SPERRY

8409 Disk Subsystem

General Description

This document contains the latest information available at the time of preparation. Therefore, it may contain descriptions of functions not implemented at manual distribution time. To ensure that you have the latest information regarding levels of implementation and functional availability, please contact your local Sperry representative.

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1. Introduction

1.1. OVERVIEW

The SPERRY 8409 Disk Subsystem (disk subsystem) is a mass storage device that can store up to 47.5 million bytes of information on fixed (nonremovable) disks. The disk subsystem is compatible with a variety of Sperry products.

The disk subsystem (Figure 1–1) is contained in a floor-model cabinet that is mounted on casters and can be easily moved to a convenient location. The disk subsystem is linked to a controlling device (described in 2.1) by an 8-bit peripheral cable. The 8409 disk subsystem may be the only peripheral device or one of four peripheral devices connected to the controlling device. Total cable length for four peripherals cannot exceed 200 feet.

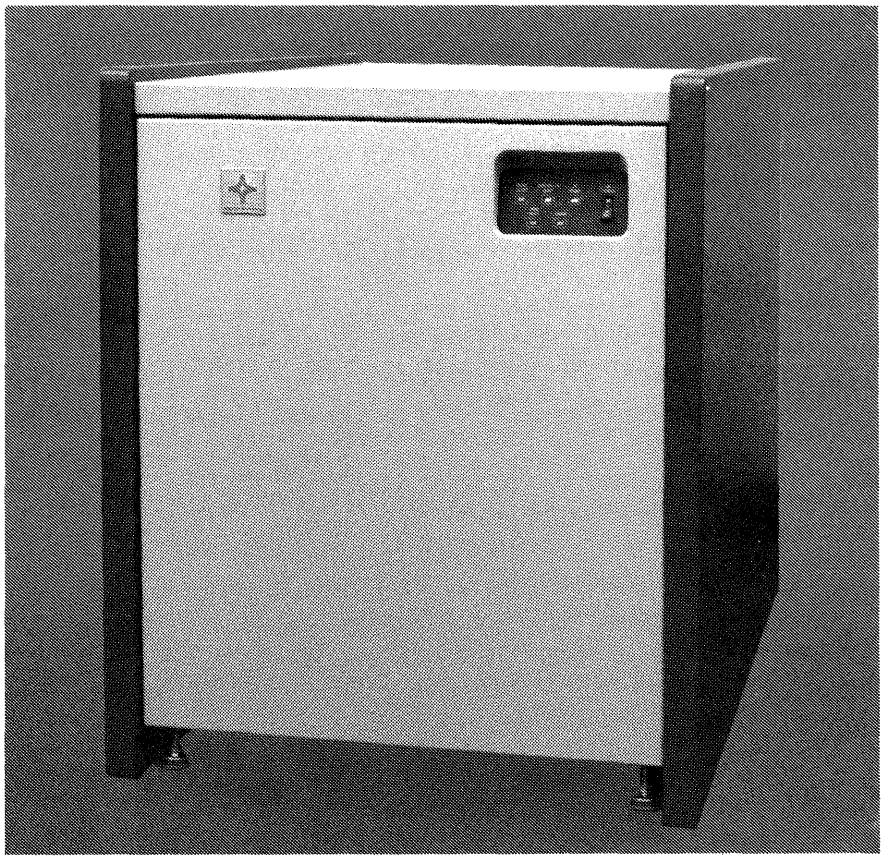

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Figure 1–1. SPERRY 8409 Disk Subsystem

One or two disk drive assemblies (Figure 1–2) can be ordered with the 8409 disk subsystem. A fully configured disk drive contains three disks, or platters, with five usable recording surfaces and three sets of recording (read/write) heads. An 8409 disk controller handles the general operation of the disk subsystem, which includes error detecting, error correcting, and status reporting.

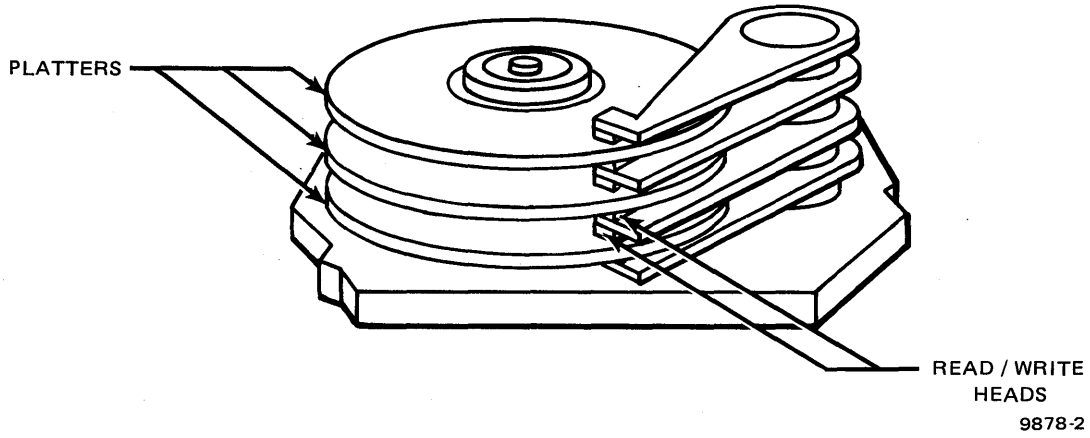

Figure 1–2. Disk Drive Assembly

NOTE:

Many operating characteristics of the disk subsystem are program dependent. Characteristics such as addressing, read/write accessing, and disk preparation formatting depend on the operating program supplied by the controlling device. This publication will survey general operating characteristics only. Consult the appropriate operating guides for detailed information on these program-dependent characteristics.

In conjunction with a controlling device, the disk subsystem performs various operations such as creating a file. After a file has been created, data can be written into the file (write operation). The information can be displayed (read operation) on a terminal screen or transferred from the disk subsystem to a host processor. Files may be altered and updated by an operator at a terminal or by the host processor. The files may be searched (search operation) for a specific file, record, or sector. Stored data can be transferred from the disk subsystem to a controlling device and can be printed or copied into another disk subsystem or other data storage device.

1.2. THE DISK DRIVES

The disk subsystem is available with one or two disk drives, each with a total storage capacity of 23,756,800 bytes (23.7 megabytes) of formatted data. The disks (platters) cannot be removed from the disk subsystem. Each disk drive has up to five recording heads for writing information to and for reading information from the disk. One additional recording head is used to inform the internal disk controller of the position of the recording heads and how they are aligned. This information is termed "servo-track data."

Each disk drive may be configured for either 4.75, 14.25, or 23.75 megabytes of data storage. For disk subsystems with minimum storage capacity (4.75 megabytes), one side or surface of the disk is used for general information storage; the other side is used for servo-track data. Storage capacity can be expanded to 14.25 megabytes (three disk surfaces) or can be fully expanded to 23.75 megabytes per disk drive (five disk surfaces), depending on system requirements.

The disk is logically portioned into sectors, tracks, and cylinders. These terms are defined in the following paragraphs.

Significant 8409 disk subsystem addressing components are summarized in Table 1–1.

Table 1–1. 8409 Disk Subsystem Addressing Components

Bytes per sector	256
Sectors per track	32
Cylinders per drive (usable)	580
Recording heads per drive	1, 3, or 5
Drives per subsystem	1 or 2
Total usable tracks available per drive	
One disk (one surface)	580
Two disks (three surfaces)	1740
Three disks (five surfaces)	2900

1.2.1. Sectors

A sector, capable of storing up to 256 bytes of data, is the smallest addressable unit on a disk surface. In addition to the actual data storage area, each sector has an area reserved for data control (addressing).

1.2.2. Tracks

Each disk surface is logically divided into 601 (580 usable) circular storage tracks. Each track contains 32 sectors (0 through 31) (Figure 1–3). There are 21 alternate tracks reserved for replacing faulty tracks. Depending on the system configuration, 1, 3, or 5 recording surfaces may be available. Track 1 is at the same relative location on every recording surface. Track 1 on side 1, platter 1 is at the same relative location as track 1 on side 2, platter 1.

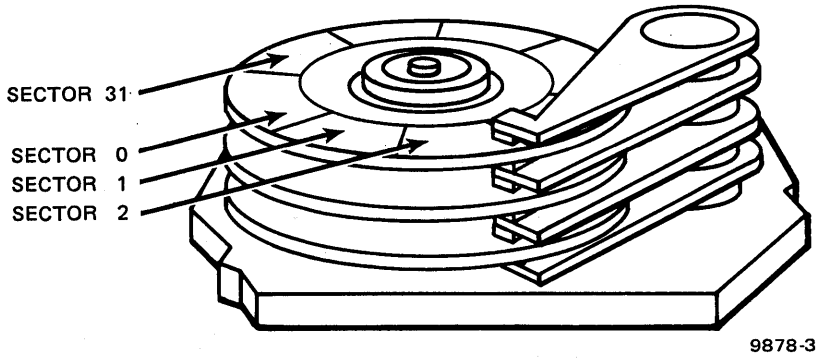

Figure 1–3. Disk Sector Format

1.2.3. Cylinders

A cylinder, for example cylinder number 1, includes all number 1 tracks (Figure 1–4). Cylinder 1 may contain 1, 3, or 5 tracks, depending on the number of recording surfaces in your system. There are 580 usable cylinders for each disk drive.

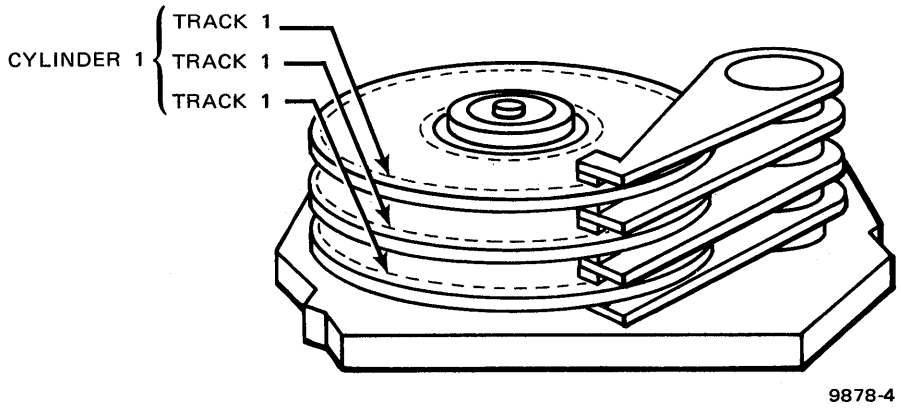

Figure 1–4. Disk Track and Cylinder Location

1.2.4. Recording Heads

The number of recording heads is equivalent to the number of disk surfaces available for general data storage. A disk drive may use 1, 3, or 5 heads. One additional head is used only for positioning information.

1.3. ADDITIONAL PUBLICATIONS

The 8409 disk subsystem may be used with a variety of Sperry terminals and systems. For specific information applicable to your terminal/system, consult the publications available for that terminal/system.

Additional publications that may aid you in learning more about the 8409 disk subsystem follow:

- SPERRY 8409 Disk Subsystem Unpacking Guide, UP-9879 (current version).
- SPERRY 8409 Disk Subsystem Installation and Operation Guide, UP-9880 (current version).
- SPERRY 8409 Disk Subsystem Deinstallation/Repacking Guide, UP-9881 (current version).

2. Equipment Characteristics

2.1. SYSTEM CONFIGURATIONS

The disk subsystem can be accessed for data storage or for data retrieval by the following Sperry terminal and communications devices:

- SPERRY Data Communications Processor/10 (DCP/10).
- SPERRY Data Communications Processor/20 (DCP/20).
- SPERRY Data Communications Processor/40 (DCP/40).
- SPERRY UTS 4000 Cluster Controller 4020 (UTS 4020).
- SPERRY UTS 4000 Cluster Controller 4040 (UTS 4040).

2.2. EQUIPMENT CONFIGURATIONS

The disk subsystem can be ordered with several variations in storage capacity and with power supplies and power cords to suit domestic or international conventions. Refer to the UTS 4000 peripheral ordering guide (current version) for feature numbers.

One or two disk drives may be ordered for a disk subsystem; each drive may be configured for 4.75, 14.25, or 23.75 megabytes of storage capacity, depending on system requirements.

An optional feature available with the 8409 disk subsystem is the dual controlling device interface. This feature provides an interface for a second controlling or communications device, allowing two devices (such as two cluster controllers) to share the disk surface.

2.3. CONTROLS AND INDICATORS

The controls and indicators for the disk subsystem are located on an inset panel (Figure 2–1) on the front of the cabinet. The indicators alert the operator to the device status, device selection, dc power, high temperature, and error conditions during operation of the disk subsystem.

2.3.1. POWER ON/OFF Switch

The POWER ON/OFF switch applies primary power to and removes primary power from the disk subsystem.

2.3.2. DC POWER Indicator

This green indicator lights when direct current is applied to the disk subsystem. If the indicator does not light, the power switch is either in the OFF position or the power supply is not operating properly.

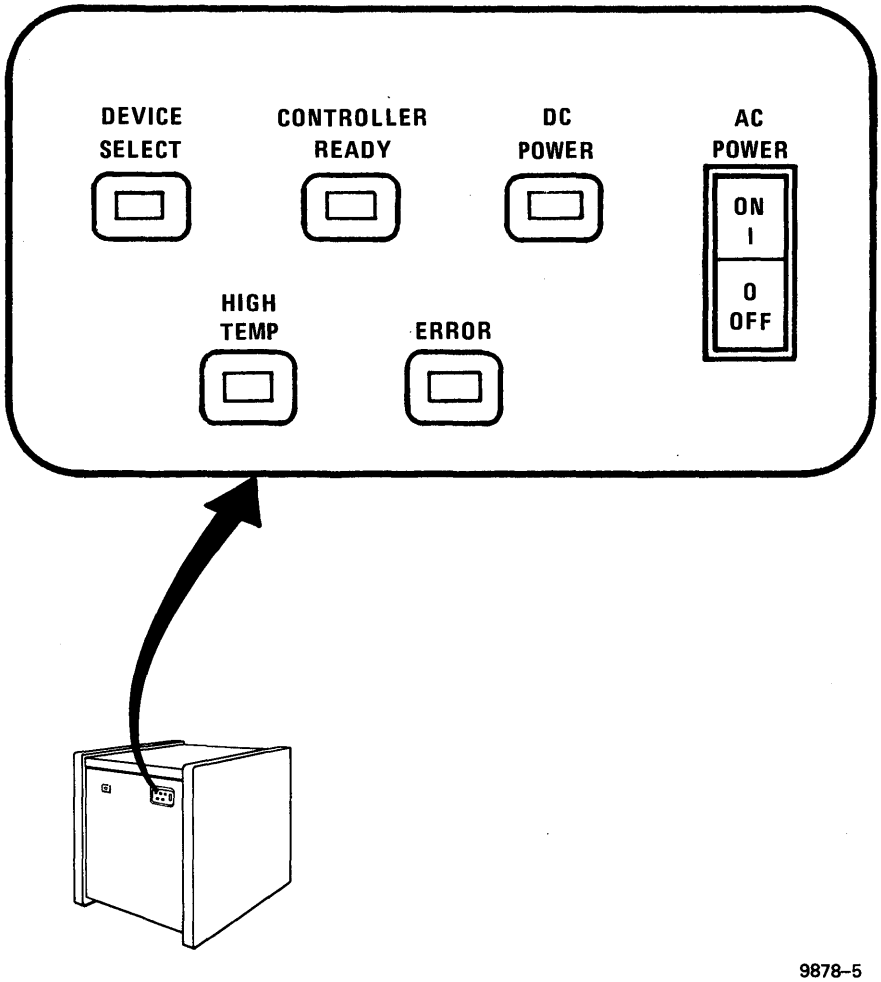

Figure 2–1. 8409 Disk Subsystem Front Panel Controls and Indicators

2.3.3. CONTROLLER READY Indicator

This green indicator lights following a successful power-on confidence (POC) test. The indicator does not light when the controller POC fails or when a controller error is detected during normal operation.

2.3.4. DEVICE SELECT Indicator

This green indicator blinks when the disk subsystem is active and is off when the system is idle.

2.3.5. HIGH TEMP Indicator

This red indicator lights when the disk subsystem internal temperature is approaching maximum level. The air filter should be checked to ensure proper air circulation within the disk subsystem.

CAUTION

When disk subsystem internal temperature approaches maximum level, reduce room air temperature and increase ventilation immediately.

2.3.6. ERROR Indicator

This red indicator lights and remains lit when there is an internal hardware error. The ERROR indicator blinks during the POC diagnostic test.

2.3.7. Additional Indicators

Additional error indicators can be viewed by removing the disk subsystem front panel. If the ERROR indicator lights, the user should remove the front panel and report to a Sperry customer service representative which of the following additional indicators are lit:

- A
- B
- SECOND I/F PCA
- DRIVE I/F PCA
- MASTER PCA
- DRIVE 1
- DRIVE 2

3. Status Reporting and Error Detection

3.1. ERROR DETECTION

After executing a command or upon detecting an error condition, the disk subsystem reports status to the controlling device. Each status message is reported through an 8-bit status byte. In addition, the controlling device can request a more detailed status report. The error status byte contains information regarding one of the following:

- Incorrect character parity in data or in command bytes.
- Invalid block error correction code (ECC) parity in data transferred to or from the disk subsystem.
- Invalid block ECC parity in file address or name.
- Invalid command.

An error condition is also reported when the disk subsystem is not physically operating because of mechanical or electronic failure or when the disk subsystem is not turned on.

3.2. ERROR RECOVERY

The 8409 disk subsystem controller attempts ECC (error correction code) error recovery during search and read operations. Other error recovery procedures can be generated through a user program.

3.3. OPERATOR TRAINING

Virtually no training is necessary to operate the disk subsystem since the disks are nonremovable and the device contains only one control (ON/OFF switch). The disk subsystem indicators should be monitored during the POC test and occasionally observed during operation.

4. Maintenance

The 8409 disk subsystem is essentially a maintenence-free device. Since the disks are fixed (nonremovable), they require no special care. However, operators should observe the disk subsystem periodically, to ensure proper operation.

Periodic cleaning of the air filter is normally the only maintenance task required for operation of the disk subsystem after it has been properly installed. (Detailed instructions for removing and cleaning the air filter are contained in the current version of the 8409 installation/operation guide, UP-9880.)

Standard office environmental conditions (proper air temperature and humidity levels) should be maintained at all times. Care should be taken to avoid placing office equipment or furniture which might prevent proper air circulation near the disk subsystem.

5. Specifications

The disk subsystem is designed to operate in a typical business environment. Physical, electrical, environmental, and technical specifications are listed in the following paragraphs.

5.1. PHYSICAL CHARACTERISTICS

Width	58.42 centimeters (23 inches)
Height	73.66 centimeters (29 inches)
Depth	78.74 centimeters (31 inches)
Weight	
1 disk drive	297 kilograms (135 pounds)
2 disk drives	343.2 kilograms (156 pounds)

5.2. ELECTRICAL SPECIFICATIONS

Line Voltage	
–00	104 to 120 volts ac (+6 percent, –15 percent)
–01	208 to 240 volts ac (+6 percent, –15 percent)
Phase	Single
Frequency	50 or 60 Hertz (±2 percent)
Wattage	
1 drive	250 watts
2 drives	330 watts
Heat dissipation	
1 drive	854 British thermal units/hour (901 kilojoules/hour)
2 drives	1127 British thermal units/hour (1189 kilojoules/hour)

5.3. ENVIRONMENTAL REQUIREMENTS

Temperature range	
Minimum	10 degrees Celsius (50 degrees Fahrenheit) Humidity at 20 to 85 percent
Maximum	34 degrees Celsius (93 degrees Fahrenheit) Humidity at 20 to 85 percent
Shipping and storage	
Up to 72 hours	–40 to 62 degrees Celsius (–40 to 144 degrees Fahrenheit) Humidity at 10 to 85 percent
Up to 6 months	–22 to 47 degrees Celsius (–8 to 117 degrees Fahrenheit) Humidity at 10 to 85 percent

5.4. OPERATING CHARACTERISTICS

Rotational speed	3600 revolutions per minute (±0.5 percent)
Average latency	8.33 milliseconds
Maximum latency	16.66 milliseconds
Byte size	8 bits per byte
Disk format	200-millimeter diameter, oxide coated
Total number of tracks	601 (each side)
Usable number of tracks	580 (each side)
Bit density (inside track)	8623 bits per inch
Sectors per track	32 (each side)
Bytes per sector	256

Interface	Transfers 8-bit (plus parity) data, command, and status signals
Command functions	Extended command (read, write, search)
	Reserve command
	Continue
	Release command
	Assume mode 2
	Send status
	Send past status
	Read status block
	Loop B

SPERRY

Terminals announcement

AB 009

8409 DISK SUBSYSTEM

INTRODUCTION

The 8409 Disk Subsystem is based on technology commonly referred to as Winchester technology. It is provided as a peripheral subsystem for the UTS 4020 and UTS 4040 (and DCP products too) offering a competitive mass storage device for our Cluster Controller products.

Each 8409 Disk Subsystem can control two disk drives and connects to the Cluster Controllers via the 8-Bit Interface. The disk drives are offered in three capacities: 23.75MB, 14.25MB and 4.75MB.

The 8409 Disk Subsystem will be only supported by the SCS-DDP 4000 controlling software.

AVAILABILITY

First Customer Delivery is scheduled for April, 1984.

DETAILS

Hardware Characteristics - The 8409 Disk Subsystem is a microprocessor based product, operating under control of the resident firmware. The 8409 consists of a floor model cabinet, disk control logic, power supply, control panel and housing for two drives. Disk drives of different capacities can be used in the same cabinet.

The disk drive uses non-removable medium. The disk uses a single head/disk assembly (HDA). Disk latency is an average of 8.33ms and a maximum of 16.67ms, with access times of: 12ms minimum, 45ms average and 85ms maximum. The data transfer rate is 625 kilobytes per second.

Housed in one cabinet, the maximum storage capacity for one subsystem will be two disk drives at 23.75MB each for a total capacity of 47.5MB.

Software Control - The controlling software for the 8409 Disk Subsystem will be part of the SCS-DDP 4000 operating system. Designed to take full advantage of the larger capacities and faster access offered by the 8409, the controlling software will support an Indexed Sequential Access Method (ISAM), as well as traditional access methods such as direct and sequential.

So that storage media will be used most efficiently, the controlling software will not use the Tape Cassette (TCS) format used previously on tape cassettes and diskettes.

BENEFITS

Economic Benefit - More storage capacity, accessed faster, with lower price on a price per capacity basis. More for less!

Application Benefit - Programs requiring large amounts of mass storage and fast access can now be executed on the cluster controllers. Better utilization of resources saves money - speeds processing time.

Operation Benefit - No need to rely on central site when big mass storage is required. Less dependency on central site resources.