the failure without a component swap. If necessary, the Worldwide Technical Support Manager will authorize a replacement part to be shipped to the customer or Customer Engineer to replace the defective component(s). Customer or Customer engineers wishing to return the entire unit or any part thereof will be issued an RMA (Return Merchandise Authorization) by Worldwide Technical Support.

In Asia/Pacific as well, the 9200 is covered with the HDS exclusive 1 year limited warranty. A warranty booklet is available and can be ordered through Insync. This document contains information about the 1 year limited warranty, caring for the product, contacting Worldwide Technical Support, returning parts to HDS for repair, upgrading the warranty service, and after warranty service. Complete details can be found in the warranty document, and it is the final word on HDS service and support responsibilities. The warranty includes 1 year limited parts and a year of next business day onsite 8-5 service as in Week Day Basic service offering (see Table 6.1)

The 9200 comes with a three-year parts warranty. It covers normal use of the product and does not cover things like accidents, abuse and the like. If a part goes bad during this time then the customer will contact HDS or its authorized distributors to arrange for a replacement. The customer or Customer Engineer will first receive a RMA (Return Materials Authorization) number from the Technical Support - Americas group. Then the customer or Customer Engineer, with HDS assistance, will ship the defective part to HDS, then HDS will ship via standard surface mail the new or repaired part back to the customer. Expedited repair, such as overnight, is available for an additional charge. Then the customer or Customer Engineer with assistance from Technical Support -Americas, if needed will replace the failed component.

The customer will first contact their local HDS office to diagnose the problem. If it is determined that an onsite HDS presence is needed they will have a local Customer Engineer dispatched to the customer. The Customer Engineer will be responsible for ordering the correct part for the customer after communicating with the Worldwide Technical Support - Americas. The Customer Engineer will then contact the customer and Technical Support - Americas when the part has arrived and will schedule a time to visit the customer to repair the 9200. After the repair is completed, the Customer Engineer will contact Technical Support - Americas to close the problem and will arrange for the return of the defective part.

HDS has upgraded service levels offering beyond the basic warranty service period. It is anticipated that most customers who are familiar with HDS’s outstanding service on its PCM products will opt for Premium service. Revenue flows to the CS&S branch for these upgraded service levels. These services are offered in three Maintenance Levels described in Table 6.1.

Note: The Hi-Track service tool is now included in all service offering levels. The 'Hi-Track' system and the associated hardware and software will remain the property of HDS and is not available for sale to any 'third party'. The customer will be expected to provide a Windows PC or UNIX server to load the Hi-Track software. Because of communication difficulties, some countries will require the customer to call the country 'Call Dispatch' desk initially before the call is passed to the Worldwide Technical Support - AP Group

6.2.2 Service Offerings

HDS has upgraded service levels offering beyond the basic warranty service period. It is anticipated that most customers who are familiar with HDS’s outstanding service on its PCM products will opt for Premium service. Revenue flows to the CS&S branch for these upgraded service levels. These services are offered in three Maintenance Levels described below and in Table 6.1.

6.2.3 Week Day Basic

- Access to the Worldwide Technical Support - 24 hours a day, 7 days a week, (US/AP), or 9am-5pm, 5 days a week, (EU). Next business day response.
- All on-site repairs scheduled between 8am-5pm Mon-Fri. only. 9am-5pm EU.
- Parts provided free of charge from local spares inventory.
- Hi-Track

6.2.4 Standard Service

- Free-phone access to the Worldwide Technical Support – 24 hours a day, 7 days a week (via local call/dispatch as necessary).
- Automatic call logging and escalation
- On-site support 24 hours a day, 7 days a week with a target 4-hour response (once it has been deemed necessary by WW Technical Support).
- Parts provided free of charge from local spares inventory.
- Hi-Track.
- Engineering Changes scheduled during regular office hours.
- Preventative Maintenance scheduled during regular office hours. (US/AP only)

6.2.5 Premium Service

- Free-phone access to the Worldwide Technical Support - 24 hours a day, 7 days a week (via the local call/dispatch as necessary).
- Automatic call logging and escalation.
- On-site support 24 hours a day, 7 days a week with a target 2-hour response (once it has been deemed necessary by the WW Technical Support group).
- Parts provided free of charge from local spares inventory.
- Hi-Track.
- Engineering Changes and Preventive Maintenance available 24x7.

Note: *This Premium service level is normally not available in EU. It is possible at the discretion of the Country CS&S Manager*

Table 6.1 Service Offerings

Week Day Basic (included in first year of 3 year Limited Warranty)	**Standard**	**Premium**
24x7 8 am to 5 pm (M-F, US/AP) 9 am to 5 pm (M (M-F, Europe)	24x7 24x7	24x7 24x7
Target Response: Next Business Day**	Target Response: 4 hours*	Target Response: 2 hours*
Telephone Support Hi-Track Corrective Maintenance (repairs) Engineering change Spares support Preventive Maintenance Concurrent Maintenance	Telephone Support Hi-Track Corrective Maintenance (repairs) Engineering change Spares support ---------- **8 am to 5 pm (M-F, US/AP)** **9 am to 5:30 pm (M-F, Europe)** Engineering change Preventive Maintenance Concurrent Maintenance	Telephone Support Hi-Track Corrective Maintenance (repairs) Engineering change Spares support Preventive Maintenance Concurrent Maintenance

Note: *=Within 50 miles of a Hitachi Data Systems Service Center, **= Within 100 miles of a Hitachi Data Systems Service Center

Chapter 7 9200 Technical Data/Specifications

The 9200 subsystem consists of two major components – 9200 RK(DF500-RK) and 9200 RKA(DF500-RKA). Rack mount or standalone with optional stand-alone kits.

The model numbers and descriptions are listed in Table 7.1.

7.1 9200 Models

Table 7.1 9200 Models

Model Number	Power Requirement	Description
9200-RK	***100/200V AC ONLY (189-127 /178-254)*** 50/60Hz Dual mains input	Rack mount model. Base unit frame, (7U EIA in height) cover, controller, HDDs, FDD, battery, fans power supplies and appropriate manual(s). Can be converted to stand-alone with optional kit. **H1F for - (1) RK** **This compromises the Deskside 10**
9200-RKA	***100/200V AC ONLY (189-127 /178-254)*** 50/60Hz Dual mains input	Rack Mount expansion frame, (3.5U EIA in height), cover, HDDs panel, FDD, fans, power supplies and appropriate manual(s) Can be converted to stand-alone with optional kit. **H2F for- (1) RK+ (1) RKA** **This compromises the Deskside 20**

The 9200 **R**ack-mount pac**k**age (RK) can serve up to (9) RKA units for a total of one hundred active disk drives. Of the one hundred drives up to five can be designated as Global Hot Spares drives. The RKAs are daisy-chain attached to the controlling RK unit by means of the two “Enclosure Assemblies” and optical cables that are present with every RK and RKA unit . The base RK unit consists of a frame, one controller with an embedded FC interface, one battery assembly, one floppy disk drive, two enclosure assemblies and two power cords. An optional second controller can be added, with cache capacity of up to 2 GB per controller. Two AC/DC power supplies maximum may be installed. One standard dedicated, plus one hot spare. The power requirement for both the RK and RKA is either standard **110V** or **220V**

50/60Hz AC power. The 9200 is intended to rack mount in the "new black" HDS 19" rack. One rail kit is needed for each RK or RKA unit. (**122234-200)** The HDS 19" rack can mount 1 RK and up to 9 RKA units.

The 9200 RK can support one SCSI or two Fibre Channel interfaces per controller, one Fibre Channel interface is standard on the controller, one is optional. There is **NO** intermix of SCSI and Fibre Channel interfaces. If the RK is converted for SCSI attachment the Fibre Channel interface that is embedded on the controller becomes non-functional. Both the RK and RKA units can be converted to stand-alone with the purchase of an optional kit/s **(H1F -RK and H2F- RK+RKA)**

- This configuration is designed to be easily mounted in the "new black" HDS 19" rack. The rack will come standard with (3) rail kits, additional rail kits for the 9200 RK/RKA are available to order.

  Rail kit for HDS 19" (black rack) - 122234-200
  Univeral Rail Kit (for other vendor racks) - 122411

- The 9200 RK provides up to one SCSI or two Fibre Channel I/Fs per controller. These multiple I/F ports can also be used to attach multiple host systems, in either a cluster server (HA) or non HA environment.

Note: SCSI and Fibre Channel I/Fs cannot be mixed in the same 9200 subsystem

Note: I/F = Interface

7.2 Storage Specifications

The importance, time requirement and economics of an application will determine which RAID level is most appropriate. The 9200 offers four RAID levels:

RAID0 (Data Striping), RAID1 (Disk mirroring), RAID5 (Parity striping), RAID0+1, (Disk Mirroring and striping combined also called RAIDA). RAID levels are user-configurable, and may be mixed within the same subsystem.

Table 7.2 Storage Capacity (GB/unit)

Type / Configuration	RAID level(*1)		1 RK		1 RK + 1 RKA		1 RK + 9 RKA (mounted on rack)	
			Capacity (G bytes)	Number of the disk drive unit	Capacity (G bytes)	Number of the disk drive unit	Capacity (G bytes)	Number of the disk drive unit
Minimum Configuration (with 35.7-G byte disk drive)	**0**	2D	71.5	2	71.5	2	71.5	2
		5D	178.8	5	178.8	5	178.8	5
		10D	357.7	10	357.7	10	357.7	10
		16D	—	—	572.3	16	572.3	16
	1		35.7	2	35.7	2	35.7	2
	5	2D+1P	71.5	3	71.5	3	71.5	3
		4D+1P	143.1	5	143.1	5	143.1	5
		9D+1P	321.9	10	321.9	10	321.9	10
		15D+1P	—	—	536.5	16	536.5	16
	0+1	2D+2M	71.5	4	71.5	4	71.5	4
		5D+5M	178.8	10	178.8	10	178.8	10
		8D+8M	—	—	286.1	16	286.1	16
Maximum Configuration (with 71.6-G byte disk drive)	**0**	2D	716	10	1,433	20	7,164	100
		5D	716	10	1,433	20	7,164	100
		10D	716	10	1,433	20	7,164	100
		16D	—	—	1,146	16(*2)	6,877	96(*2)
	1		358	10	716	20	3,582	100
	5	2D+1P	430	9(*2)	864	18(*2)	4,728	99(*1)
		4D+1P	573	10	1,146	20	5,731	100
		9D+1P	645	10	1,289	20	6,447	100
		15D+1P	—	—	1,075	16(*2)	6,447	96(*2)
	0+1	2D+2M	287	8(*2)	716	20	3,582	100
		5D+5M	358	10	716	20	3,582	100
		8D+8M	—	—	573	16(*2)	3,438	96(*2)

*1 : D : Data disk

M : Mirror disk

P : Parity disk

*2 : This is not the maximum configuration of the subsystem.

The maximum capacity can be increased when the subsystem uses another RAID level.

Note:

- The capacity of the subsystem depends on the capacity of disks to be installed.
- In the minimum configuration, **35.7** GB disks are used. The capacities in the maximum configurations are calculated using the **71.6** GB disks

Table 7.3 Hard Drive Specifications (Hitachi) and (Seagate)

Hard drive	18GB - 15,000	36 GB – 10,000	72 GB – 10,000
Vendor / Model	Hitachi	Seagate - ST136403FC	Hitachi – DK31CJ-72FC
Formatted Size	18.4	35.7	71.6
Disk Rotation Speed	15,000 RPMs	10,000 RPMs	10,000 RPMs
Average Latency	2.01	2.99 ms	2.99 ms
Average Access Time	3.9ms	5.2 ms	5.85 ms
Data Transfer Rate (Internal)	385-512 Mb/sec	179-313 Mb/sec	
MTBF	1,000,000 hours	1,000,000 hours	1,000,000 hours

Table 7.4 9200 Disk Drive Feature codes

Feature Number	Single Disk	Physical size/Capacity
DF-F500-AAH18 (1.0 inch high – 15,000 RPM)	Single (1 Drive)	3.5" 18Gigabyte Disk 18.4 G-bytes
DF-F500-AAF36-S (1.0 inch high – 10,000 RPM)	Single (1 Drive)	3.5” 36 Gigabyte Disk *69856512 Blocks or 35.766 G-bytes*
DF-F500-AAF36-H (1.0 inch high – 10,000 RPM)	Single (1 Drive)	3.5” 36 Gigabyte Disk 6*9856512 Blocks or 35.766 G-bytes*
DF-F500-AAF72-S (1.6 inch high – 10,000 RPM)	Single (1 Drive)	3.5” 72 Gigabyte Disk *139912192 Blocks or 71.635 G-bytes*
DF-F500-AAF72-H (1.6 inch high – 10,000 RPM)	Single (1 Drive)	3.5” 72 Gigabyte Disk *139912192 Blocks or 71.635 G-bytes*

Notes:

- *Note: 18GB 15K available only as RFQ.*
- *G-Bytes = 1,000,000,000 bytes, this definition is different then the 1 KB =1,024 bytes that is the common PC definition.*

- *When the 9200 operates in RAID0 mode, data is striped across all drives, meaning if one drive in the group fails data is lost on all drives in the group. There is NO parity protection.*
- *When the 9200 operates in RAID5 mode and a disk fails, the data remains secure. This is because data and parity is written (striped) across all drives in the parity group. RAID-5 is the most common operating mode of the 9200.*
- *The 9200 subsystem can support the designation of up to five "HOT" spare disk drives in the array. In the event of a drive failure, these drives are automatically mapped to the position occupied by the failed drive in any RAID5 parity group.*
- *The last character of the feature code designates Hitachi or Seagate drives, they are compatible. Initially there may be some Seagate drives seen, however it is the factories plan to provide only Hitachi drives in the near future. The 'H' and 'S' designations are also stamped on the physical drive.*

7.3 Redundancy Options

Table 7.8 Redundancy Options

	9200(RK)	**9200(RKA)**
Dynamic Hot Swap Spare Disk(s)	Yes (5) (optional)	Yes (5) (optional)
Redundant Enclosure Assy.	Yes	Yes
Dual Controller w/mirrored cache	Yes (optional)	N/A
Hot Swap AC/DC Power Supply	Yes (standard)	Yes (standard)
Hot-pluggable fan	Yes	Yes

7.4 9200 Cache Memory

The 9200 is a dedicated disk storage subsystem. It features integral RAID capable cache controller/s. Applications (e.g., databases) can take advantage of cache memory, particularly in sequential operations. The 9200 has a very flexible cache configuration capability to match the right level of cost vs. performance depending on customers workloads.

Table 7.5 Cache Memory Feature Codes

Model	Code	Capacity
9200 RK	DF-F500-C256 set of (2) 128 DIMMS	256 MB
	DF-F500-C512 set of (2) 256 DIMMS	512 MB
	DF-F500-C1G set of (2) 512MB DIMMS Requires microcode 0554/B or above	1 GB

Notes:

- Cache battery backup time is dependent on a number of circumstances, but primarily the more cache memory installed the shorter the battery backup time.
- It takes the sealed lead acid battery up to 24 hours to become fully charged. During battery charging, a yellow warning LED lights up on the SVP board and this indicates that the Write-Through cache is disabled, resulting in decreased performance until the battery becomes fully charged.
- Optimal systems integrity will only occur when the battery is fully charged and the Write Cache is fully functional.
- The 9200 controller has (4) cache memory slots available. *Please note this is a change from the 5800, which had (16) slots*. The 9200 provides higher capacity DIMMs then the 5800. The 9200 has a maximum cache capacity of 2GB per CTL. Cache memory is sold in pairs and should be installed as such. The highest value of cache DIMM must be installed first, in slots 0,1 followed by the next highest etc. until all cache is installed. The cache controller writes the entire data in the cache memory to the disk (De-staging processing) when turning off the power using the power switch on the front panel (or when the SCSI terminator power switches to the low level in remote mode.) This process takes a few seconds, and then the power is turned off. If the power is directly turned off using the circuit breaker on the back of the equipment or the supply to the equipment fails, the cache memory enters the battery backup mode since the cache destaging process cannot be performed. Please see the maintenance manual to ensure that this cache data is properly destaged to the disks before any maintenance is performed on the system. If this step is not performed correctly, data loss may occur.
- Parity data is generated, maintained, and checked for all data I/O transfers that occur. Data is also stored with a proprietary error-correction code (ECC). This technology is not only able to detect the presence of a data error, but also corrects it.

Table 7.6 Cache Specifications

	9200 RK
Cache Capacity (MB) per CTL	256MB – 2GB
Cache Backup Time	48 hrs @ 4GB

7.5 9200 Dual Controller

All the 9200 models can be equipped with a second controller. This second controller can take over the operations of the 9200 in the event that the primary controller fails, or be configured as an additional active controller for high performance operations. The amount and type of installed cache memory on the second controller **MUST** be the same as that installed on the primary controller as the cache is mirrored.

Table 7.7 Dual Controllers

Dual controller Feature number	Feature Available on 9200 Model
DF-F500-F1F	9200 RK

7.6 9200 Controller based LAN Attachment

All the 9200 model controllers come equipped with a 10 BASE T Ethernet LAN attachment. This can be used to send SNMP MIB2 error messages to a network monitor such as a workstation running HP OpenView, SUN Netmanager and CA Unicenter. Resource Manager 9200 software is also supported via this attachment.

7.7 9200 Internal Interface Board and Connector

The 9200 RK controllers have (1) imbedded Fibre Channel Interface as standard. If you would like additional connectivity the following optional interfaces can be ordered. The available types of interfaces are Fibre Channel both 1Gb and 2Gb capable, Ultra W/D SCSI,Ultra-2 (LVD) This is the most likely place that a 9200 will be incorrectly ordered. Double check with the customer to make sure that the proper interface has been ordered.

Note: 9200 Fibre Channel interfaces cannot be mixed with SCSI in the same subsystem due to separate microcode for each. If SCSI Interfaces and microcode are added to a 9200, this will automatically disable the Fibre Channel interface port that is embedded on the controller.

Table 7.10 SCSI Interfaces

Feature code	SCSI TYPE	Model Availability
DF-F500-DFUDS	Ultra-wide Differential 68 pin screw-type connector	9200 (RK)
DF-F500-DFU2S	Ultra-2 LVD 68 pin screw-type connector	9200 (RK)

Table 7.11 Fiber Channel Interfaces

Feature Code	Fibre Channel Type	Available on model
DF-F500-DF2G2 (2Gb interface)	Non-OFC optical	9200 (RK)
DF-F500-DFFM5 (FC-AL) only	Non-OFC optical	9200 (RK)
DF-F500-DFFM6 (FC-AL and fabric) capable	Non-OFC optical	9200 (RK)

Note: 9200 Fibre Channel interfaces cannot be mixed with SCSI in the same subsystem.

Note: The DF2G2 has (2) ports, but when installed on the controller disables the embedded 1Gb FC chipset on the controller, giving you max. of (2) ports per controller, the 1Gb port on the controller is then covered by a dummy plate.

The multiple 9200 Fibre Channel interfaces are available on all models. These support both FC/Arbitrated Loop, Public and Private implementations and Fabric switch in ***limited*** host, HBA and hub/switch configurations. The Fibre Channel industry is still being developed. This will very likely result in many compatibility issues that will affect 9200 Fibre Channel. Hitachi and HDS will publish documentation indicating which platforms; adapters and operating systems will be supported. Please see the eFAR in the HDSnet Knowledge Center at http://ntserv.hds.com/ssen/main.cfm

7.8 Optional Feature/Functions

7.8.1 Flash Access 9200

The Flash Access feature **DF-F500-WLU** is now available for the 9200. This is a separately orderable feature that provides the ability to configure up to (2) LUNS per 9200 (in a dual controller configuration) resident in cache memory. This provides very high access speeds at 100% cache hit rate to data resident on these LUNs, and is very useful for database index, registry etc.

Please see for more information on this feature. http://sanweb01.hds.com/techpubs/

7.8.2 LUN Security 9200

The LUN Security feature **DF-F500-WSEC** is now available for the 9200 family. This is a seperately orderable feature that provides LUN security access in a multiple host environment. This is accomplished by creating a list and allowing or disallowing host access to 9200 LUNs using the Host bus adapter WW name that is unique to every fibre channel adapter.

Please see for more information on this feature. http://sanweb01.hds.com/techpubs/

Note:
This feature requires the Disk array management program (Resource Manager 9200) in order to configure. This feature can only be used with the Fibre Channel interface/s.

7.8.3 Dual Active ID Succession 9200

The Dual Active ID Succession feature **DF-F500-WD** is now available for the 9200 family. This is a seperately orderable feature that provides a function in which, when one controller in a dual controller configuration is blocked due to a failure, the other controller takes over the Port-ID of the blocked controller, and automatically switches the path to continue processing.

This feature can be setup to function in either Hot Standby or Dual Active mode.

Please see for more information on this feature. http://sanweb01.hds.com/techpubs/

Note:
The Dual Active ID Succession is only effective in the case of controller failure only. It is not effective in case of a failed host HBA or cable failure including hub failure. This feature is currently recommended with (2) hubs for redundancy. Supported on fabric only in Loop mode or FL-port connection.

7.8.4 Remote Rebooting Function

This function is a feature of the new Resource Manager 9200 program.

Currently parameters and configuration information items on the DF500 can be changed using the Resource Manager 9200 program. With the use of this new feature, you can now perform a remote subsystem reboot after making changes to system parameters, so they can take effect. Host I/O must be suspended prior to the reboot procedure.

Chapter 8 Advanced Middleware Solutions

The Open Storage environment has changed dramatically over the past several years, with the most recent changes focusing on advanced middleware solutions that provide more reliable and redundant operations. The 9200 product now supports a variety of these solutions, which include special software for alternate path and failover for high-availability computing environments. In general, this software provides error recovery for failing paths or failing host systems.

Note: Most High-Availability solutions (except Hitachi Path Manager and Veritas) are not sold or serviced directly by HDS. While we have engineered and/or qualified or are currently qualifying our product to work in these environments, we are not prepared to support those software products directly. The vendors who sell these solutions are responsible for providing the technical support relative to their product. HDS have the responsibility to provide support for ***our*** product in these environments. Hitachi Path Manager is the exception to this as HDS is the only vendor who will be selling this solution for HDS storage products.

Table 8.1 Middleware Product Support Philosophy

Platform	Software	Support		
		1st level	2nd level	3rd level
HP	Service Guard	HP or reseller	HP	HP
	HP Volume Manager	HP or reseller	HP	HP
	HP Open View	HP or reseller	HP	HP
Sun	Veritas First Watch	HDS WW TECH	HDS WW TECH	Veritas
	Hitachi Safe Path	HDS WW TECH	HDS WW TECH	Conley
	Sun Netmanager	SUN	SUN	SUN
	Veritas VxVol	Veritas or reseller	Veritas	Veritas
IBM AIX	HACMP PSSP	Clam and Associates or reseller	Clam and Associates	Clam and associates
Windows NT Systems	Microsoft Cluster Server	Microsoft or reseller	Microsoft	Microsoft
	Hitachi Path Manager	HDS WW TECH	HDS WW TECH	STR
	Hitachi Safe Path	HDS WW TECH	HDS WW TECH	Conley
	Veritas VxVol	Veritas or reseller	Veritas	Veritas
All Platforms	CA Unicenter	CA	CA	CA
	Configuration Mgr. II	HDS CE	HDS WW TECH	STR

Notes:

- For 3rd party software tested with HDS products, HDS WW Tech Support is available to provide installation and connectivity support for HDS products regarding their integration into the 3rd party software environment. 3rd party applications installation and questions must be directed to the vendor.
- Level 1 is defined as front line first point of contact for customers (questions relating to configurations and product differences)
- Level 2 is defined as providing advanced consultation and problem identification services
- Level 3 is defined as providing fixes or product changes to customer problem and inquiries

8.1 Hitachi Path Manager

The Hitachi Path Manager 9200 is software that resides on a Windows NT/2000, or IBM AIX RS/6000 host, attaching to a Hitachi 9200 Disk Array Subsystem. Using redundant paths between the server and the disk storage. Path Manager provides Failover functionality only for the 9200, both FC and SCSI.

Table 9.1 HPM product codes

Hitachi Path Mgr. NT	P-242Z-J003
Hitachi Path Mgr. Win2000	P-242Z-J003
Hitachi Path Mgr AIX (entry)	P-9122-J003
Hitachi Path Mgr AIX (enterprise)	P-9122-J004
Hitachi Path Mgr. Solaris	P-902Z-J103

Please see:
Hitachi Path Mgr. NT/2000 MK-90DF512
Hitachi Path Mgr. AIX MK-90DF510
Hitachi Path Mgr. Solaris MK-90DF511

These manuals have detailed installation and configuration instructions for this software product. http://sanweb01.hds.com/techpubs/

8.2 VERITAS Foundation Suite™

Hitachi Data Systems and Veritas have entered into a Reseller agreement to market and support the Foundation Suite™ software product. The following is a brief description of the product and how HDS plans to support this product. Hitachi Data Systems Worldwide Technical Support – Americas, will be the level 1 support for the Veritas Software's Foundation Suite. Hitachi Data Systems TRC groups, initially in the US, then Europe, will handle all level 1 support calls on a 24 x 7 basis. Asia/Pacific is still under consideration. The US and European TRCs will have access to the Veritas knowledge base via the Web. Training for these individuals will be offered by the Veritas Software company in the US and Europe. Training for HDS field support will not be offered at this time. Level 2 and level 3 support issues will be passed to Veritas Software.

Note: For more information access the Veritas Product Support Plan available on the Intranet at http://www.hdssd.hitachi.com/storage/5700/VeritasPSP2.doc

Note: Please refer to the Feature Availability Report (FAR) or eFAR for updates on verification of the 9200 in this environment.

8.3 IBM AIX-HACMP

HACMP - High Availability Cluster Multi-Processing for AIX. The IBM High Availability Cluster Multi-Processing (HACMP) for AIX system enables clustered RISC System/6000 servers to recover from server, disk, network and network interface failure. The HACMP for AIX system provides reliable, recoverable shared disk resources for mission-critical commercial applications.

HACMP does not require specialized hardware or system software. The HACMP system is built on standard AIX services, such as the Journaled File System (JFS) and the Logical Volume Manager (LVM), and industry-standard protocols, such as TCP/IP.

HACMP extends two traditional approaches: HACMP's design combines elements from two traditional, but limited, computing paradigms--symmetric processing and fault tolerant computing--to create a highly available implementation that optimizes performance, expandability and economy.

Symmetric processing distributes the system over multiple processors. This approach provides an economical growth path because a symmetric processing system can scale horizontally by adding more processors or vertically by increasing the computing power of the processors. However, the symmetric processing model has no fail over capacity, which limits its usefulness in mission-critical computing.

The fault tolerant model uses redundant hardware to provide a highly available environment that can recover from hardware failure. This approach is expensive, as a fault tolerant environment requires specialized hardware and system software. A fault tolerant environment is also unable to detect software failures, which are the most common reason for downtime.

To overcome the limitations inherent in each approach, many sites attempt to combine the two models to ensure a stable, recoverable system. Unfortunately, this solution can drain both budgetary and system resources. The design of the HACMP system, on the other hand, provides a flexible, less costly clustered environment with minimal redundant hardware.

Focus on commercial applications: HACMP is designed primarily for commercial applications that serve large numbers of users, require fast access to large amounts of storage and require highly available computing services.

An example of a typical high availability environment follows: Two processors (nodes in HACMP terminology) provide database services to multiple clients. If one of these nodes fails, the HACMP facilities allow the surviving (fail over) node to take over for the failed node. The fail over node assumes control of all shared resources and starts a second database server identical to the one that was running on the failed node. At that point, client applications can check for cluster status and reconnect to the new database.

Support of HACMP environments is not provided directly by HDS. HDS have had the 5700E product certified by CLAM Associates and have a “Letter of Validation” from Clam Associates to this effect. If customers require support for HACMP directly, they should get support from the vendors who sold them HACMP and are receiving service revenue for that product. HDS does have a responsibility to understand and support our product in HACMP environments, and the task of determining when an issue is related to our product or “theirs” can be a challenge.

Note: Please refer to the Feature Availability Report (FAR) and eFAR for updates on verification of the 9200 in this environment.

8.4 HP-UX MC Service Guard

MC/ServiceGuard (Multi-Computer ServiceGuard) is a specialized facility for protecting mission-critical applications from a wide variety of hardware and software failures. With MC/ServiceGuard, two-node to eight-node systems are organized into an enterprise cluster that delivers highly available application services to LAN attached clients. Within an enterprise cluster, MC/ServiceGuard monitors the health of each node and quickly responds to failures in a way that eliminates or minimizes application downtime. MC/ServiceGuard is able to detect and respond to failures in the system processing unit (SPU), system memory, LAN media, LAN adapters, system processes, and application processes.

MC/ServiceGuard guarantees that any application package will run on only one node at the same time. The cluster will automatically reconfigure itself when it detects that a node has gone down. The quorum is a safeguard which prevents multiple clusters from forming in the event that some of the nodes cannot talk to each other (multiple nodes could form multiple sub-clusters or groupings). A cluster cannot form unless more than 50 percent of the configured nodes are members of the cluster. This is controlled through a lock disk feature, a semaphore, which is used to break ties. Ordinarily when the cluster re-forms as a result of some failure, any systems, which do not wind up part of the reconfigured cluster, will be crashed immediately to prevent the possibility of multiple clusters forming.

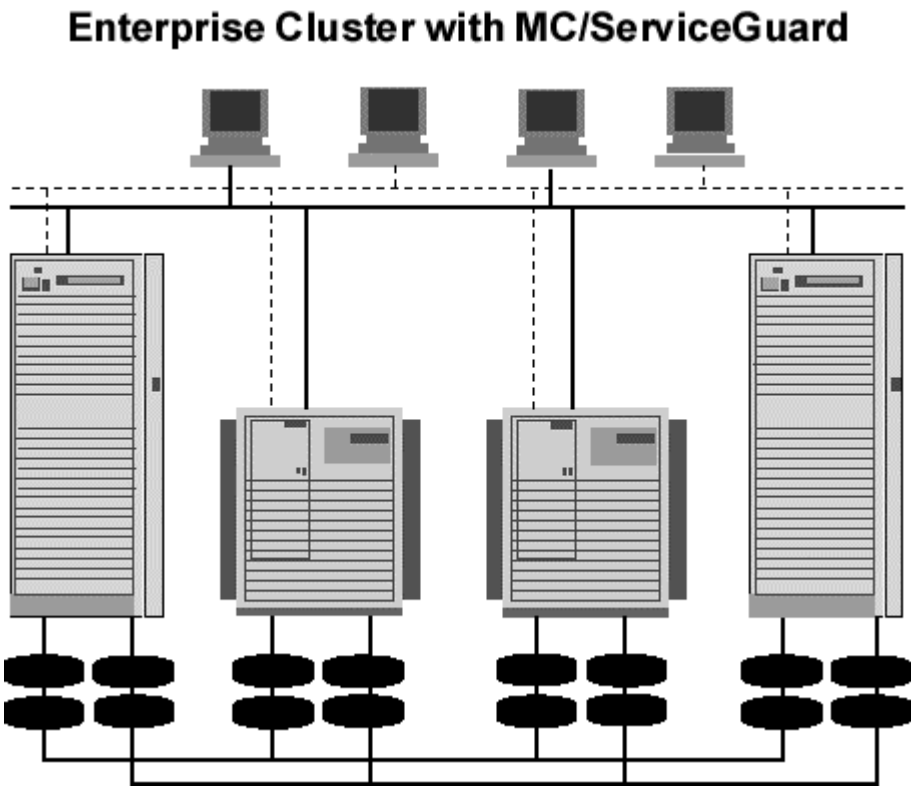


Figure 8.2 MC/Service Guard Cluster

MC/Service Guard supports various disk interfaces including SCSI disks and subsystems. For SCSI-2 systems, it will support Single-ended SCSI, which is a 6 meter maximum bus length, Fast/Wide/Differential SCSI, which is a 25 meter maximum bus length, and Hewlett-Packard Fiber Link (HP-FL), which allows for up to 500 meter maximum cable length.

HDS do not currently support MC/ServiceGuard directly, and are not in a position to provide technical support for installations and problems in this environment.

Note: Please refer to the Feature Availability Report (FAR) or eFAR for updates on verification of the 9200 in this environment.

8.5 Resource Manager 9200 - (Disk Array management program - JAVA & CLI)

Resource Manager 9200 is a software-based configuration management solution. This software will function on either workstations running the Microsoft Windows 95/NT, SGI-IRIX, HP-UX (CLI only) or SUN Solaris operating systems. Communication is either via an RS-232 interface (Windows only) or through a 10 BASE-T Ethernet Local Area Network (LAN). The 9200 has a 10 BASE-T (RJ-45) Ethernet LAN port integrated into each controller as a standard feature.

Resource Manager 9200 implements a control console concept to provide a comprehensive management tool for configuration, malfunction alert, and device management of the 9200 disk subsystems attached to the LAN. This allows the features and functions of the 9200 disk subsystem to be centrally administered, providing an invaluable tool to the network administrator when monitoring multiple 9200's across the enterprise. It provides the means to obtain data, which will enable Performance Management and Capacity Planning of the installed 9200 disk subsystems. The current trend of I/T organizations is to centralize the management of network hardware. Disk array management program addresses the requirements of our customers in managing the 9200 resources from a single centralized administration point and providing assistance to their end-user departments.

Note: There will also be a "service" copy of this program shipping along with the microcode set on every 9200 RK, as this is a mandatory item to setup and configure the 9200. It will be labeled DAMP Maintenance Tool - CD-00MT001-xx and could be a newer revision than what is GA to our customers. This tool is to remain under the control of the FE for install and service work only.

Resource Manager 9200 program features:

- Windows 95/NT/2000 (RS-232 & LAN)
- SUN
- HP (CLI only)
- Available in JAVA GUI or CLI
- Supports Flash Access 9200 (DF-F500-WLU)
- Supports LUN Security 9200 (DF-F500-WSEC)
- Supports new Password Security Protection Control feature 9200 (DF-F500-WSPS)

  (Included with the Resource Mgr. 9200)
- Supports Remote Reboot function
- LU mapping (64 LU max.)
- Automatic Alert

- Email error notification
- FRU status
- 9200 Utilization Statistics/ Performance Statistics and reporting
- Up to 1024 subsystems can be managed using the LAN version
- On-line LUN Format
- Differentiation of Administrator and User and Maintenance functions
- On-line microcode update (with the use of a Path Failover software product)
- Parameter Setting Wizard is now available in Resource Manager 9200 program, however 9200 still requires a reboot for some settings to take effect.

Warranty Support for Resource Mgr. 9200 program is provided by the Worldwide Technical Support – Americas/Europe functions. Optional support offerings will be offered for "level" of service for each geography. This is intended to provide coverage beyond the "8 AM to 5PM", "Monday to Friday" support provided by Week Day Basic coverage. Each service level will have an additional cost associated with this extra service offering. In Europe, only prime shift support is intended for this product.

Table 9.2 Resource Manager 9200 Product Codes

Java GUI and CLI for the following host platforms:	**044-100190-01**
MS Windows	Same
SUN Solaris	Same
HP – (CLI only)	Same

Note: There will also be a "service" copy of this program shipping along with the microcode set on every 9200 RK, as this is a mandatory item to setup and configure the 9200. It will be labeled DAMP Maintenance Tool - CD-00MT001-xx and could be a newer revision than what is GA to our customers. This tool is to remain under the control of the FE for install and service work only.

Chapter 9 9200 Major Specifications

9.1 Hardware Specifications

Table 9.1 Storage Capacity Specifications (in GB/unit)

Type / RAID level(*1) / Configuration			1 RK		1 RK + 1 RKA		1 RK + 9 RKA (mounted on rack)	
			Capacity (G bytes)	Number of the disk drive unit	Capacity (G bytes)	Number of the disk drive unit	Capacity (G bytes)	Number of the disk drive unit
Minimum configuration (with 35.7-G byte disk drive)	**0**	2D	71.5	2	71.5	2	71.5	2
		5D	178.8	5	178.8	5	178.8	5
		10D	357.7	10	357.7	10	357.7	10
		16D	—	—	572.3	16	572.3	16
	1		35.7	2	35.7	2	35.7	2
	5	2D+1P	71.5	3	71.5	3	71.5	3
		4D+1P	143.1	5	143.1	5	143.1	5
		9D+1P	321.9	10	321.9	10	321.9	10
		15D+1P	—	—	536.5	16	536.5	16
	0+1	2D+2M	71.5	4	71.5	4	71.5	4
		5D+5M	178.8	10	178.8	10	178.8	10
		8D+8M	—	—	286.1	16	286.1	16
Maximum configuration (with 71.6-G byte disk drive)	**0**	2D	716	10	1,433	20	7,164	100
		5D	716	10	1,433	20	7,164	100
		10D	716	10	1,433	20	7,164	100
		16D	—	—	1,146	16(*2)	6,877	96(*2)
	1		358	10	716	20	3,582	100
	5	2D+1P	430	9(*2)	864	18(*2)	4,728	99(*1)
		4D+1P	573	10	1,146	20	5,731	100
		9D+1P	645	10	1,289	20	6,447	100
		15D+1P	—	—	1,075	16(*2)	6,447	96(*2)
	0+1	2D+2M	287	8(*2)	716	20	3,582	100
		5D+5M	358	10	716	20	3,582	100
		8D+8M	—	—	573	16(*2)	3,438	96(*2)

Note:

- The capacity of the subsystem depends on the capacity of disks to be installed.
- In the minimum configuration, **35.7** GB disks are used. The capacities in the maximum configurations are calculated using the **71.6** GB disks

Table 9.2 Data Specifications

	9200 RK	9200 RKA
Number of rows	1	1
Drives/row	10	10
Cache capacity (MB)	256 MB – 2GB per CTL	N/A
Cache backup time (h)	48 @ 4096 MB	N/A
Cache Control System	Read LRU/write after	N/A
RAID configuration	RAID0, RAID1, RAID5, RAID 0+1	
Host interface	Ultra/wide differential. Ultra2 (LVD) and Fiber channel	N/A
Maximum data transfer rate	40 MB/s - Ultra SCSI 80 MB/s - Ultra2 (LVD) 100 MB/s - Fiber Channel	N/A
Number of host ports	(2) I/F per CTL, Fibre Channel (1) I/F per CTL, SCSI	N/A
Redundancy spare disk	Yes (2-5 optional)	Yes (2-5 optional)
Redundancy spare power supply	Yes	Yes
Data block length	512 bytes	512 bytes
Number of LUNs	8 or 64 max. with LUN mapping	8 or 64 max. with LUN mapping
Startup time	40 sec. – 180 sec.	40 sec. – 180 sec.
Outer dimensions in mm (WxDxH)	482x706x700	483x707x262
Weight in kg (max)	170	65-75

Table 9.3 Internal Logic Specifications

	9200
Controller CPU	Motorola PowerPC 750e RISC Processor (@ 300 MHz)
Controller O/S	VxWorks
Controller memory	Flash=2 MB, L2 cache=512 KB, SRAM=64 MB
Data Bus performance	Cache=805 MB/sec
Data Assurance methods	Data Bus=Through-parity Cache=ECC 1 bit for correction and 2 bits for detection Disk Drive= 8 byte Data assurance code
Firmware, Microcode	Firmware stored in EEPROM memory on CTL, Microcode stored in system area of Row 0 disks

Table 9.4 Power Requirement Specifications

	9200 RK (base unit)	9200 RKA (expansion unit)
Voltage (V)	89-127 V AC 178-254 V AC	89-127 V AC 178-254 V AC
Frequency (Hz)	50/60 ± 1 Hz	50/60 ± 1 Hz
Nominal current (A)	6.6/3.3	5.0/2.5
Breaking current (A)	20	15
Required power in steady state (VA)	660	500
Required power at start (VA)	770	600

9.2 Environmental Specifications

Table 9.5 Temperature Specifications

Temperature	9200 (all models)
Operating	10 – 40 C
Not operating	-10 – 50 C
Transporting/ storing	-30 – 60 C
Temperature change rate	10 C/h
Max. wet bulb temperature	29 C (no dew condensation)

Table 9.6 Humidity and Vibration/Impact Specifications

	9200 (all models)
Operating humidity	8-80%
Not operating humidity	8-90%
Operating vibration	2.5 G or less
Non-operating vibration	5.0 G or less
Transporting vibration	5.0 G or less

Note:

- No corrosive gas or salty air can be present.
- The radio frequency radiation conforms to VCCI Class A and CE mark.
- The equipment will tip over at a 15° angle or more.

Table 9.7 Noise, MTBF

	9200 (all models)
Acoustic noise	60dB or less
MTBF	More than 50,000 hours

9.3 9200 Inventory Codes

Table 9.8 9200 Inventory codes

European Inventory & Marketing code North America & Asia Pacific Inventory code	**Description**
DF500-RK	Includes RK frame, (1) controller with FC I/F, (2) Power supplies, (1) Battery Unit, (1) Fan Unit, (1) FDD, (2) ENC RK boards, (2) keys, (2) J2F power cables (excludes cache, additional I/Fs and HDDs)
DF500-RKA	Includes RKA frame, (2) Power supplies, (2) ENC RKA boards, (4) ENC cables, (2) J2F power cables (excludes HDDs)
DF-F500-C256	Cache Memory 256MB (128 MB x2)
DF-F500-C512	Cache Memory 512MB (256 MB x2)
DF-F500-C1G	Cache Memory 1GB (512 MB x2)
DF-F500-AA18	3.5" Disk Drive, 17.8GB (15,000 RPM)
DF-F500-AAF36	3.5” Disk Drive, 35.7GB (10,000 RPM)
DF-F500-AAF72	3.5” Disk Drive, 35.7 GB (10,000 RPM)

Table 9.9 9200 Inventory Codes, continued

European Inventory & Marketing code	Description
DF-F500-Y1F	Enclosure board for RK unit
DF-F500-F1F	Controller for 9200 RK, also has (1) FC I/F included on board
DF-F500-DFUDS	Ultra-Wide differential 68-pin screw type (with built-in terminator)
DF-F500-DFU2S	Ultra2 LVD 68-pin screw type (with built-in terminator)
DF-F500-DFFM5	Additional Interface for **9200 Fibre Channel (FC-AL) only** 1Gb I/F Note: SCSI I/F and Fibre cannot be mixed
DF-F500-DFFM6	Additional Interface for **9200 Fibre Channel (FC-AL and Fabric)** 1 Gb I/F Note: SCSI I/F and Fibre cannot be mixed
DF-F500-DF2G2	Additional Interface for 9200 **Fibre Channel (FC-AL and Fabric)** 2Gb I/F Note: SCSI I/F and Fibre cannot be mixed
2103786-HRK.P	9200 RK Bezel. Black
2104414-HRKA.P	9200 RKA Bezel, Black

Table 9.10 9200 Inventory Codes, continued

European Inventory & Marketing code	North America & Asia Pacific Marketing Code	Description
MK-90DF504	MK-90DF504	9200 User and Reference Manual

Note: This manual and the host install manuals can be ordered through the Techpubs system on the Intranet at http://sanweb01.hds.com/techpubs/

Table 9.11 European SCSI Cables

European Inventory Code	Type	Connector A	Connector B	Length
CBL-WN68501	Narrow S/E	68 pin micro D	50 pin micro D	1M
CBL-WN68503	Narrow S/E	68 pin micro D	50 pin micro D	3M
CBL-WN68505	Narrow S/E	68 pin micro D	50 pin micro D	5M
CBL-WS681	W/D	68 pin micro D	68 pin micro D	1M
CBL-WS683	W/D	68 pin micro D	68 pin micro D	3M
CBL-WS685	W/D	68 pin micro D	68 pin micro D	5M
CBL-WS6810	W/D	68 pin micro D	68 pin micro D	10M
CBL-WS6820	W/D	68 pin micro D	68 pin micro D	20M
043-100069-01	W/VHDC	68 pin	VHDC .8mm champ	3M
043-100070-01	W/VHDC	68 pin	VHDC .8mm champ	12M
043-100075-01	W/VHDC	68 pin	VHDC .8mm champ	20M
043-100071-01	LVD	68 pin	68 pin	1M
043-100072-01	LVD	68 pin	68 pin	3M
043-100073-01	LVD	68 pin	68 pin	5M
043-100074-01	LVD	68 pin	68 pin	8M

Table 9.12 European Fibre Channel Optical Cables

European Inventory Code	Type	Length
JZ-050SS005PC	Duplex SC/SC optical, 50um multi-mode	5M
JZ-050SS010PC	Duplex SC/SC optical, 50um multi-mode	10M
JZ-050SS020PC	Duplex SC/SC optical, 50um multi-mode	20M
JZ-050SL025PC	Duplex SC/LC Cable, 50um multi-mode	25M
JZ-050LL025PC	Duplex LC/LC Cable, 50um multi-mode	25M

Table 9.13 North America & Asia Pacific SCSI Cables

Inventory Code	Marketing Code	Type	Connector A	Connector B	Length

043-100016-01	CBL-SC0001	Narrow	50 pin	Half/Pin/Latch	1M
043-100006-01	CBL-SC0002	Narrow	50 pin	Half/Pin/Latch	3M
043-100007-01	CBL-SC0003	Narrow	50 pin	Half/Pin/Latch	5M
043-100017-01	CBL-SC0004	Narrow	50 pin	Half/Pin/Latch	8M
043-100018-01	CBL-SC0005	Wide	68 pin	68 pin	1M
043-100008-01	CBL-SC0006	Wide	68 pin	68 pin	3M
043-100009-01	CBL-SC0007	Wide	68 pin	68 pin	5M
043-100019-01	CBL-SC0008	Wide	68 pin	68 pin	8M
043-100011-01	CBL-SC0011	Narrow	50 pin	Half/Pin/Latch	5M
043-100013-01	CBL-SC0015	Narrow	50 pin	Half/Pin/Latch	5M
043-100020-01	CBL-SC0017	N/W	50 pin	68 pin Half/Pin/Screw	1M
043-100014-01	CBL-SC0018	N/W	50 pin	68 pin Half/Pin/Screw	3M
043-100015-01	CBL-SC0019	N/W	50 pin	68 pin Half/Pin/Screw	5M
043-100021-01	CBL-SC0020	N/W	50 pin	68 pin Half/Pin/Screw	8M
043-100033-01		Wide	68 pin (screw)	68 pin (screw)	12M
043-100069-01		W/VHDC	68 pin	VHDC .8mm champ	3M
043-100070-01		W/VHDC	68 pin	VHDC .8mm champ	12M
043-100075-01		W/VHDC	68 pin	VHDC .8mm champ	20M
043-100071-01		LVD	68 pin	68 pin	1M
043-100072-01		LVD	68 pin	68 pin	3M
043-100073-01		LVD	68 pin	68 pin	5M
043-100074-01		LVD	68 pin	68 pin	8M

Table 9.14 North America & Asia Pacific Fibre Channel Optical Cables

Inventory Code	Type	Length
JZ-050SS002PC	Duplex SC/SC optical, 50um multi-mode	2M
JZ-050SS005PC	Duplex SC/SC optical, 50um multi-mode	5M
JZ-050SS010PC	Duplex SC/SC optical, 50um multi-mode	10M
JZ-050SS015PC	Duplex SC/SC optical, 50um multi-mode	15M
JZ-050SS025PC	Duplex SC/SC optical, 50um multi-mode	25M
JZ-050SS050PC	Duplex SC/SC optical, 50um multi-mode	50M
JZ-050SS100PC	Duplex SC/SC optical, 50um multi-mode	50M

JZ-050SL025PC	Duplex SC/LC Cable, 50um multi-mode (for 2Gb interfaces)	25M
JZ-050LL025PC	Duplex LC/LC Cable, 50um multi-mode (for 2Gb interfaces)	25M

Table 9.13 RS/6000 SP2 & SR4300 ONLY

European Inventory Code	Type	Connector A	Connector B	Length
CBL-RS60001	Wide	68 pin micro D	Micro Centronic	1M
CBL-RS60003	Wide	68 pin micro D	Micro Centronic	3M
CBL-RS60005	Wide	68 pin micro D	Micro Centronic	5M

9.4 Spare Part Lists

Table 9.14 A Kit (A9200) Model 9200

Spares Part Number	Description	FIT	Location	Repair Status	Kit
5507067-3	HDU ASSY (36GB 10000 rpm)	40000	DF-F500-A5F36	R	A/B
5507067-4	HDU ASSY (72GB 10000 rpm)	40000	DF-F500-A5F72	R	A/B
5507067-44	HDU ASSY (18GB 15000 rpm)	40000	DF-F500-AAH18	R	A/B
5507067-5	AC/DC PS (RK)	2000		R	A/B
5507067-6	AC/DC PS (RKA)	2000		R	A/B
5507067-7	256MB CACHE MEMORY DIMM (2x128)	1700	DF-F500-C256	R	A
5507067-22	512MB CACHE MEMORY DIMM (2x256)	1700	DF-F500-C512	R	A
5507067-8	1GB CACHE MEMORY DIMM (2x512)	3400	DF-F500-C1G	R	A
5507067-76	FIBRE CHANNEL NON-OFC I/F	300	DF-F500-DFFM6	R	A/B
5507067-61	FIBRE CHANNEL NON-OFC I/F (200 MB/s 2 port interface)	300	DF-F500-DF2G2	R	A/B
5507067-9	SCSI W/D Ultra I/F	300	DF-F500-DFUDS	R	A/B
5507067-10	SCSI Ultra2 LVD I/F	300	DF-F500-DFU2S	R	A/B
5507067-12	CTL ASSY	4800	DF-F500-F1F	R	A/B
5507067-13	RK ENCLOSURE ASSY	1100	DF-F500-Y1F	R	A/B
5507067-14	RKA ENCLOSURE ASSY + FC cable	1100		R	A/B
5507067-16	BATTERY ASSY (RK)	2 YR		U	A
5507067-17	FDD ASSY(RK)	10,000 hr		U	A/B
5507067-18	FAN ASSY	25,000 hr		U	A/B
5507067-19	ENCLOSURE (FC) CABLE			U	A/B
5507067-25	P/S CABLE 2.5M 125V 15A		DF-F500-J1F	U	A
5507067-23	P/S CABLE 2.0M 250V 6A		DF-F500-J2F	U	A
5507067-24	POWER DISTRIB UNIT for H2F	1000		R	A
5507067-31	REMOTE CABLE for H2F (white)			U	A

5507067-52	REMOTE CABLE for H2F (yellow)			U	A
3247392-J	SCSI cable 68pin,P/S, 1.5M			U	A
3247392-K	SCSI cable 68pin,P/S, 5M			U	A
3247392-L	SCSI cable 68pin,P/S, 3M			U	A
3247392-M	SCSI cable 68pin,P/S, 10M			U	A
3247392-N	SCSI cable 68pin,P/S, 15M			U	A
3247392-O	SCSI cable 68pin,P/S, 0.5M			U	A
3247392-P	SCSI cable 5M(for RS6000)			U	A
043-100071-01	SCSI cable 68pin,P/S, 1M (LVD)			U	A
043-100072-01	SCSI cable 68pin,P/S, 3M (LVD)			U	A
043-100073-01	SCSI cable 68pin,P/S, 5M (LVD)			U	A
043-100074-01	SCSI cable 68pin,P/S, 8M (LVD)			U	A
043-100069-01	SCSI cable 68pin,P/S > VHDC 3M			U	A
043-100070-01	SCSI cable 68pin,P/S > VHDC 12M			U	A
043-100075-01	SCSI cable 68pin,P/S > VHDC 20M			U	A
5491805-2	Fibre Channel Cable Duplex SC/SC multi-mode (2M)			U	A
5491805-5	Fibre Channel Cable Duplex SC/SC multi-mode (5M)			U	A
5491805-10	Fibre Channel Cable Duplex SC/SC multi-mode (10M)			U	A
5491805-15	Fibre Channel Cable Duplex SC/SC multi-mode (15M)			U	A
5491805-25	Fibre Channel Cable Duplex SC/SC multi-mode (25M)			U	A
5491805-50	Fibre Channel Cable Duplex SC/SC multi-mode (50M)			U	A
JZ-050SL025PC.x	Fibre Channel Cable Duplex SC/LC Cable, 50um multi-mode (25M)			U	A
JZ-050LL025PC.x	Fibre Channel Cable Duplex LC/LC Cable, 50um multi-mode (25M)			U	A

Table 9.18 B Kit (B9200) Models 9200

Spares Part Number	Description	FIT	Location	Repair
5507067-3	HDU ASSY (36GB 10000 rpm)	40000	DF-F500-A5F36	R
5507067-4	HDU ASSY (72GB 10000 rpm)	40000	DF-F500-A5F72	R
5507067-44	HDU ASSY (18GB 15000 rpm)	40000	DF-F500-AAH18	R
5507067-5	AC/DC PS (RK)	2000		R
5507067-6	AC/DC PS (RKA)	2000		R
5507067-76	FIBRE CHANNEL NON-OFC I/F	300	DF-F500-DFFM6	R
5507067-61	FIBRE CHANNEL NON-OFC I/F (200 MB/s 2 port interface)	300	DF-F500-DF2G2	R
5507067-9	SCSI W/D Ultra I/F	300	DF-F500-DFUDS	R
5507067-10	SCSI Ultra2 LVD I/F	300	DF-F500-DFU2S	R
5507067-12	CTL ASSY	4800	DF-F500-F1F	R
5507067-17	FDD ASSY(RK)	10,000 hr		U
5507067-18	FAN ASSY	25,000 hr		U
5507067-13	RK ENCLOSURE ASSY	1100	DF-F500-Y1F	R
5507067-14	RKA ENCLOSURE ASSY + FC cable	1100		R
5507067-19	ENCLOSURE (FC) CABLE			U

9.4.1 North America's Rack Specification

HDS (new black) - 19 inch Rack

For the Americas, HDS will be selling a 19" Rack solution from Electrorack. This rack provides a very robust and reliable rack solution at a moderate cost. The specific racks that have been designed for HDS by Electrorack include custom features including power strips (PDUs) available in both 120VAC and 220VAC, top mounted fans for ventilation, a deep cabinet, full maintenance access, removable/lockable side panels, lockable rear door and, anti-tip stabilizer.

The fully welded rack is constructed of 14 gauge cold rolled steel, designed specifically for heavy payloads and can meet UBC(Uniform Building Code) Seismic Zone 4 requirements with appropriate bolt downs.

- The HDS 19" rack is capable of mounting (1) RK and up to (9) RKA's for the maximum configuration. The approximate weight of a fully configured RK model is 65kg or 143.3lbs. The approximate weight of a fully configured RKA model is 40kg or 88lbs.
- Conveniently sized rack enclosure that can be used to house the 9200 rack-mount units, and is (40) EIA units in height.
- Enables customers to manage large quantities of data storage in a small footprint.

Power distribution units provide dual power supplies for the 9200 thus ensuring higher availability.

The Power Distribution Units (IEC320) are available in 120 VAC and 220 VAC for this rack. The PDUs require different power connector cables based on the model and power requirements. The 122234-110 uses (2) L520P plug type and will require (2) L520R (20 amp 110V) AC receptacle. The 122234 uses (2) L620P plug type and will require (2) L620R (20 amp 208V) AC receptacle.

The HDS 19" rack provides optimum cooling through top-mounted fans that produce an aggregate of 990 CFMs. (cubic feet per minute).

The HDS 19" rack features an all-aluminum extruded frame with sheet-steel coverings and specially designed support members to provide the safety and stability that customer will expect when using rack- mounted devices to store data. In addition, an anti-tip device in the front of the rack can be extended while maintaining the 9200s to ensure that there will be the necessary safety while handling the 9200 units on or off the rack enclosure.

Please find the latest HDS 19" rack "Configurator Worksheet" document posted on the 9200 Product Support webpage at : http://sanweb01.hds.com/support/storage/9200/9200.htm

Table 9.15 HDS 19" Rack (new black)

Product Codes	Power Requirements	Product Description
122234-110	HDS 19" Rack, 110 Volt	includes 3 pairs of railkits, 110V fan, and (2) 110V PDUs with their 110V Power Cords
122234	HDS 19" Rack, 220 Volt	includes 3 pairs of railkits, 220V fan, and (2) 220V PDUs with their 220V Power Cords
043-100082-01	PDU, 110-220V, (16A)	can be used for 110V or 220V
043-100085-01	Power Cord for PDU, 110V, 5-15P Plug	ALWAYS order a Power Cord when ordering a PDU. This connects the PDU to the power source.
043-100083-01	Power Cord for PDU, 220V, L6-20P Plug	ALWAYS order a Power Cord when ordering a PDU. This connects the PDU to the power source.
122296-05	Filler Panel, 0.5U For HDS 19" Rack	These are used for filling up the empty space that remains in the front after mounting hardware in a rack.
122296-1	Filler Panel, 1.0U For HDS 19" Rack	same
122296-3	Filler Panel, 3.5U For HDS 19" Rack	same
122296-7	Filler Panel, 7.0U For HDS 19" Rack	same
122234-200	Rail Kits for 9200 in HDS 19" Rack	ALWAYS order when mounting a 9200 in an HDS 19" Rack.
122411	Universal Rail Kit for 9200 in 3rd party 19" racks	ALWAYS order when mounting a 9200 in non-HDS 19" Rack.

Note: PDUs are UL and CSA approved and listed.

Ordering information: When a HDS 19" rack is ordered, the order must include the appropriate number of rail kits to reflect the 9200 units being mounted on the rack minus (3). There are (3) rail kits included with the rack.

When installing a number of 9200 in the HDS 19" rack that will not fill the total mounting space, filler panels can be order to cover the exposed space. These panels are available in three sizes:

- .5 EIA
- 1 EIA
- 3.5 EIAs.
- 7 EIAs

Note: *1 EIA unit is 1.75 inches*.

Maintenance: The only components that require spares, and is a serviceable component in this rack solution are the Power Controller Kit and the 9-Volt Fan Assy.. These are being spared separately, we expect a very low number of failures in this area.

Asia Pacific Rack Specification

For cost and feature functionality, Europe and Asia Pacific has found local suppliers for rack solutions in their geographies. For details on the rack solution and support requirements, contact Sales Support or Technical Support in Sefton Park, UK or Sydney, AU.

9.4.2 European Rack Specification

For Europe, HDS will be selling a 19" rack solution. The Knurr Miracle Rack provides a very robust and reliable rack solution at a moderate cost. The specific racks that have been designed for HDS by Knurr include custom features including dual phased power strips, and a deep cabinet. Dual sourcing power controller units provide dual power input for the 9200 thus ensuring higher availability. The Knurr rack provides optimum cooling through top-mounted fans that produce an aggregate of 990 CFMs. (cubic feet per minute).

The features include an all-aluminum extruded frame with sheet-steel coverings and specially designed support members to provide the safety and stability that customer will expect when using rack- mounted devices to store data. In addition, an anti-tip device in the front of the rack can be extended while maintaining the 9200s to ensure that there will be the necessary safety while handling the units on or off the rack enclosure.

Table 8.5 Knürr Miracle Rack

Dimensions in millimeters	Finish/Material	Test Limits	Construction	Loading Rate
External: 600 x900x 2120	■ Aluminum extrusions. ■ Die cast corners ■ Sheet steel side covers ■ External surface: All visible surfaces including front door and posts are powder coated Black RAL 9011	■ Vibration = MIL STD 810 ■ IP test = DIN 40 050/IEC 529 ■ UL test = 1244 ■ NEMA = 12 ■ EMC = MIL STD 285 ■ Earth = VDE 0100 T540	■ Vented rear door with mesh panel ■ No front door ■ Curved top cover ■ 4 x 6 way IEC 320 10amp rated PDU terminate4d with 16 amp Commando plug. Also fitted with Weiland ST in line connector. ■ Rack supplied fitted with chassis runners.	With Mobile Castor Plate, max–500 Kg

Table 8.6 European Oracle Marketing Codes for Knürr cabinet.

Marketing Code	Product Description
M1.130.374.0	Knurr Cabinet 9200 (2 x UPS units max.)
M2.008.023.1	Knurr Cabinet blank plate 3.5 "U" high - Black
M2.008.022.1	Knurr Cabinet blank plate 2 "U" high - Black
M2.008.021.1	Knürr Cabinet blank plate 1 "U" high - Black

Chapter 10 9200 Education

Global Education will announce soon a “formal” curriculum for this product. It will be handled by Global Education within each division. This is currently composed of two separate classes, the 9200 Installation and Maintenance Class (9200IM) and the 9200 Differences class (9200DIF) that consists of the differences between the 5800 and 9200 products. There is also a WBT (9200WBT) that will be a prerequisite to the formal classes. The schedule for these classes in the U.S. will become available when announced on HDSnet at: http://sdtrain.hds.com/esta/ The same set of "Hitachi Factory Training" has been provided to each Division within HDS to ensure accurate and consistent technical details are available to HDS colleagues worldwide.

HDS Global Education has made available a set of CBT training materials that provide an excellent opportunity for CS&S colleagues who want to increase their expertise in these areas that are beyond that offered in formal classroom training. Emphasis in HDS classroom training is focused on the hardware and those specific skills required to provide basic service on the product. Expertise and more advanced host system topics are not covered in this HDS training.

For HDS colleagues who require more extensive or additional hands-on training, the systems vendors also offer excellent sources of education for their environments. There are also many quality sources of “Open Systems” education available in almost every geography. Table provides www links to the major system vendors education offerings:

Table 10.1 Vendor Web Links

System Vendor	WWW link
IBM AIX	http://www.training.ibm.com/ibmedu
Hewlett Packard HP/UX	http://www.hp.com/education/
SUN Solaris	http://www.sun.com/service/suned/index.html
Microsoft Windows NT	http://www.microsoft.com/train_cert/

10.1 European Education

A training class is currently available for the 9200 Disk Subsystem product and can be scheduled through the Global Education department.

The course under development currently covers:

- Product Introduction
- RAID CBT (refresher)
- Hardware install and configuration.
- Microcode installation, upgrade
- Hardware features and upgrades
- Disk sparing
- Dual controller
- SNMP introduction
- Resource Manager 9200
- Web access
- LUN Mapping
- ECN's & FCB’s
- Support structure
- Troubleshooting
- Lab including all mentioned above
- Hi-track
- Fibre Channel

It is anticipated that as the 9200 series product becomes established, a requirement for advanced training may be identified. The Attachment class now available in EEC includes connectivity to the major host platforms: HP-UX, SUN Solaris, IBM AIX, and NT.

Announcement of any additional courses will be made via the normal Global Education communication channel, and included in this document when updated.

10.2 Americas Education

9200 specific education has been developed by adding the brand new hardware content to the previous 5800 host connectivity offering in addition to entirely new content covering the new Resource Manager 9200 both JAVA and CLI and Web access tool. The plan is also to continue to make more use of CBT Training and have more emphasis on integration aspects of the midrange storage market.

The schedules for these classes in the U.S. are available on HDSnet at http://sdtrain.hds.com/esta/

The 9200 series class is a very detailed and complete class, with emphasis on the set-up and operation of the 9200. It includes hands-on exercises in a number of host environments including AIX, HP/UX, Solaris, and Windows 2000, Windows NT. It also includes detailed sections on:

- Hardware installation and configuration.
- Microcode installation and upgrade
- Hardware features and upgrades
- Disk sparing
- Dual controller
- SNMP introduction
- Resource Manager 9200
- Web access
- LUN Mapping
- Troubleshooting
- Trace and Dump collection
- Hi-Track
- Fibre Channel

10.3 Asia/Pacific Education

Training schedules for each of the regions in Asia/Pacific – Australia/New Zealand, ASEAN and North Asia – are under development. Training material for these classes will be prepared in conjunction with the European and Americas CS&S Divisions. Currently the training is provided by the Asia/Pacific Technical Support and Marketing groups as required.

Chapter 11 Error Reporting

11.1 SNMP

In 1988, the Internet Engineering Task Force (IETF) developed a two-pronged strategy to address the critical need for systems and network management standards. For a short-term solution, the IETF released SNMP; a management protocol that would be easy to implement on a variety of network devices, but would have somewhat limited functionality. For the long term, IETF planned to adopt ISO's more powerful and complex Common Management Information Protocol (CMIP). However, CMIP has not been widely accepted by the industry and SNMP has become the dominant standard management protocol. Originally used primarily to manage remote network infrastructure devices, SNMP has been extended to manage more diverse network components, such as LAN servers, operating systems, and applications software. SNMP has not been widely accepted to manage desktops and portables, because it requires more memory and other system resources than is practical.

SNMP architecture defines a set of commands that an SNMP manager (management software application) can use to retrieve or change the attributes of a managed device (or managed object). Attributes (or proper-ties) describe the characteristics and current state of the managed device and are made available by an SNMP agent (management agent). For example, the managed object might be a disk controller board with attributes that are both static (e.g., amount of memory on board) and dynamic (e.g., number of disk input/output operations processed or number of failed requests).

The SNMP standard defines both how to communicate with agents of managed resources and which attributes of those resources can be obtained and set. It does not specify how to interpret and act on specific attribute values. Decisions on this level are left to specific management applications.

SNMP architecture provides for storage of the attributes of the managed devices in a hierarchical (tree-based) database called a Management Information Base (MIB). A typical SNMP environment has two types of MIBs: Internet MIBs and vendor MIBs. Internet MIBs are defined, standardized by Systems Management Standards the Internet community, and define attributes common across resources of the same class. Vendor MIBs (the majority of existing MIBs) extend Internet MIBs with attributes specific to a particular vendor's device. For instance, the vendor of a disk controller board might develop a MIB that extends the generic attributes contained in the Internet MIB to include attributes unique to the vendor's own board. The combination of generic Internet MIBs and vendor-specific MIBs provides the flexibility required to describe diverse network devices. However, because each vendor MIB can describe unique attributes, management applications must load and compile all MIBs associated with managed devices in order to manage them.

SNMP management consoles obtain management information from management agents using a combination of polling and traps. SNMP consoles poll management agents for information, issuing GET and GET-NEXT commands, then sending instructions. An SNMP agent can itself send unsolicited alerts or traps to the management application to notify it of unusual events. These exchanges use the TCP/IP User Datagram Protocol (UDP), an unacknowledged connectionless transport system.

The original SNMP specification has a number of limitations. It does not address security, so unauthorized users can access management agents or intercept commands. It does not allow management consoles to communicate with each other, limiting SNMP's scalability in distributed networks. In addition, since UDP exchanges are unacknowledged, the management agent receives no confirmation that communications have successfully reached the management console. These and other drawbacks led to the development of SNMP 2 in 1993. SNMP 2, which corrects these problems but is considerably more difficult to implement and use than SNMP, has been debated extensively in the industry since 1993 and has not been adopted by the IETF. Meanwhile, vendors have developed interim solutions to address SNMP limitations, particularly security.

Table 11.1 9200 SNMP Kit Product Part Number

Product Codes	Kit Description
DF-F500-WS	SNMP CD Kit. contains: (1) CD Rom, with "key file", MIB and sample configuration files

11.2 Hi-Track for 9200

11.2.1 What is Hi-Track?

Hi-Track is a service feature of HDS and consists of JAVA based software program/s developed by HDS to allow remote monitoring of HDS products. Hi-Track is installed on a users workstation or server, then attached to the 9200 Disk Sub system using TCP-IP over the customers LAN or dial-out. The management server then can contact the local HDS Support Center using "FTP" of status and error information. Hi-Track monitors the 9200s that are registered every (1) minute for various conditions and will perform an FTP "put" command to the HDS Support Center if an error occurs. If there is no error condition Hi-Track will report back "good" status once every 24 hours.

Note: H-Track 9200 Monitor Program rev. 1.2 now supports "dial-out" in addition to FTP.

11.2.2 How it works

The Hi-Track board interrogates the 9200 once every (1) minute for certain errors and abnormalities. If an error or abnormality is detected, Hi-Track will FTP put via the Internet or dial-out to the local HDS support center, the error or status data relating to the condition is transferred.

Hi-Track will automatically re-transmit the incident after 4 hours, should the error condition remain uncorrected. This process repeats every 4 hours, until the error is corrected. If a new type of condition occurs (i.e. a drive error versus a battery error), the call will be transmitted immediately and the 4 hour recall of unresolved errors, reset to run from this time.

The program running on the Management PC will call out to the local HDS Support Center once every 24 hours even if there are no errors to report in order to assure the Hi-Track system is functioning properly and to report the present condition of the 9200.

Table 11.2 9200 HiTrack Product Part Number

Tool Codes	Kit Description
IP0826-1-P	Hi-Track Software CD Kit. contains: (1) CD Rom

11.2.3 What is Supported/Reported

Hi-Track can detect the following errors: -

- Drive Failure
- Cache Failure
- Mate Controller Failures
- Enclosure Board Failures (Loop failure)
- Fan Failure
- AC/DC Power Supply Failure
- Battery Failure

The Hi-Track system is capable of attaching and issuing “Mode Sense” commands to the 9200. The reply to these inquiries will be a “health status” reply of the attached 9200 disk subsystem. The Hi-Track system cannot determine the cause of failures directly, it can only report them, and cannot be used to detect intermittent recoverable problems. Hi-Track reporting of controller failures can only be accomplished in Dual Controller environments where the reporting of a controller failure is initiated by the “mate controller”.