9895A Flexible Disc User's Manual

HEWLETT PACKARD

9895A Flexible Disc
Memory User's Manual
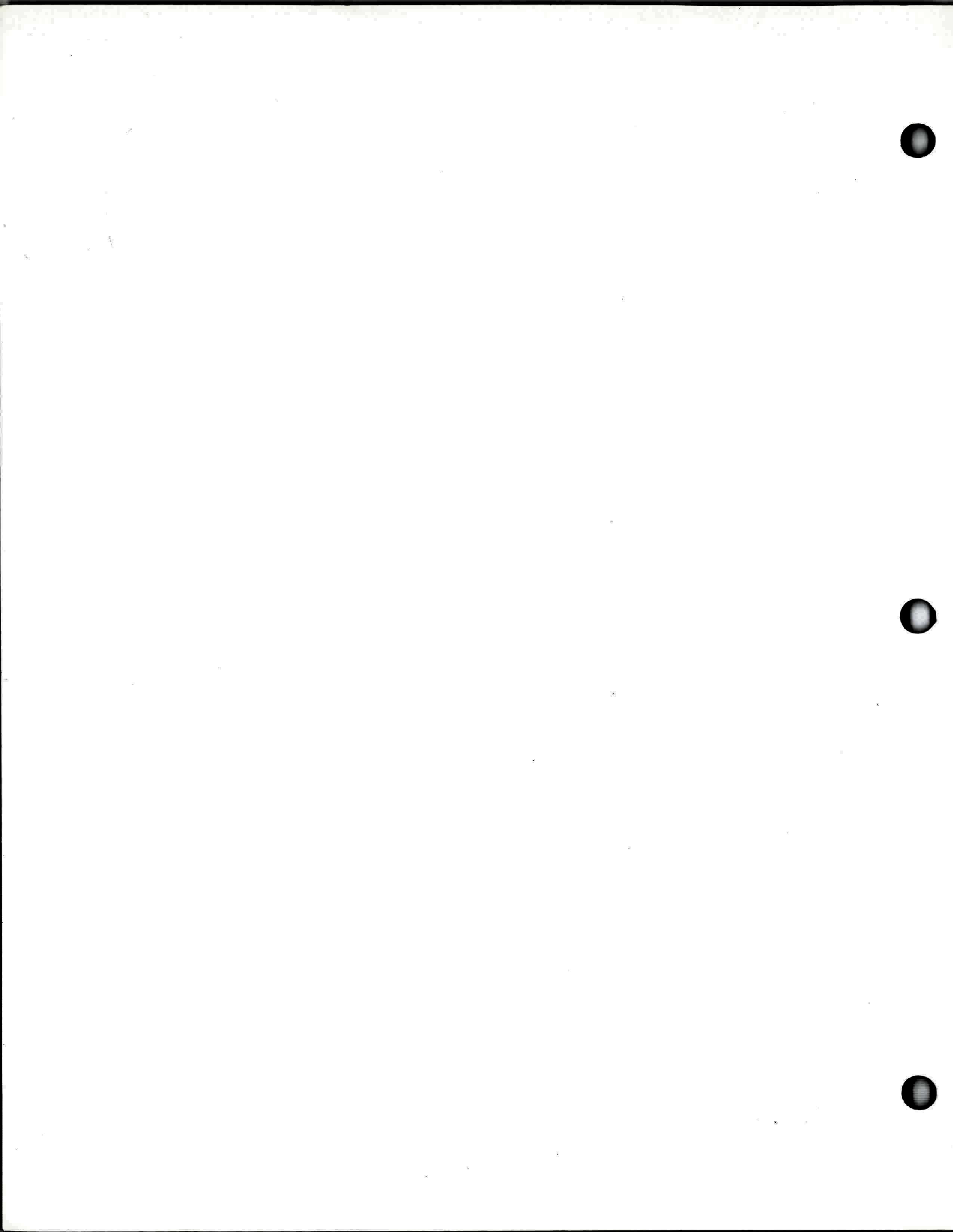
Table of Contents

Chapter 1

Introduction

General Description

The HP 9895A Disc Memory is a random-access data storage device utilizing a standard flexible disc medium. Option 010 contains one flexible disc drive. When no option is specified the 9895A contains two disc drives. Either disc memory is capable of controlling one additional 9895A memory.

The disc memory is connected to a controlling device via the HP Interface Bus (HP-IB) system.[1] Many HP computers provide a high-level language subsystem to control the disc memory. After installing and testing the disc memory as described in this manual, refer to the computer's disc programming or subsystem reference manual for details on controlling the disc memory. The specifiers used to refer to the 9895A in several systems are listed in the table below.

System Controller	9895A Identifier (with Default Parameters)	
HP 85	D700	Note: there are no commas in the HP 85 specifier. D is used for all discs, and the HP 85 automatically determines the type of disc being used.
HP-9835	H7,0,0	
HP 9845	H7,0,0	

For information on operating a 9895 with a 1000 series system, consult the 1000 series documentation. The 98228A Mass Storage ROM Manual for the 9825T describes the disc access commands to use the 9895.

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[1] The HP-IB is Hewlett-Packard's implementation of IEEE standard 488-1978.

Technical Specifications

Except where noted, all specifications apply to either 9895A or a 9895A Opt. 010.

	9895A Opt. 010	9895A
Number of Drives	1	2
Formatted Storage Capacities:		
HP (double-sided, double density)	1.18 Mbytes	2.36 Mbytes
*IBM (single-sided single density)	256 Kbytes	512 Kbytes
Interface	HP-IB	
Average Access Time	174 msec	
Maximum Access Time	410 msec	
Data Transfer Rates:		
HP format:		
Read Burst	190 kbytes/sec	
Write Burst	190 kbytes/sec	
Buffered[1]	23 kbytes/sec avg.	
IBM format:[2]		
Buffered[1]	10 kbytes/sec avg.	
Rotational Speed	360 RPM ± 3.5%	
Power Source Requirements	100 Vac 120 Vac 220 Vac 240 Vac } ± 10%	
Line Frequency	50 Hz 60 Hz } ± 2%	
Environmental Specs:		
Operating Temperature	10°C to 40°C (50°F to 104°F)	
Relative Humidity	20% to 80% with maximum wet bulb temperature not to exceed (non-condensing) 25.5°C (77.9°F)	
Operating Altitude	0 m to 4572 m (0 ft to 15,000 ft)	
Storage Temperature	−40°C to 60°C (−40°F to 140°F)	
Storage Altitude	−304.8 m to 15,240 m (−1000 ft. to 50,000 ft)	

9895 Current Requirements

(In Milliamps)

Voltage Switch Setting	9895A (Dual Drive Master)		9895A Opt. 012 (Dual Drive Slave)		9895A Opt. 010 (Single Drive Master)		9895A Opt. 011 (Single Drive Slave)	
	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
100 Vac	2080	1880	1800	1620	1400	1260	1090	980
120 Vac	1730	1580	1480	1360	1160	1060	890	820
220 Vac	920	870	800	750	600	570	470	440
240 Vac	800	770	680	650	530	510	400	380

1 Interleave parameter dependent - best case every other sector.

2 Since tolerances on IBM 3740 compatible media are not fully specified by vendors and do vary, HP can't guarantee that IBM 3740 media can be read by the 9895 in every case.

Accessories

The following accessories are supplied with each disc memory.

Description	Quantity	HP Part Number
Slave Cable	1 (option 011 and 012 only)	09895-61606
Power Cord	1	(see page 11)
Flexible Disc	1	(see below)
User's Manual	1	09895-90000
Drive Protector	2	09895-90010

A package of 10 double-sided, double-density discs can be ordered under part number 92195A.

Disc Memory Options

The disc memory can be ordered with any of the following options. To upgrade an existing disc memory, specify the corresponding field installation kit or accessory described in the next section.

Option 001 — 50 Hz Option — The Disc Memory is set up for operation on 50 Hz Line Frequency.

Option 002 — Rack Mount Option — The Disc Memory is equipped for mounting in a 19 inch Instrument Cabinet. (For use with HP rack system also order 30 inch racking support rails — part number 12679B)

Option 010 (Single Drive with Control Board) — Deletes one drive from the 9895A assembly.

Option 011 (Single Drive Slave) — Deletes the controller board and one drive for the 9895A assembly.

Option 012 (Dual Drive Slave) — Deletes the controller board from the 9895A assembly.

Field Kits and Accessories

The following kits are available to convert an existing disc memory. Each must be installed by qualified technical personnel such as an HP Customer Engineer.

HP 9895A Drive Accessory (98952A) — Provides an additional drive and the hardware to convert a 9895A Option 010 to a full 9895A or an Option 011 to Option 012.

HP 98951A Controller Accessory (98951A) — Provides the hardware to convert a slave drive (Option 011 or 012) to a master.

Rack Mount Kit (09895-88022) — Provides the hardware for mounting a disc memory in a 19-inch instrument cabinet. (For use with HP rack system also order 30 inch racking support rails — part number 12679B)

Flexible Disc Media

The storage medium used in the HP 9895A is a flexible disc, commonly called a diskette. The flexible disc is 200mm (7.9 inches) in diameter and has a 38mm (1.5 inch) hole for alignment on the disc drive spindle. The disc is enclosed in a protective plastic jacket with a slot for head access to the recording surface. Both sides of the flexible disc are used for data storage.

By using flexible discs identified as "double-sided", up to 1.2 megabytes of data can be stored on each disc. Double-sided, double-density discs (HP part number 92195A, package of ten) are available from HP's computer supplies catalog. Phone orders may be placed by calling the toll free order number 800-538-8787. The disc memory can also handle single-sided flexible discs, allowing slightly over ¼ megabytes of storage using single density recording and ½ megabytes using double-density recording. Since some storage is used in subsystem overhead, the exact amount available for user storage depends upon the controller subsystem. Refer to the appropriate mainframe programming or reference manual for details.

Each flexible disc must be initialized before it can be used for data storage. The initialization procedure marks each disc track, checks for defective tracks, and may establish file directories. Refer to the mainframe programming or reference manual for the correct procedure.

CAUTION

USE ONLY HP APPROVED MEDIA SINCE THE USE OF NON-APPROVED MEDIA CAN RESULT IN PREMATURE DISC FAILURE OR DAMAGE TO THE 9895A. (CONTACT YOU LOCAL HP SALES AND SERVICE OFFICE FOR A LIST OF APPROVED MEDIA.)

USING NON-HP APPROVED MEDIA FOR ONE TIME ONLY APPLICATIONS SUCH AS DATA INTERCHANGE WILL NOT DAMAGE THE DRIVE OR DESTROY THE MEDIA, BUT IF EXTENDED USAGE IS ANTICIPATED, THE DATA SHOULD BE TRANSFERRED TO MEDIA APPROVED FOR THE 9895A.

For your convenience, HP offers a package of 10 discs for the 9895 (HP part number 92195A).

Operating Cleanliness

To prevent potential damage or data loss, it's extremely important to maintain the cleanliness of the disc and air within the disc drive. The disc drive should not be operated in an environment in which dust, smoke, moisture, oil or chemical vapor, or other foreign matter are present. Also, be sure to strictly follow the disc handling guidelines.

The critical elements involved in the read/write process are shown below. The read/write heads must maintain contact with the disc during read and write operations. Also shown are various types of contaminants and their size relationships. A contaminant particle hard enough and of the right size may scratch either the oxide coating or the head surface. Even if not hard enough to scratch, it may be large enough to lift the head from the surface, causing data errors.
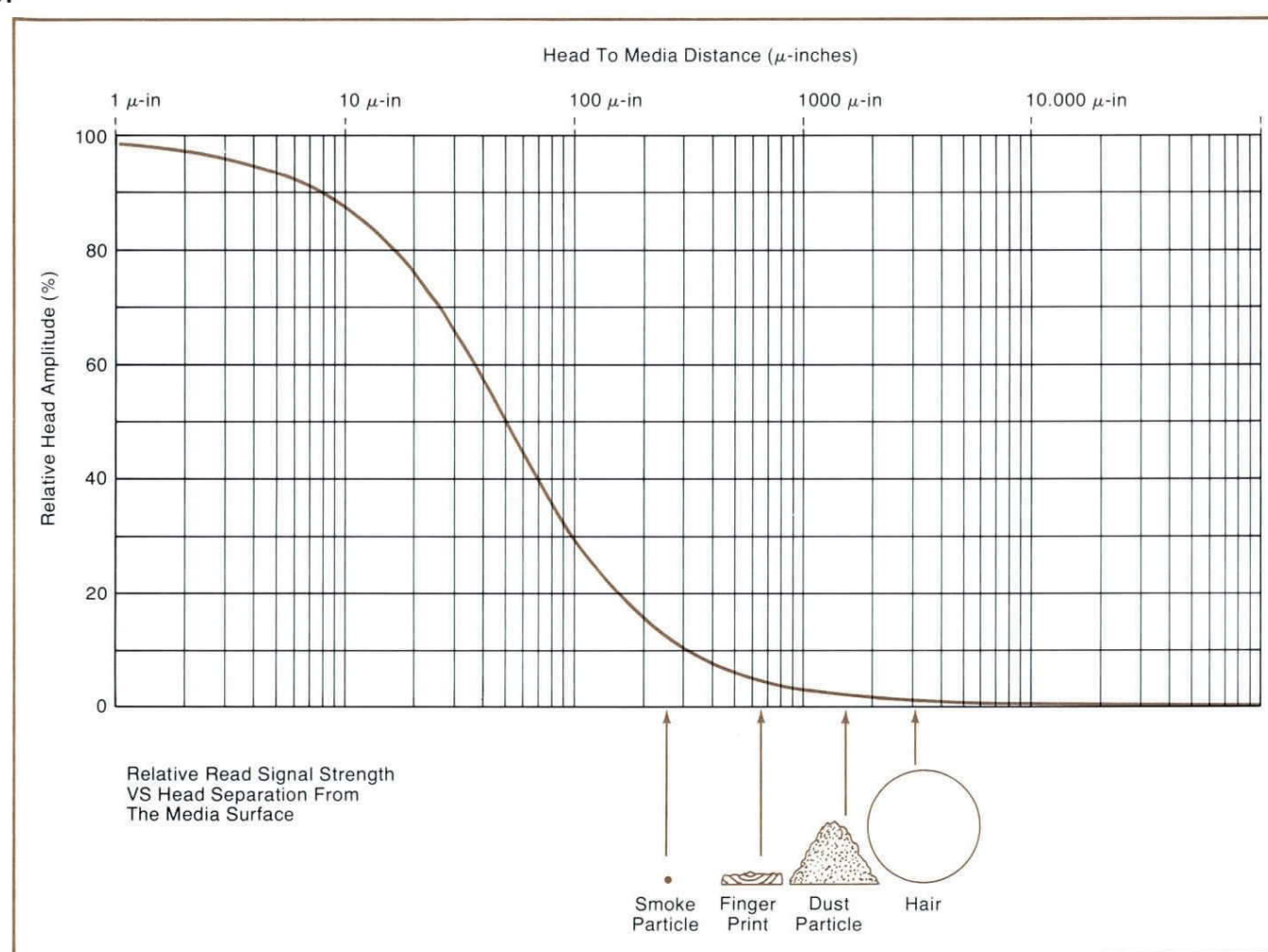
Head/Media Critical Requirements

Data integrity cannot be assured with relative head amplitudes below 50%.

Handling Discs

The flexible disc is basically maintenance free, but it is delicate and MUST BE HANDLED CAREFULLY. Remember, the disc contains your valuable data and programs and should be treated accordingly. A good rule of thumb is to treat your disc as you would a valuable record album. Here are some specific Do's and Don'ts to avoid loss of data or damage to your discs.

EVEN A LITTLE CARELESSNESS IN DISC HANDLING CAN DRAMATICALY REDUCE THE LIFE OF THE DISC.

DO

## Backup Discs Frequently

There is always a chance of losing data when mass storage devices are accessed. There are many causes in any computer system — a programming bug, operator error, power failure, or hardware failure. In the case of flexible discs, another mode is possible — media failure from contamination or wearout. YOUR ONLY PROTECTION AGAINST DATA LOSS IS FREQUENT BACKUP OF YOUR FILES.

DO

## Return Disc To Storage Envelope When Not In Use
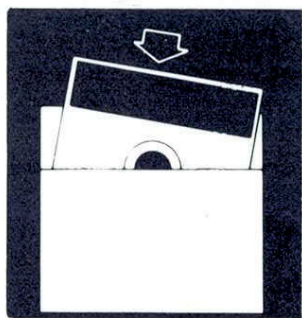
This is the single most important thing to remember about handling your disc because it prolongs disc life by protecting it from dust and scratches. Between uses discs should be stored upright in a dust free container. The box the discs are shipped in, or a similar container, is a good choice.

Operate Your System In A Clean Environment
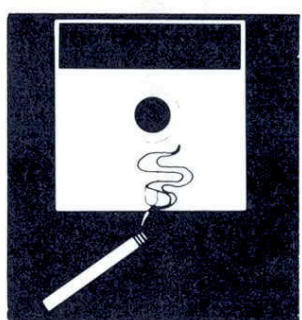
Airborne contaminates and particles accidently dropped onto the disc will cause your disc to wear out prematurely and may cause unreliable data storage and retrieval operations. Some of the most common contaminates are DUST, SMOKE, ASHES, ERASER CRUMBS, and BREADCRUMBS. Chemical vapors may also cause premature wearout.

Maintain Proper Temperature And Humidity
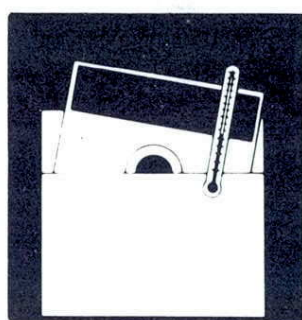
The proper operating range is 10 C (50 F) to 40 C (104 F) and 20% to 80% relative humidity. While temperature is usually easy to control, it may be necessary to make special provisions to keep the humidity in the proper range. Although the disc will continue to operate outside the normal humidity range, it will wear out more quickly and will have a higher error rate.

Avoid Magnetic Fields

Since the data is stored as a pattern of magnetic fields on the disc, it can be erased by an external magnetic field. Avoid placing a disc near power transformers, magnets or large disc memories. Additionally, while HP goes to great lengths to confine the magnetic fields produced by it's CRT deflection shields (so well that some of our disc drives are mounted in the same cabinet as the display) CRT's with magnetic deflection systems have been known to wipe out discs, and it is a good idea to avoid placing discs on top of CRT's.

Remove Disc From Drive When Not In Use
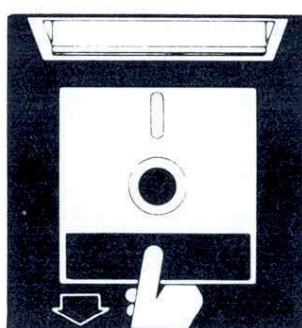
Remove the disc completely from the drive when access is not needed for an extended period of time. The disc continues to rotate as long as it is in a drive which is turned on, even if it is not accessed. This rotation will eventually wear the disc out over long periods of time.

Use A Felt Tip Pen To Label Your Disc
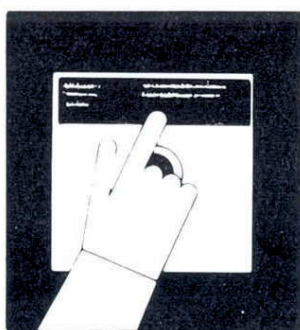
Use a soft felt tip pen to label your disc, and be careful to write only in the label area. Avoid the exposed media while labeling the disc. If possible, write on the large labels provided BEFORE applying them to the disc.

Replace Discs Frequently

Although discs are designed to provide several million revolutions of useful life, they will eventually wear out. The life of a disc is VERY dependent on how carefully it is handled and how much it is used. A disc used sparingly (less then 20 minutes a day) should last over a year. A disc that is used heavily (more than 2 hours a day) should not be expected to last more than 3 months. To be safe, you should copy your data to a new disc and discard the old disc every 3 months for a heavily used disc or at least once a year, even for lightly used discs. If you ever see visible signs of abrasion on the disc, do an immediate backup and discard the worn disc.

DON'T

Do Not Touch The Surface Of The Disc

The thickness of a fingerprint is enough to lift the head off the disc and cause errors (See figure on page 9). The oils in a fingerprint will also collect dust which can cause a disc to wear out sooner than it normally would.

Do Not Bend or Fold the Disc
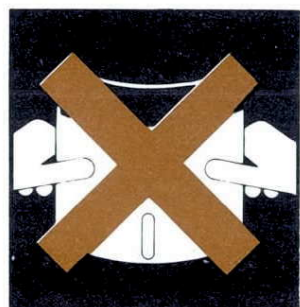
The disc is flexible but will not operate if it is creased. Using ball point pens, rubber bands, paper clips, etc. can crease the disc.

Do Not Try To Clean A Disc

The inside surface of the disc jacket is covered with a special material that cleans the disc as it rotates. Any other method of cleaning may cause solvent damage to the media or scratch the disc, causing loss of data. If a disc becomes dirty or scratched, immediately transfer the data to a new disc and dispose of the old disc.

CAUTION
IF YOU EVER DESTROY MEDIA (IF IT LOOKS ANYTHING
LIKE THE PHOTO BELOW) IN YOUR 9895 STOP USING THE
DRIVE UNTIL IT CAN BE SERVICED. THIS IS EXCEPTIONALY
IMPORTANT, AS CONTINUED USE OF THE DRIVE WILL DE-
STROY MORE MEDIA. IMMEDIATELY CALL YOUR NEAREST
HP SALES AND SERVICE OFFICE (SEE THE LIST IN THE
BACK OF THIS MANUAl FOR THE NEAREST OFFICE.)
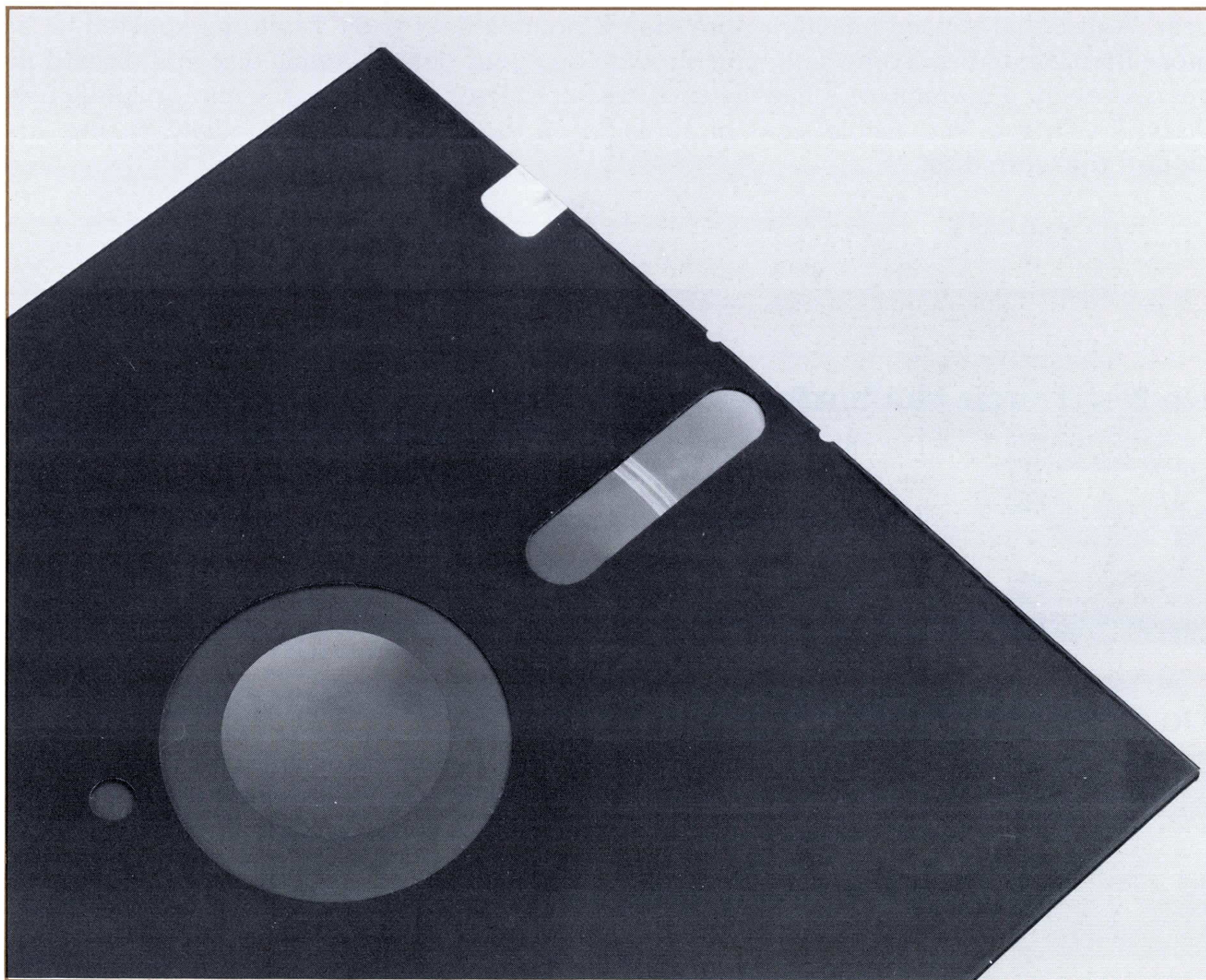
Chapter 2
Installation

Unpacking and Inspection

Your 9895A Disc Memory was carefully inspected, both electrically and mechanically, before shipment. It should be free of scratches and in perfect electrical order upon receipt. Carefully inspect the memory for any physical damage caused in transit. Notify HP and file a claim with the carrier if there is any damage.

Please check to ensure that you have received all of the items which you ordered and that any options specified on your order have been installed. Refer to the Standard Accessories list and Options described on the previous pages.

If you have any difficulties with your system, if it is not operating properly, or if any items are missing, please contact your nearest HP Sales and Service Office; addresses are supplied at the back of this manual.

Moving the Disc Memory

If the disc memory must be moved to a new location, be sure to handle it with care:

- Insert a Drive Protector Card or a scratch disc in each drive and close the door to prevent the read / write heads from contacting each other.
- Be careful when picking up and setting down the disc memory.
- Repack the disc memory in its original shipping carton before transporting it to another site.

CAUTION
THE DISC MEMORY IS A PRECISION INSTRUMENT. A SUDDEN JAR COULD MISALIGN THE READ / WRITE HEADS, RESULTING IN READ ERRORS AND / OR DAMAGED DISCS.

Master/Slave Connector   Line Switch   Fuse

HP-IB Connector   Line Frequency
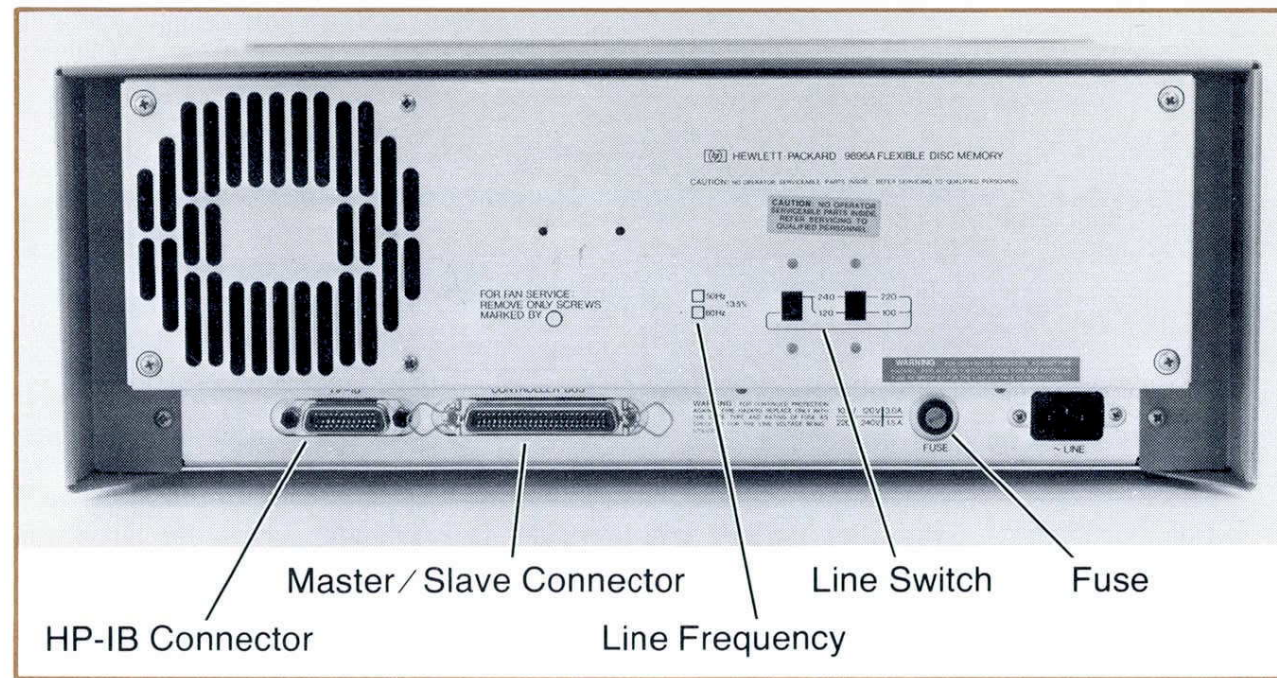
Power Connections

Power Requirements

The disc memory has the following power requirements:

- **Line Voltage:** The disc memory operates from nominal powerline voltages of 100, 120, 220 and 240 Vac. The range of operation is from ±10% of each nominal voltage.

- **Line Frequency:** The disc memory may be modified internally for operation on nominal 50Hz and 60Hz line frequency.

- **Power Consumption:** The disc memory requires a maximum of 180 watts.

The disc memory should already be set to operate on the power line voltage in your area. The setting is indicated on the rear panel (see below). If it is not correct for your local power system, set it according to the switch diagram below. If it is not set for the correct line frequency, as indicated on the rear panel, contact your nearest HP Sales and Service Office, addresses are provided in the back of this manual.


240V   **220V**   **120V**   **100V**
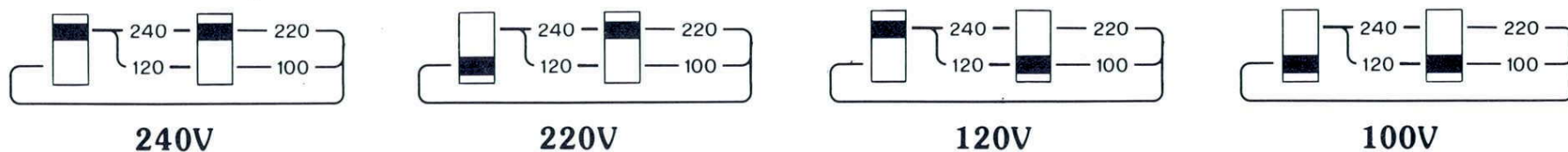
Fuses

Always be sure that the correct fuse is installed. Failure to follow this precaution may result in damage to the disc memory. A different fuse is required for each of the two voltage ranges of 100-120 Vac and 220-240 Vac. Be sure that the fuse on the rear panel is the proper type and rating, as shown below.

Voltage Setting	Fuse Rating	HP Part No.
100,120	3.0 amp (NB)	2110-0003
220,240	1.5 amp (NB)	2110-0043

WARNING
ALWAYS DISCONNECT THE DISC MEMORY FROM ANY AC POWER SOURCE BEFORE CHANGING FUSES.

Power Cords

Power cords with different plugs are available for the equipment; the part number of each cord is shown below. The cord packaged with the equipment depends upon where the equipment is to be delivered. If your equipment has the wrong power cord for your area, please contact your local HP Sales and Service Office.

8120-1351   8120-1369   8120-1689   POWER-INPUT SOCKET

8120-1378 [1]   8120-0698 [2]   8120-2104

L = Line or Active Conductor (also called "live" or "hot")
N = Neutral or Identified Conductor
E = Earth or Safety Ground

[1]UL and CSA approved for use in the United States of America and Canada with equipment set for either 100 or 120 Vac operation.

[2]UL and CSA approved for use in the United States of America and Canada with equipment set for either 200 or 240 Vac operation.

Available Power Cords

WARNING
IF IT IS NECESSARY TO REPLACE THE POWER CORD, THE REPLACEMENT CORD MUST HAVE THE SAME POLARITY AS THE ORIGINAL. OTHERWISE A SAFETY HAZARD MIGHT EXIST IF AN INTERNAL FAILURE OCCURS.

Interface Connections

The disc memory is connected to the controller via an HP-IB Interface Card. The HP-IB cable supplied is connected to the disc memory. Be sure to follow HP-IB cabling guidelines when connecting the system, as described in the interface manual supplied with the controlling device.

To connect a slave disc memory (Option 011 or 012) to the master disc memory, connect the 09895-61606 interface cable supplied with the slave to each disc memory.

NOTE
The HP-IB connector on the slave drive is not usable.

Device Address

Each device in an HP-IB system must be set to a unique device address. The disc memory can be set to any one of eight addresses, ranging from decimal values 0 thru 7. The address is selected via a switch located under the front panel. The switch is preset to device address 0 at the factory. The front cover is removed by pulling out on the lower outside corner of each drive access opening.

Unit Code

Each disc memory controller can handle up to four drives in two disc memories. Since all drives respond to the same device address, each must be set to a unique unit code. The unit codes are factory set to 0 and 1 for a Master Unit and 2 and 3 for a Slave Unit. The unit code is affixed to the front panel under its respective drive.
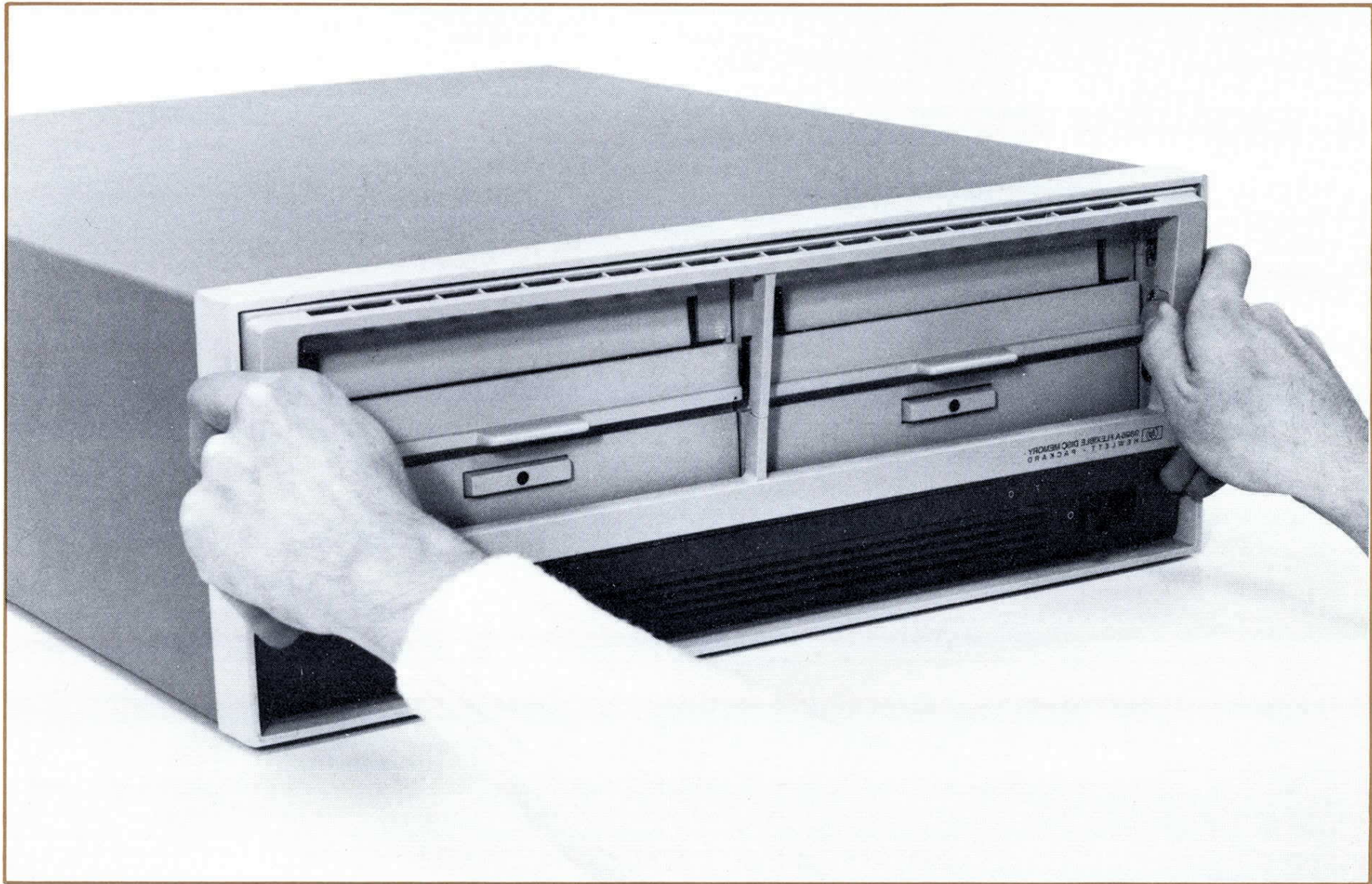
Removing Front Panel

Device Address Switch
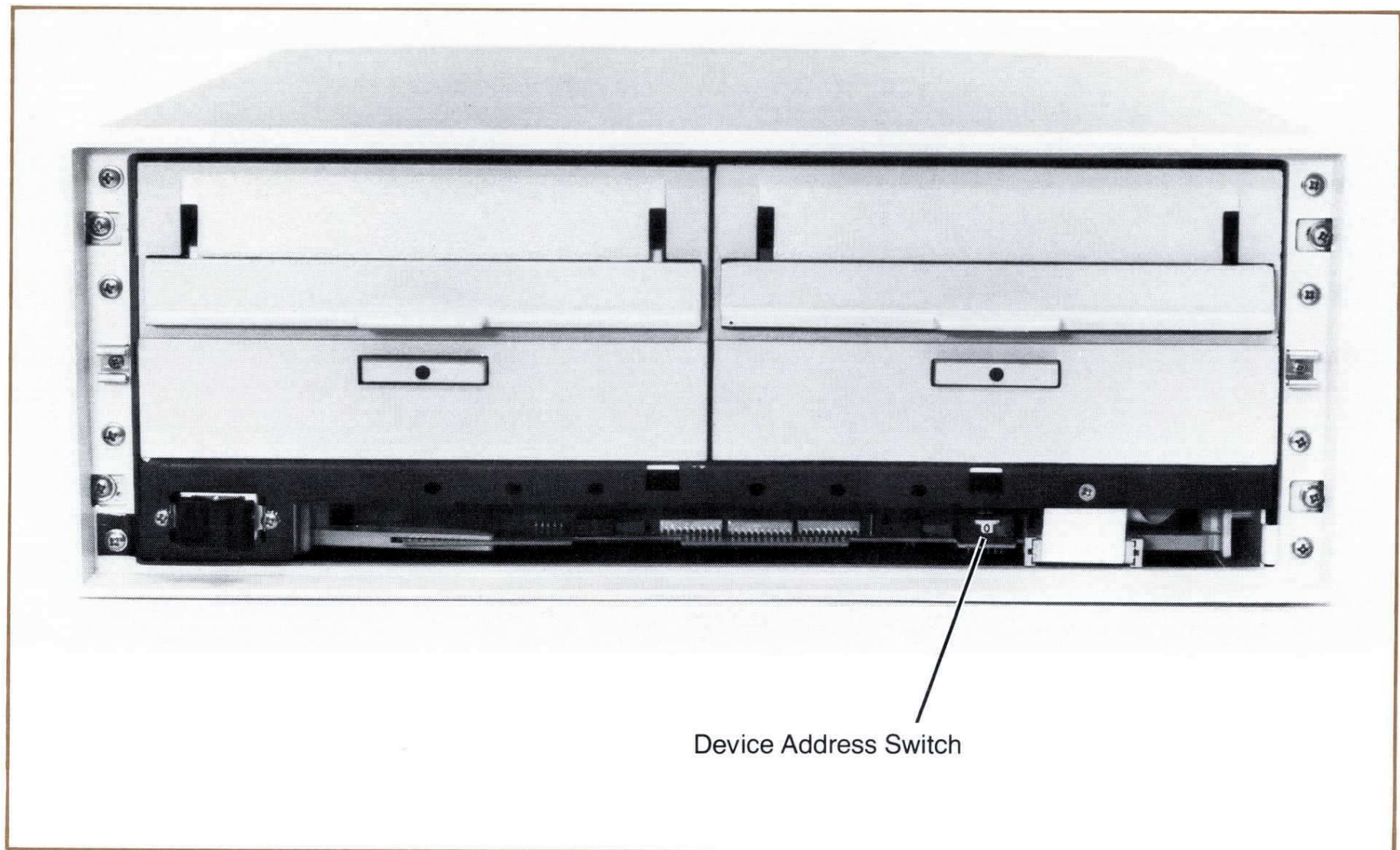
Device Address

Power On and Testing

Once the power and interface connections are complete, switch the disc memory on using the power switch at the left. All HP-IB devices in the system must be switched on before the system can operate. You will hear drive access sounds from the memory. This is part of the self test. The disc memory automatically performs a self test on each drive at power-up. Self tests can also be run manually, as described in Chapter 4.
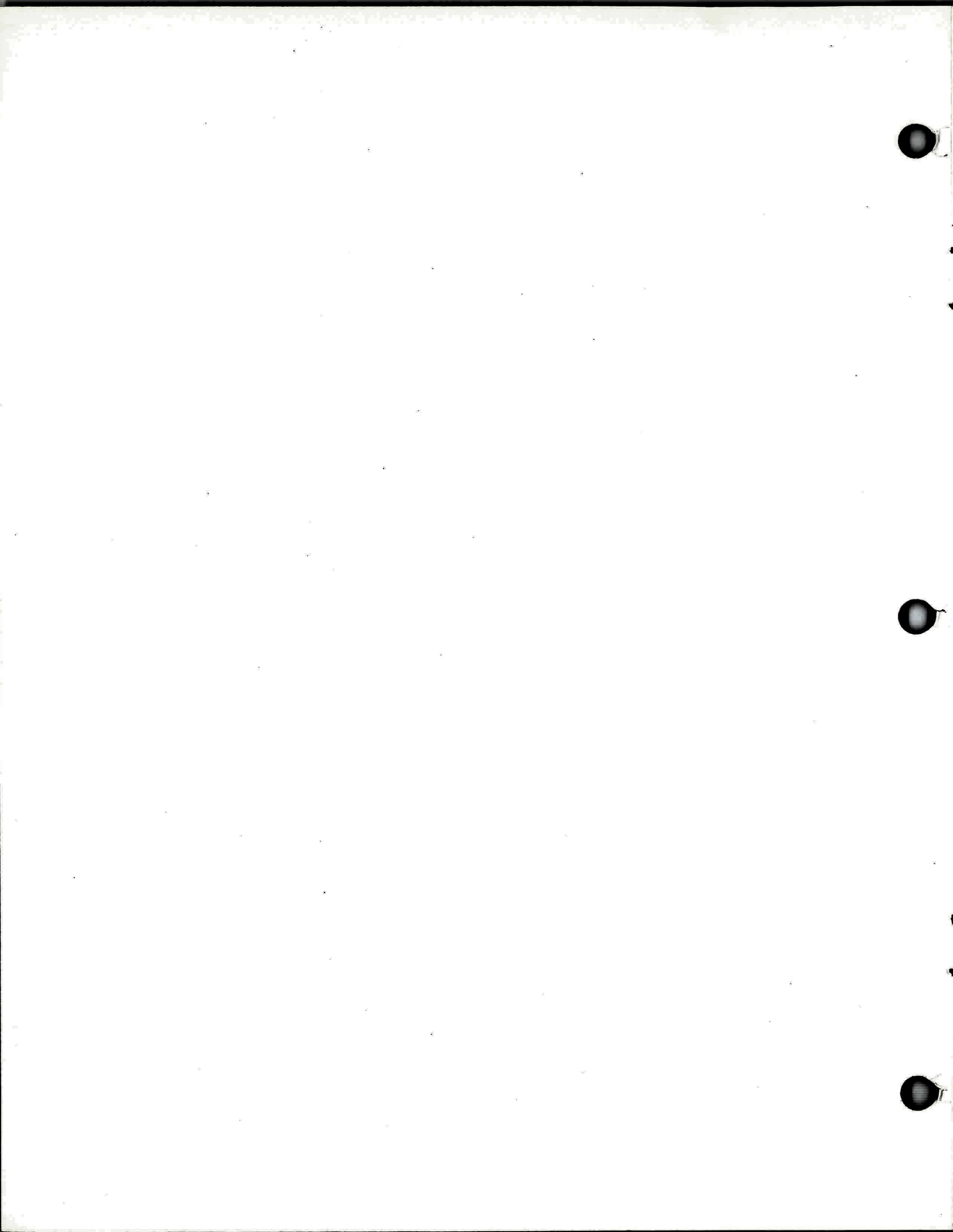
Chapter 3
Operation

This chapter shows how to handle flexible discs and provides a brief overview of disc structure for the programmer. Since each disc drive is completely controlled by the computer, refer to your computer's programming or subsystem reference manual for details on its disc-control language.

Front Panel Controls

Be sure that each disc drive in the system is switched on before running a program. There is no warm-up period.

There is an indicator on the disc eject button. The light being on indicates that the heads are loaded and the door is locked.

Front Panel Controls

Disc Installation

For your convenience, HP offers a package of 10 discs for the 9895 under part number 92195A.

Follow these steps to install a disc:

1. Open the door of the drive by pushing in on the small button on the front of the drive (below the door).
2. Remove the disc from its protective envelope and carefully slide it into the drive, label-side up and nearest you, until you hear a click.
3. Close the door by pressing down firmly on the bar until the door locks. The disc can be installed with power on without harming the disc.
4. Remove the disc by pressing the button on the front of the drive. Always remove each disc and store it in the protective envelope to ensure prolonged disc life.

Write Protection

Data and programs stored on a flexible disc can be protected from being written over. The disc is "write-protected" by uncovering a notch in the sealed protective jacket. When the notch is covered, as shown below, writing is allowed. HP discs are supplied with the notch covered, enabling you to write on the disc. Any opaque tape, can also be used. **Remember, fingerprints can be disastrous to your data, so be careful not to touch the surface of the disc.**

WRITE
PROTECT NOTCH

TAB

FOLD OVER TO
BACK OF DISC
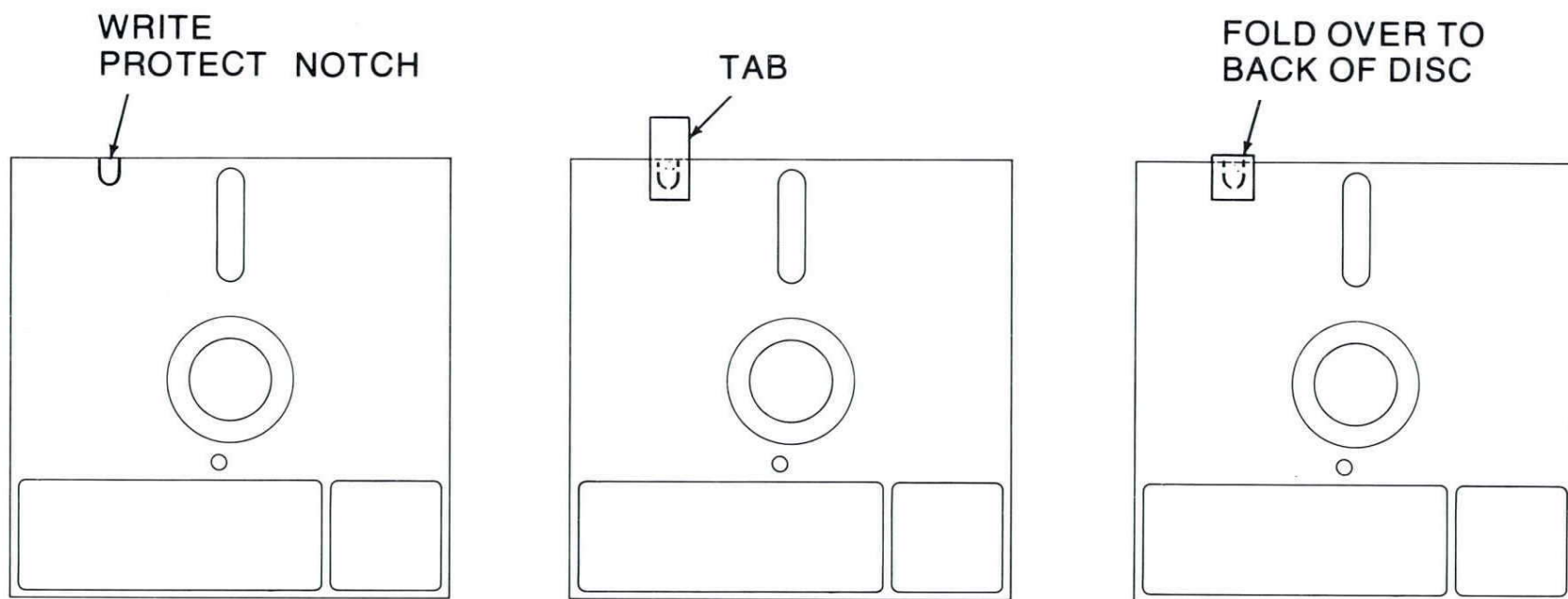
Disc Structure

The flexible disc is a circle of plastic 200 mm (7.9 inches) in diameter, enclosed in a sealed black plastic jacket. Bonded into the surface of the disc is a ferromagnetic iron oxide with characteristics similar to magnetic tape. Data is stored in the form of binary digits represented by magnetized spots on the disc. Information is stored and retrieved by read/write heads that come in contact with the disc's upper and lower surfaces.

Data is stored in concentric tracks on each side of the disc. Each disc has 77 circular tracks, numbered 0 thru 76. Each track is subdivided into either 30 sectors using HP format or 26 sectors using IBM format. Each sector contains either 256 bytes of data using HP format or 128 bytes using IBM format. The data contained in one sector is the smallest amount of information that can be written at a time. The disc is soft sectored, that is, there is no hardware indication of where each sector starts. Instead, the beginning of each sector is indicated by information recorded on the disc.
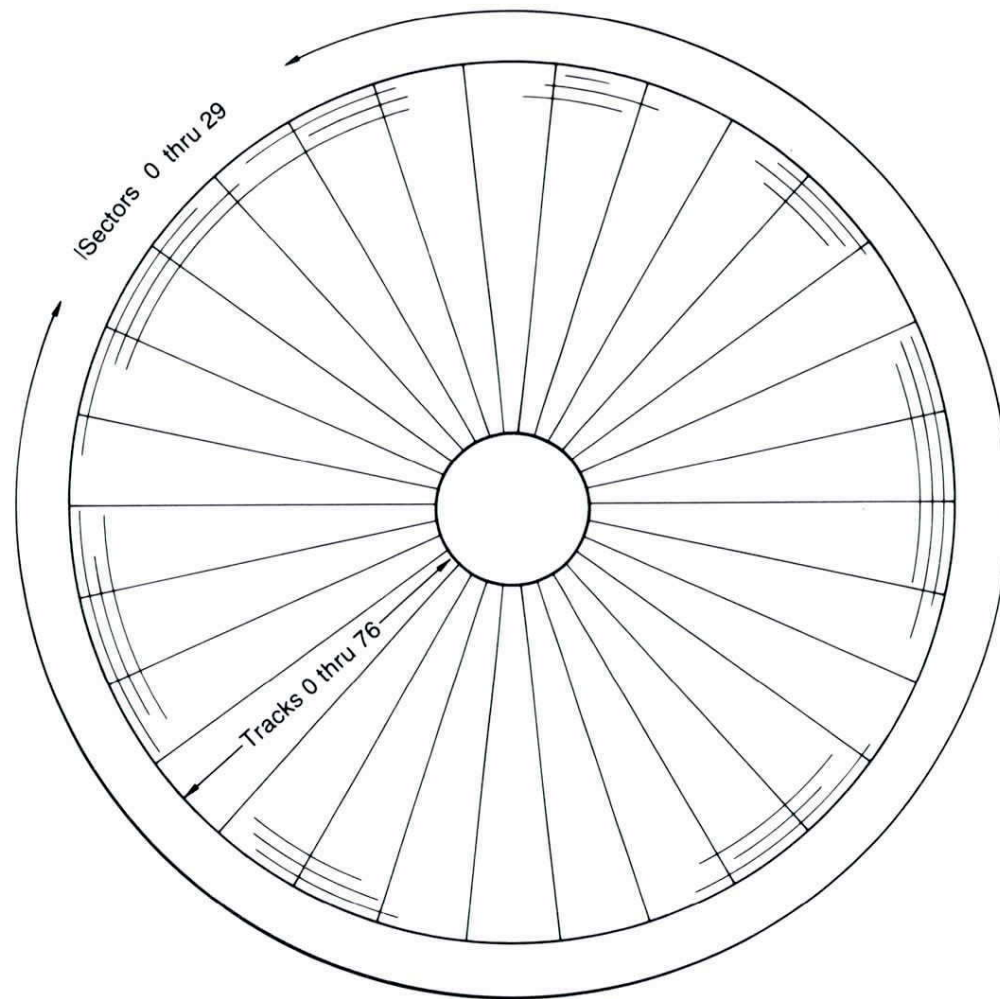
The file structure and available data-access methods depend on the computer language. Most computers require add-on language enhancements to enable disc control. Some computers have built-in mass storage commands for fundamental data and program storage. For advanced mass storage control, however, a Mass Storage ROM or disc subsystem is needed. For complete information on file structure and data-access methods, refer to the mass storage programming or subsystem reference manual supplied with your system.

Chapter 4

Self Test Procedures

The disc memory automatically performs an electronics self test on each drive at power-up. This causes the drive access sounds you hear when the machine is powered up. Manual access to the electronics self test, along with two other tests is described below.

NOTE

The LED patterns discussed in this chapter may be disturbed by an external controler. Therefore, **always disconnect the HP-IB Cable from the 9895A before performing the self tests**.

Electronics Self Test Procedure

Remove the front cover by pulling out on the lower outside corner of each disc access opening (see page 12). Beneath the drive unit you will see the front edge of a printed circuit board. On the board are two switches and a group of five light emitting diodes (LED's). The LED's indicate the status of the self-test. If they are blinking, self-test is being run. If they stop blinking and display a pattern, self-test has failed, with the failed test number displayed on the four left-most LED's. If only the right-most LED is lit, then self-test has completed successfully.

Self-Test LED's   Switch   Switch
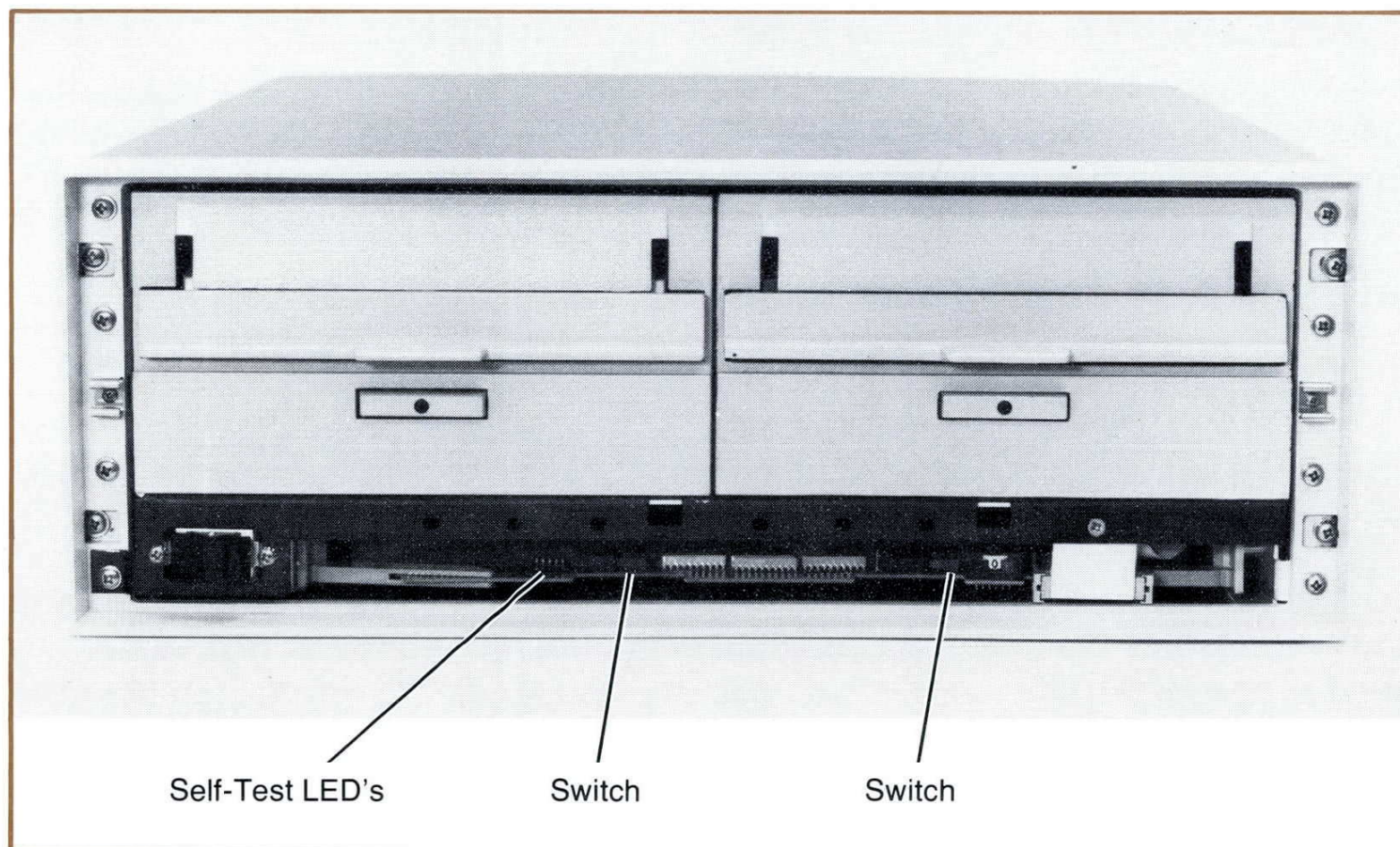
To repeat the self test, press and release the right-most switch. The LED's should blink as the self test routine progresses, then stop, with the right-most LED lit.

Passed all tests

OOOO●

If any other pattern appears, try rerunning the test. If the 9895 fails the test again, call your local HP Sales and Service Office.

Write/Read Self Test Procedure

CAUTION

USE ONLY A SCRATCH DISC WHEN RUNNING THIS SELF TEST SINCE THE TEST ERASES DATA ON THE DISC. THE DISC SHOULD **NOT** CONTAIN USEFUL DATA.

A more elaborate test, the write/read self test is run using the following procedure:

1. Install a non-write protected disc in each drive. (This disc must **not** contain any valuable information, as the test will alter the contents of the disc.)
2. Press and hold the left-most switch.
3. While holding the left-most switch, press the right-most switch.
4. Release the right-most switch, and then the left-most switch. The self test should start.

This test will check everything in the preceding test, and in addition will write on the disc and then read back, comparing what is read with what it wrote. This process checks the write/read circuitry and the CRC generator/checker.

Read Only Self Test Procedure

NOTE

The disc used in this self test **must** be formatted, but need not contain any other informtion.

A read only self test is also provided. To perform the self test insert a formated disc in each drive in your system. Next depress and hold the righthand self test switch. A soft clicking will be heard at approximately two second intervals, and the LED's will flicker. If a test is failed, the clicking will stop with the LED's indicating the test failed. Otherwise, the clicking will continue for approximately 1½ minutes per drive in your system, and the LED's will end up in the all tests passed configuration (rightmost LED lit). After the test has been completed, or has been terminated due to failure, release the switch.

CANADA

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TWX: 610-271-4482

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