

Hewlett-Packard

9885M/S Flexible Disk Drive Installation Manual





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HP 9885M/S Flexible Disk Drive Installation Manual

This manual replaces installation information in the back of the 9825 Disk Programming Manual (09885-90000) and the 9831 Disk Operating & Programming Manual (09885-90050). For a list of accessories supplied with each 9885 Disk Drive, refer to the Installation Note which accompanied the drive.

Printing History

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Table of Contents

Chapter 1: General Information

Introduction	1
Components	1
The 9885M Disk Drive	2
The 9885S Disk Drive	2
Multiple Drive Systems	2
The Disk Control ROM	2
The Disk	2
Suggested Disk Manufacturers	3

Chapter 2: Installation

Inspection	5
Power Requirements	7
Power Cords	8
Rack Mounting	9
System Connections	10
Drive Select Switches	11
Install the Disk Control ROM	12
Turn On	12
Disk Drive Tests	12
Self Test	12
To Test the 9885M	13
To Test Each 9885S	13
WITHOUT a Disk Installed	13
WITH a Disk Installed	13

Chapter 3: Operating Considerations

Front-Panel Controls	15
Installing a Disk	16
Disk Care Guidelines	17
Write-Protecting the Disk	18
System Reliability	19
Disk Structure	19
Systems Area	20
Systems Table	20
File Directory	21
Availability Table	21
Backup Track	21
Storage Area	21
9825A Disk Structure	21
File Structure	22

Appendix : Disk Specifications

Disk Capacity	23
Disk Speed	23
Disk Drive Interface Cable	24
Replaceable Parts List	24
Configuration Board Jumpers	25
Option X85 Cable Assembly	25

Subject Index	27
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Chapter 1

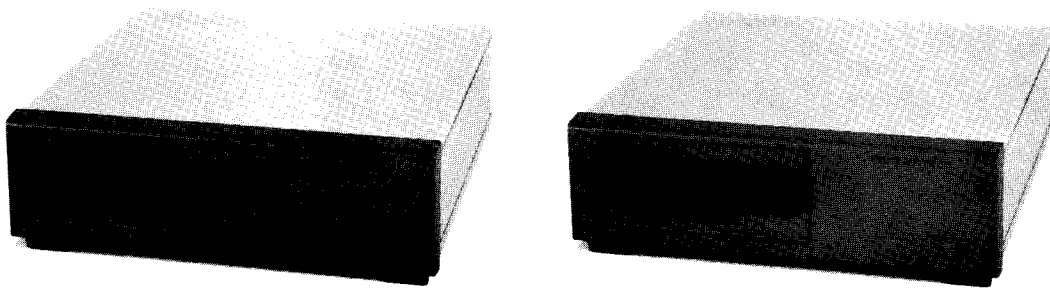
General Information

Introduction

The HP 9885 Flexible Disk Drive is a mass storage device that uses a flexible disk as the storage medium. Flexible disks can be accessed much faster than tape cartridges and have more than twice the storage capacity. Almost a half million bytes can be stored on each disk. The drive's short data access time makes it an extremely powerful yet easy to use storage unit for your desktop computer.

Components

There are two types of 9885 drives available – the 9885M (a Master drive), and the 9885S (a Slave drive).



HP 9885M and 9885S Flexible Disk Drives

The 9885M Disk Drive

The 9885M is the Master drive, or the controller, in single and multiple drive systems. The 9885M can hold and operate one flexible disk at a time. At least one 9885M is required for the system to operate, although up to eight 9885M's can be connected in one system. An HP 9878A I/O Expander is required if more than four peripherals are to be connected to an HP desktop computer.

The 9885S Disk Drive

The 9885S is the Slave drive used in multiple drive systems. Up to three 9885S drives can be connected to each 9885M in the system. Each slave drive can hold and operate one flexible disk at a time. The 09885-61607 cable connects slave drives in a multiple drive system.

Multiple Drive Systems

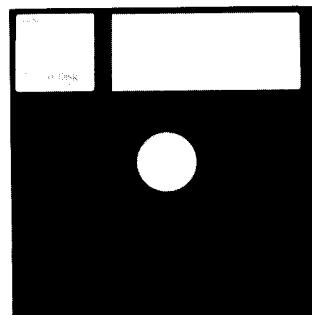
There may be a total of eight 9885 systems connected to your computer, with one 9885M controller and three 9885S slave units in each system. Each unit, M and S alike, may contain a disk for the storage of information, and each can be addressed individually.

The Disk Control ROM

Access to 9885 drives is made through a disk control or mass storage ROM which plugs into your desktop computer. The ROM must be properly installed before attempting to access the drives, as described in the manual supplied with the ROM.

The Disk

The flexible disk is the storage medium for the 9885. Each disk can hold about a half million bytes. Only one side of the disk is used for storage. Be sure to read and follow the Disk Care Guidelines in Chapter 3.



The Flexible Disk

Each disk must be initialized before it can be used for the first time. One of the disks supplied with the 9885M has been initialized and is ready for use. To initialize other disks, refer to the procedure in the disk control or mass storage ROM manual.

Suggested Disk Manufacturers

A list of approved disk manufacturers is available through your HP Sales and Service Office. Use only those disks with your 9885, or loss of data, damage to the read / write head, and high maintenance costs may result.

IMPORTANT

Do not use disks other than those approved by HP, otherwise permanent damage to your drive may result.

Chapter 2

Installation

Inspection

After unpacking each 9885 Drive, check it for physical damage. Complete unpacking instructions follow.

You should have already carefully removed your desktop computer, 9885M Drive, and 9885S Drive(s) if ordered, from their shipping packages. After unpacking the drive(s), remove the foam shipping piece from each drive door.

The individual parts of each disk system were thoroughly inspected before they were shipped to you. All equipment should be in good operating order. Carefully check each drive and other items for any physical damage sustained in transit. Notify HP and file a claim with the carrier if there is any such 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 in your computer.

Refer to the 9885M and S Installation Notes to check the accessories supplied.

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.

Fuses

Always be sure that the correct fuse is installed. Failure to follow this precaution may result in damage to the drive.

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.

WARNING

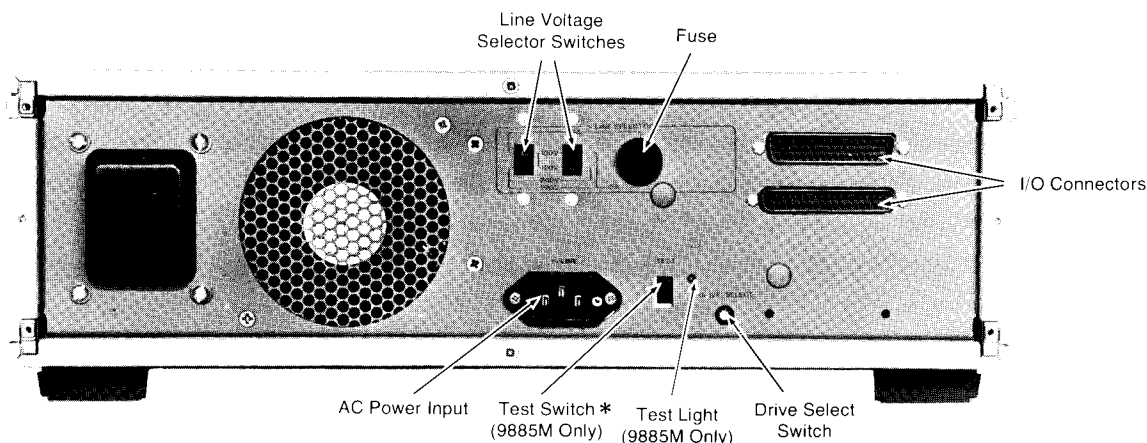
ALWAYS DISCONNECT THE DRIVE FROM ANY AC POWER SOURCE BEFORE CHANGING FUSES OR SETTING VOLTAGE SELECTOR SWITCHES.

Fuses

Voltage Setting	Fuse Rating	HP Part Number
100, 120	3 amp (SB)	2110-0381
220, 240	2 amp (SB)	2110-0303

To change a fuse –

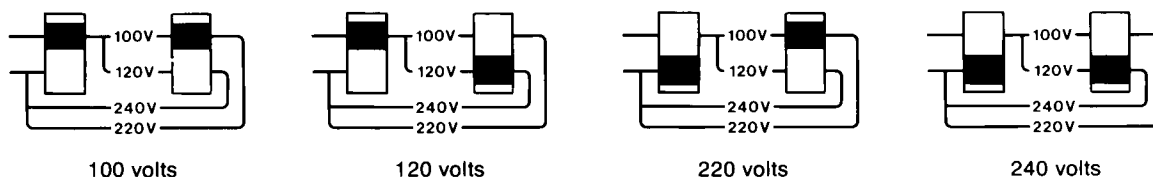
1. Insert a screwdriver or a coin in the slot of the fuse cap on the rear panel (see the next photograph).
2. Press in slightly on the cap and turn it counterclockwise.
3. Pull the fuse cap from the rear panel.
4. Remove the original fuse from the fuse cap and install the new fuse (either end) in the cap.
5. Install the fuse cap and fuse on the rear panel. Press in slightly on the cap and turn it clockwise.



9885 Rear Panel

Power Requirements

The 9885M or S can operate on line voltages of either 100, 120, 220, or 240 Vac (+5%, -10%). The line frequency must be within 3.5% of 50 or 60 Hz¹. The voltage selector switches on the rear panel must be set to the nominal ac line voltage in your area. The illustration below shows the correct settings for each nominal line voltage.



Line Voltage Switch Settings

To alter the setting of the selector switches –

1. Insert the tip of a small screwdriver (or any small tool) into the slot on the switch.
2. Slide the switch so that the position of the slot corresponds to the appropriate voltage, as shown.

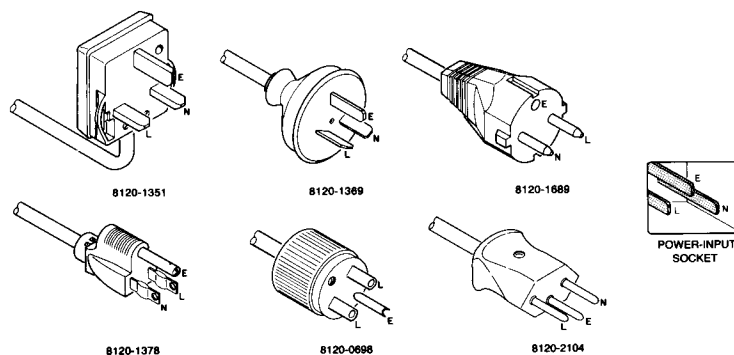
¹ Each drive must have option 001 to operate properly on a 50 Hz line frequency. This option is installed at the factory.

Power Cords

Power cords with different plugs are available for the equipment; the part number of each cord is shown below. Each plug has a ground connector. 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.

Power cords supplied by HP have polarities matched to the power-input socket of the equipment as shown –

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



Power Cord Options

WARNING

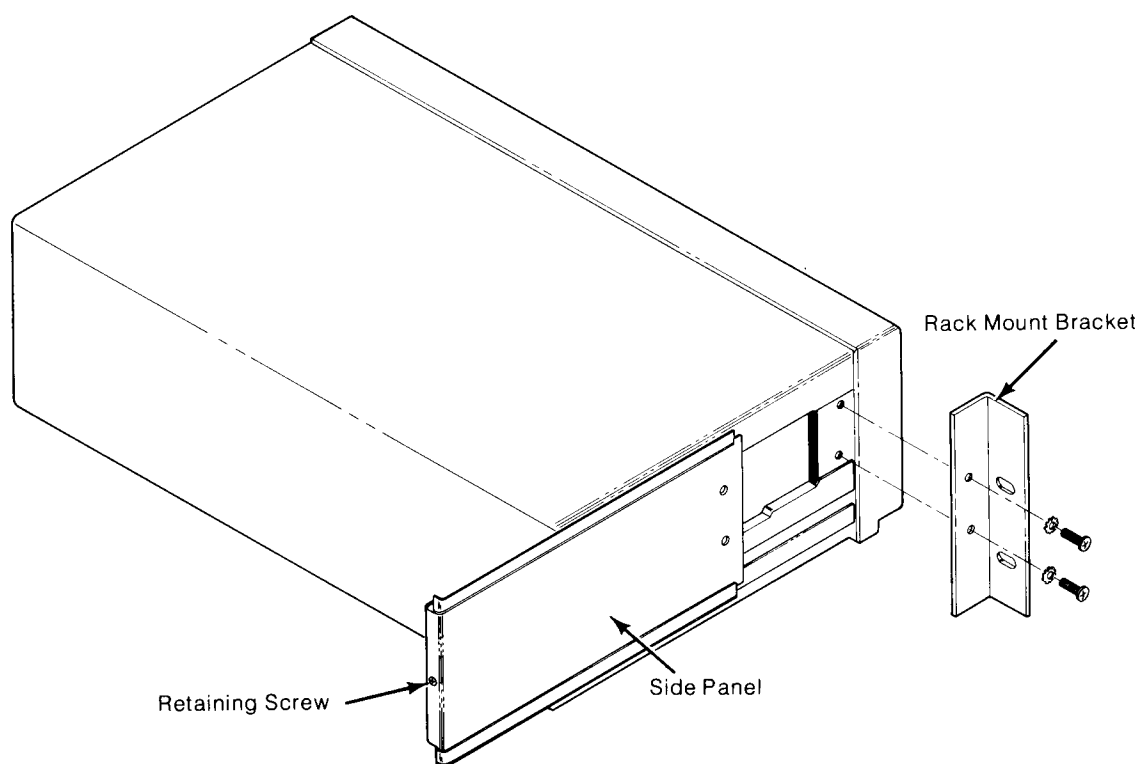
IF IT IS NECESSARY TO REPLACE THE POWER CORD, THE REPLACEMENT CORD MUST HAVE THE SAME POLARITY AS THE ORIGINAL. OTHERWISE A SAFETY HAZARD FROM ELECTRICAL SHOCK TO PERSONNEL, WHICH COULD RESULT IN INJURY OR DEATH, MIGHT EXIST. IN ADDITION, THE EQUIPMENT COULD BE SEVERELY DAMAGED IF EVEN A RELATIVELY MINOR INTERNAL FAILURE OCCURRED.

Rack Mounting

The Option 002 Rack Mount Kit allows you to mount your drive in a standard 19-inch rack mount cabinet. This option is typically installed at the factory, although a rack-mount field installation kit is available.

The rack mount brackets are not able to support the entire weight of the equipment. A shelf or other support should be provided by the equipment rack or cabinet to support the weight.

To install the HP 98024 Rack Mount Kit, first replace the standard side panels with those supplied in the rack mount kit (refer to the next figure). Then install the rack mount brackets with the screws provided in the kit.

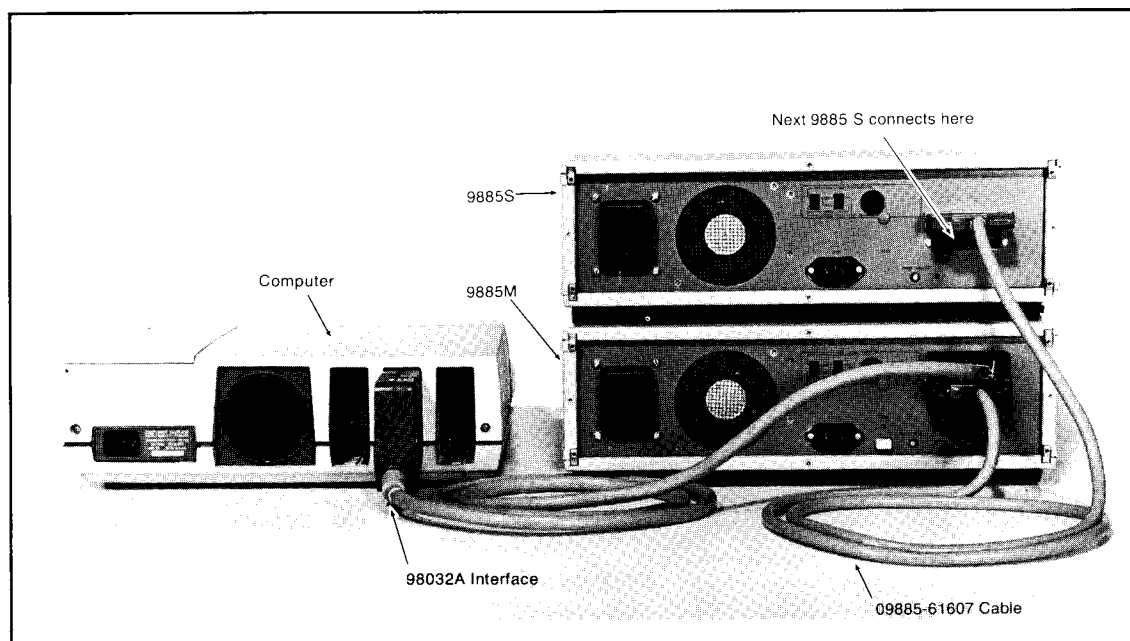


Rack Mount Kit Installation

System Connections

Connect the computer to the drive(s) using the interface cable(s) supplied. Then connect the system to an ac power source. Interconnections for a typical desktop computer system are shown here –

1. For a single drive system, connect the 9885M to the computer by inserting the interface card end of the interface cable into the back of the computer. Connect the other end of the interface cable to the top I/O connector on the back of the 9885M.
2. For multiple drive systems, connect the 9885M to the computer as just described. Then up to three 9885S drives can be connected in series to the 9885M drive using the 09885-61607 cable between drives. (Note: The 9885S drive cannot be connected directly to the computer.)



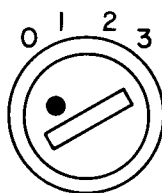
Connecting 9885 Drives to a Desktop Computer

3. Repeat this procedure for systems with more than one 9885M drive.
4. Connect one end of the ac power cord to the power-input connector on the rear panel of the computer and the other end to an appropriate ac power source.
5. Connect one end of the ac power cord(s) to the input connector on the rear panel of the drive(s) and the other end(s) to an appropriate ac power source.

Drive Select Switches

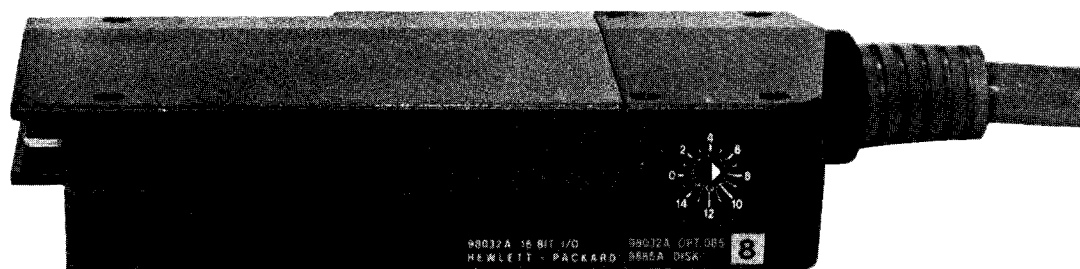
Set the drive number on the back panel of each drive; the drive number (0 thru 3) selected is the one opposite the dot on the switch. Then set the select code switch (0 thru 15) on each interface card used —

1. Once all drives are connected, set the drive select switch on the rear panel of each drive to the desired number (0 thru 3). It's recommended that the 9885M drive be set to 0. The drive number selected is the one opposite the dot on the switch. Each of the drives connected to the desktop computer via the same interface card must have a different drive number. So a maximum of four drives can be connected via one interface card.



Drive Select Switch
(Shown Set to 0)

2. Set each HP 98032A Interface (with the option for your particular desktop computer) in your system to a different select code. Up to eight¹ 9885M drives may be connected to one computer, providing each interface cable is set to a different select code.



Select Code Switch

¹ An HP 9878A I/O Expander is required if more than four interface cables (including those for 9885M drives) are connected to the desktop computer.

Install the Disk Control ROM

Most HP desktop computers require a disk control or mass storage ROM to provide statements and functions for controlling 9885 disk drives. Refer to the installation procedure in the manual supplied with the ROM.

Turn On

Once the system is properly connected and the disk control ROM is installed, your system is ready to turn on –

1. Turn on the desktop computer using the power switch on the right.
2. Turn on the 9885M and 9885S power switch located on the front panel of each drive.
All drives in a system must be turned on before the system can be operated.

Disk Drive Tests

Many tests are available for checking operations of each HP 9885 Flexible Disk Drive. The 9885M Self Test can be used to check electrical operation of each drive and is run with or without a disk installed. The Self Test does not require the computer. This test offers a good means of checking each drive when it's received and then at periodic intervals. The Checkread and Pattern Tests provided with desktop computers allow the operator or programmer to test each disk and drive when it's installed in a system. Refer to the desktop computer system test booklet for details.

Self Test

Use this test to check the electrical operation of each 9885M or 9885S Flexible Disk Drive. The 98032A Interface must be disconnected from the 9885M before running the test. The Self Test should be run with a blank (uninitialized) disk installed. If a blank disk is not available, the test can be run without a disk; however, a less thorough test is performed.

CAUTION

USE ONLY A BLANK DISK WHEN RUNNING THE SELF TEST, SINCE THE TEST WILL ERASE DATA AND INITIALIZATION ON TRACK 0 OF THE DISK.

To Test the 9885M –

1. Disconnect the 98032A Interface from the 9885M.
2. Switch on all the drives in the system. Insert a blank disk in the 9885M and close all drive doors.
3. Insert the blade of a screwdriver into the slot of the TEST switch on the back of the 9885M and slide the switch down; then release it. The yellow light next to the TEST switch should go on for approximately one minute. When the test is complete the light will go out.

If the light stays on longer than one minute, the test has failed. To repeat the test, be sure all drive doors are closed properly and then slide the TEST switch down again. If the test fails again, contact HP for assistance.

To Test Each 9885S –

1. Be sure the 9885S is connected to the 9885M via a 09885-61607 interface cable.
2. Install a blank (uninitialized) disk in the 9885S and close all drive doors in the system.
3. Slide the TEST switch down on the 9885M and release it. The yellow light next to the TEST switch should go on and stay on for about one minute. If the light remains on longer than about one minute, the test has failed.
4. Repeat this test for each 9885S. Be sure that a blank disk is installed in only one drive at a time. All drive doors must be closed.

WITHOUT a disk installed, the self test –

- Checks the microprocessor and program memory.
- Checks the drive control and drive status circuits.
- Checks the I/O functions.

WITH a disk installed, the self test –

- Checks the microprocessor and program memory.
- Checks the drive control and drive status circuits.
- Checks the I/O functions.
- Checks the read/write electronics.
- Checks the head positioning circuits.

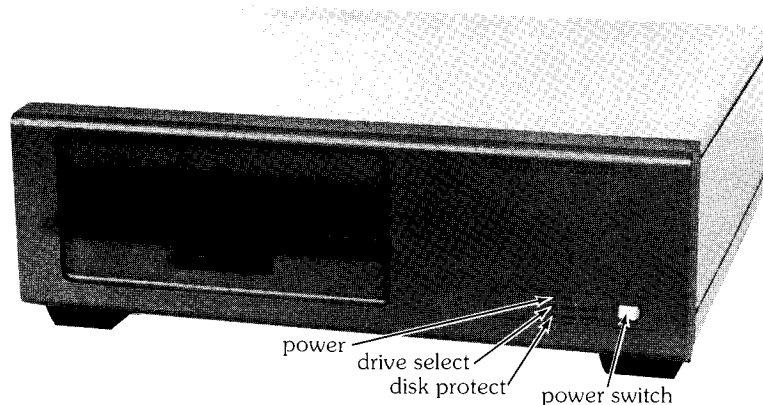
Chapter 3

Operating Considerations

This chapter shows how to handle flexible disks and provides a brief overview of disk structure for the programmer. Since the disk drive is completely controlled by the computer, refer to the disk programming manual for your computer for details on its disk-control language. The 9885 Installation Note furnished with the 9885M lists the disk programming manuals currently available.

Front-Panel Controls

Be sure that each disk drive in the system is switched on before running a program. The green LINE light shows when power is applied. There is no warm-up period.



The drive reads and writes data and programs from the disk by passing a read/write head over the disk surface as it spins in the drive. The yellow DRIVE SELECT light indicates when the read/write head is in motion.

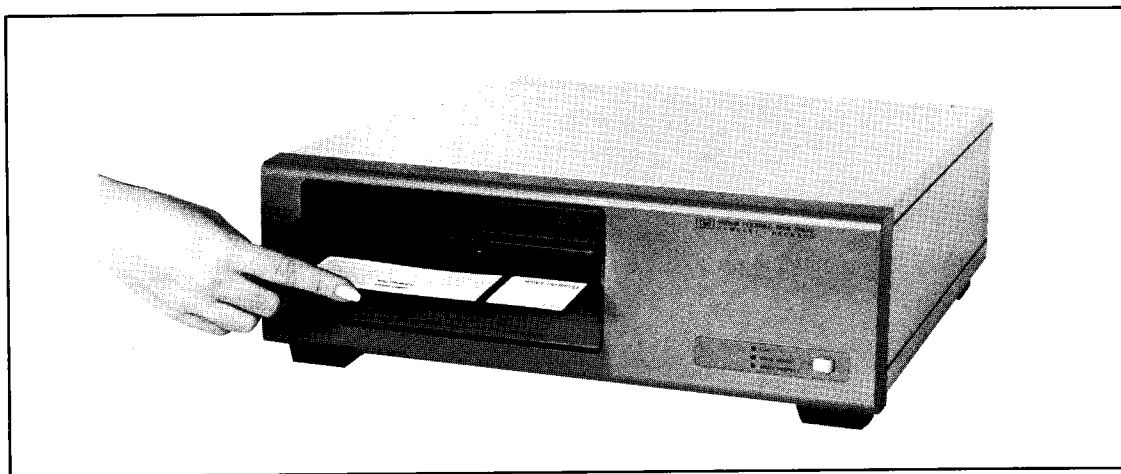
Installing a Disk

Follow the steps below to install a disk in your drive.

CAUTION

USE ONLY FLEXIBLE DISKS APPROVED BY HP. ANY OTHER DISK MAY CAUSE PERMANENT DAMAGE TO THE READ/WRITE HEAD IN THE DRIVE. FOR A LIST OF APPROVED DISKS, CONTACT AN HP SALES AND SERVICE OFFICE.

- Once all drives are properly connected, open the door of the drive by pushing in on the small bar on the front of the drive (below the door handle).
- Then remove the disk from its protective envelope¹ and carefully slide the disk in (label side up and on the right, nearest you) until you hear a click.
- Close the door by pressing down firmly on the handle until the door locks closed. (The disk can be installed with power on, and the spindle rotating, without damage to the disk.)
- The disk can be removed by pressing the bar below the handle on the front of the drive. The door springs open and the disk is released. When the disk is removed, it should always be replaced in its protective envelope.



Installing a Disk

¹ Never remove the disk from its sealed black jacket. For more information about handling disks, see Disk Care Guidelines.

Disk Care Guidelines

The flexible disk is basically maintenance free, but should be handled with care. Here are some guidelines to avoid loss of data or damage to your disks. By following these suggestions, you'll greatly improve the reliability of your disks.

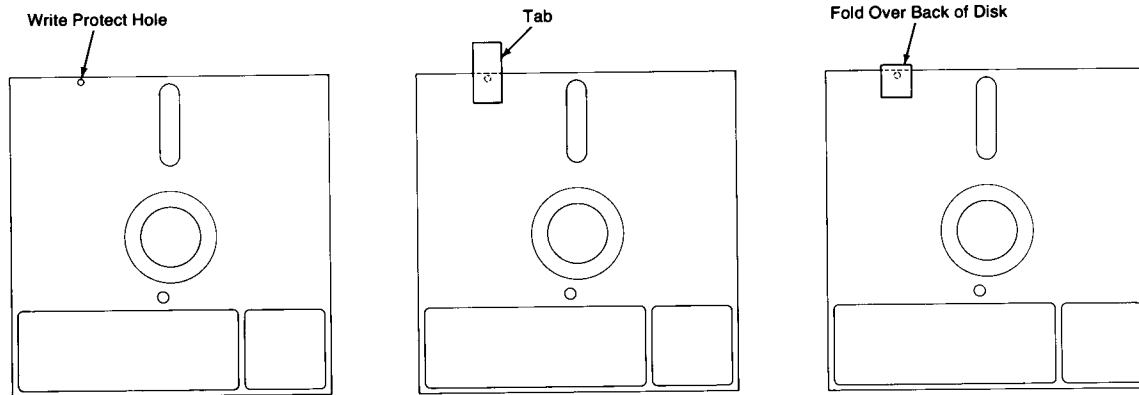
CAUTION

USE ONLY HP APPROVED DISKS SINCE USE OF OTHERS CAN RESULT IN DAMAGE TO YOUR DRIVE. (CONTACT YOUR LOCAL HP SALES AND SERVICE OFFICE FOR A LIST OF RECOMMENDED MANUFACTURERS.)

- Replace worn disk envelopes and always return disks to their storage envelopes after removing them from the drive to protect them from damage. Envelopes can be ordered from HP.
- Since fingerprints on the disk can cause loss of data, **NEVER** touch the surface of the disk showing through the protective sealed jacket.
- Avoid writing on the sealed plastic jacket with lead pencil or ball-point pen. Use a soft felt-tip pen and write on the label only.
- Although the disk is flexible, do not bend or fold it since this, too, can cause damage to the disk.
- Never subject disks to temperatures below 10° C (50° F) or above 52° C (126° F) or relative humidity outside the range of 20% to 80%.
- Contamination from dust, ash, smoke, etc., can damage disks.
- Avoid placing disks in strong magnetic fields like those caused by transformers or magnets, since this can cause loss of data.
- Never remove disks from their sealed protective jackets.
- The inside surface of the sealed protective jacket is coated with a special material that cleans the disk as it rotates. Any other method of cleaning may scratch the disk and cause loss of data.

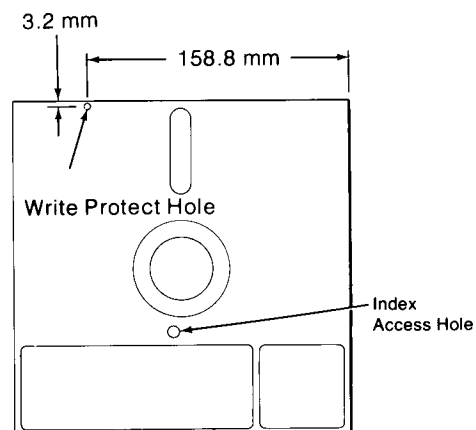
Write-Protecting the Disk

The data and programs stored on a disk can be protected from being written over. The disk is "write-protected" by uncovering a hole in the sealed protective jacket at the location shown below. When the write protect hole is uncovered, nothing can be written on the disk. When the write protect hole is covered, as shown below, writing is allowed on the disk. HP disks are supplied with the hole covered, enabling you to write on the disk.



A package of opaque WRITE tabs is supplied with each disk drive. Any opaque tape, such as black electrical tape, can also be used.

If a disk does not have the write protect hole (see previous section), you can punch a 3.2 mm ($\frac{1}{8}$ inch) diameter hole in the disk jacket at the location shown here –



System Reliability

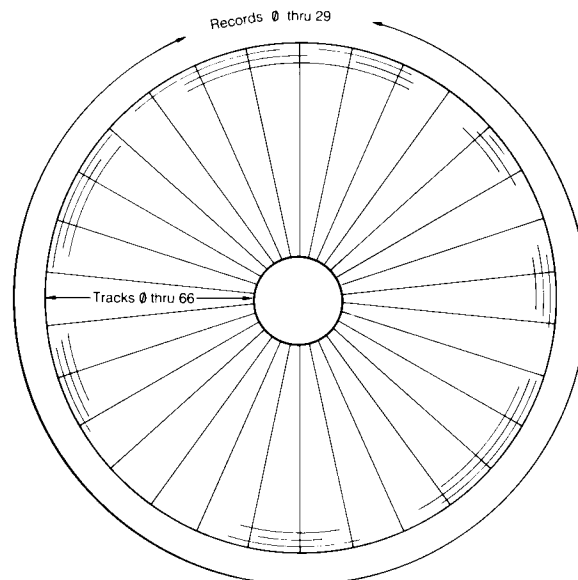
The reliability of your system depends directly on the care you exercise in handling your disks and in avoiding the situations just described. Disks and drives that are not subjected to these “extremes”, will perform maintenance-free for a longer period of time than those handled without regard to the disk care guidelines.

A year from the original date of delivery you should contact your HP Sales and Service Office for a preventative maintenance check-up. Preventative maintenance should be performed once a year thereafter by an HP representative.

Disk Structure

The disk used in the 9885 is a circle of plastic 20 cm (7 $\frac{7}{8}$ inches) in diameter, enclosed in a sealed black plastic jacket. Bonded onto the surface of the disk 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 disk. Information is stored and retrieved by a read / write head that comes in contact with the lower surface of the disk.

Data is stored in concentric tracks on the disk. Each disk has 67 circular tracks, numbered 0 thru 66. The disk is also subdivided into 30 pie-shaped sectors. Each sector contains 67 records (1 record = 256 bytes).

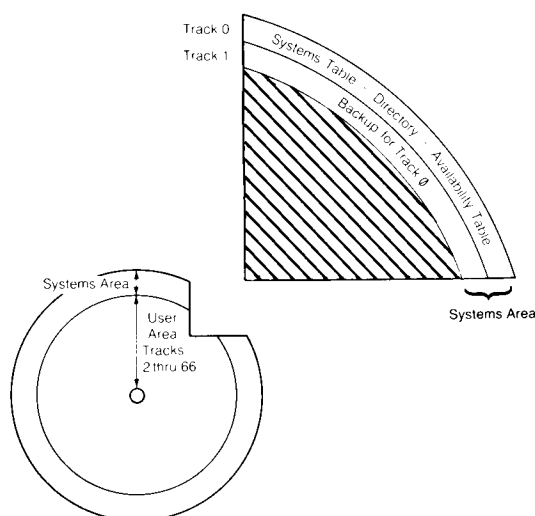


Disk Structure

Systems Area

Some of the area on the disk is reserved for use by the system (usually tracks 0 and 1). The rest of the disk area (tracks 2 thru 66) is available for your use. Each track in the systems area has a duplicate copy of these items –

- Systems Table.
- Directory to file locations and their sizes (once you've defined them).
- Availability Table that indicates remaining usable disk space.



Systems Area of Disk

Systems Table

Record 0 of the systems table indicates the computer used to initialize the disk, an optional disk label (name), the number of defective tracks, and the location of the beginning of the user area.

When a disk is initialized, the number of defective tracks is recorded in the systems table. If more than six tracks are defective, the disk is rejected (contact HP for a replacement). The first two bytes of the systems table indicate the number of defective tracks. The physical location of the defective tracks is not accessible. This results in a contiguous set of logical tracks with no intervening defective tracks. For example, if there are two defective tracks on a disk, the usable tracks will ordinarily be numbered 2 to 64.

File Directory

The directory in records 1 thru 22 contains entries for 352 possible files, one entry for each file written on the disk. Each entry (16 bytes) contains information such as file name, location, size and type of each file. If the directory in track 0 cannot be read, the spare directory from track 1 is automatically used.

Availability Table

The availability table in records 23 thru 28 monitors the amount and location of the remaining disk space. The availability table is automatically updated after any file is added to, or removed from, the disk.

Any space on the disk that becomes available (for example, after execution of a KILL or PURGE statement) is automatically combined with other available disk space if the areas are contiguous. This creates larger available spaces on the disk instead of numerous shorter spaces.

Record 29 of the systems area is unused.

Backup Track

Another track (usually track 1) contains the same system information as track 0. The information on the backup track is automatically used if track 0 should become defective.

Storage Area

Tracks 2 thru 66 are usually used for recording your files and programs. The tables in the systems area are updated whenever new information is added to, or deleted from, the disk and whenever the disk is reorganized (repacked). With 30 records per track and 256 bytes per record, there are 499,200 bytes of available storage space per disk.

9825A Disk Structure

The disk structure varies from that just described when the 9825A Calculator is used. Tracks 1 thru 4 are automatically reserved for bootstrap routines and track 5 is used for the backup copy of track 0. This leaves tracks 6 thru 66 for user storage.

File Structure

The disk file structure and available data-access methods depend on the computer in use and its language. Most computers require add-on language enhancements (e.g., plug-in ROM) to enable disk control. Some computers, such as the HP 9845A, have built-in mass storage commands for fundamental data and program storage. For advanced mass storage control, however, the 9845A requires the Mass Storage ROM.

For complete information on file structure and data-access methods, refer to the disk programming manual supplied with your system. A list of the manuals currently available is in the 9885M Installation Note.

Appendix

Disk Specifications

Disk Capacity

The following table lists the storage specifications for the flexible disk. Within a record, there may be any combination of stored data types.

Maximum storage per disk	514,560 bytes 2,010 records
Bytes per physical record	256
Tracks per disk	67
Records per track	30

Disk Speed

The following table lists the access speed specifications.

Rate of spin	360 rpm
Average access time	267 ms
Maximum transfer rate	46,000 bytes per second
Instantaneous transfer rate	62,500 bytes per second
Head settling time	8 ms
Step time	8 ms

Disk Drive Interface Cable

The HP 98032A Option X85 Interface connects the 9885M to an HP desktop computer. The first digit of the interface option number indicates whether additional installation or operating information should be supplied for operation with a particular desktop computer.

For example –

The HP 98032A Option –	Is intended for use with an –
085	HP 9825A Calculator
185	HP 9831A Desktop Computer
485	HP 9845A Desktop Computer

NOTE

The 98032A Interface must contain a rev.c circuit board (part no. 98032-66501) to operate with the 9845A. Interfaces shipped with 9885M Option 485 already have this board. If you are using an earlier interface with the 9845A, call your HP service representative for assistance.

The same interface cable is shipped with each option. A wiring diagram and technical description of that cable is shown next. For more information on the interface, refer to its installation and service manual.

Wire color codes in the wiring diagram correspond to the standard resistor color code. Digits have this significance –

0 = Black	5 = Green
1 = Brown	6 = Blue
2 = Red	7 = Violet
3 = Orange	8 = Gray
4 = Yellow	9 = White

Most Prevalent Color → XXX ← Narrow Stripe
 ↑
 Widest Stripe

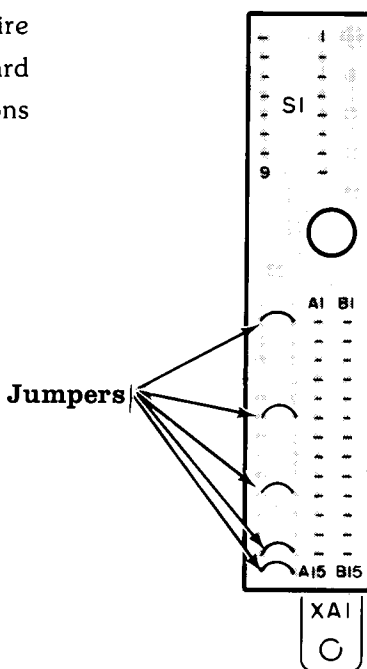
For example, pin A20 (I/O) on the interface connector has color code 901. White (9) is the most prevalent color, black (0) is the widest color band, and brown (1) is the narrow color band.

Replaceable Parts List

HP Part No.	Qty	Description
98032-61610	1	Cable Assembly
1251-4147	1	Connector, 2 × 25 (Interface End)
5040-8071	1	Cable, Molded
1251-4480	1	Connector (Disk Drive End)
1251-2058	1	Lock Assembly
1251-4475	1	Connector Hood

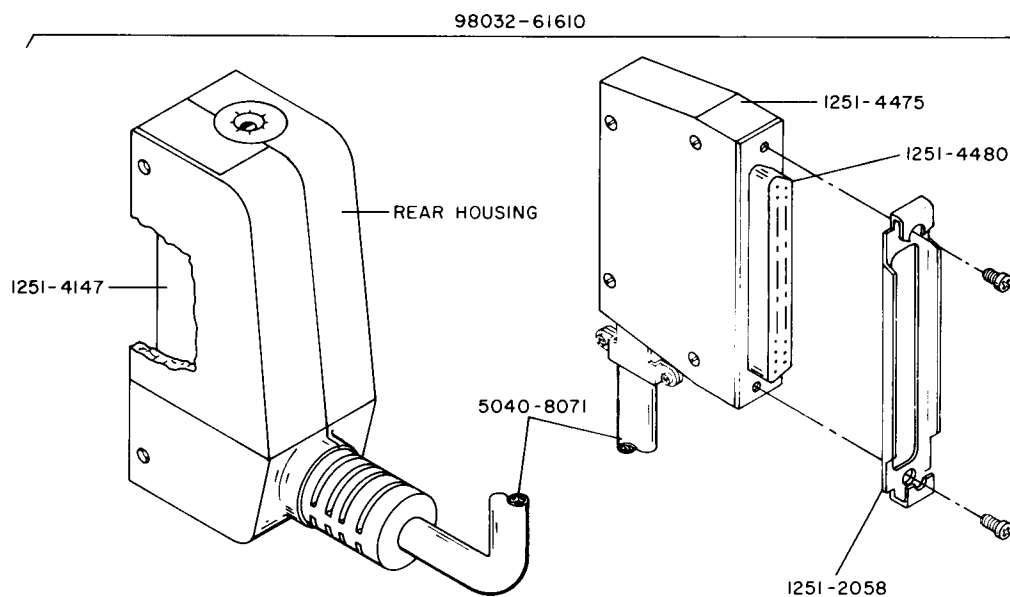
Configuration Board Jumpers

The 98032A Option X85 Interface has six wire jumpers installed on the configuration board (inside the interface rear housing) at positions 2, 7, 8, B, E and F.



Option X85 Configuration Board
(Circuit Side)

Option X85 Cable Assembly



Cable Wiring Diagram

Interface Connector				9885M Connector	
Line	Pine	Wire Color	Pin	Line	
GND	A1	(905)	2	GND	
DO15	A2	(948)	18	DIO15	
DO14	A3	(947)	19	DIO14	
DO13	A4	(946)	20	DIO13	
DO12	A5	(945)	21	DIO12	
DO11	A6	(937)	22	DIO11	
DO10	A7	(936)	23	DIO10	
DO9	A8	(935)	24	DIO9	
DO8	A9	(934)	25	DIO8	
DO7	A10	(97)	26	DIO7	
DO6	A11	(96)	27	DIO6	
DO5	A12	(95)	28	DIO5	
DO4	A13	(94)	29	DIO4	
DO3	A14	(93)	30	DIO3	
DO2	A15	(92)	31	DIO2	
DO1	A16	(91)	32	DIO1	
DO0	A17	(90)	33	DIO0	
GND	A18	(9)	8	GND	
PCTL	A19	(98)	10	PCTL	
I/O	A20	(901)	15	N/C	
Preset	A21	(902)	5	Preset	
CTL0	A22	(927)	4	CTL0	
CTL1	A23	(928)	6	CTL1	
GND	A24	(903)	11	GND	
Shield	A25	(Shield)	1	Chassis GND	
GND	B1	(906)	3	GND	
DI15	B2	(926)	35	DIO15	
DI14	B3	(925)	36	DIO14	
DI13	B4	(924)	37	DIO13	
DI12	B5	(923)	38	DIO12	
DI11	B6	(915)	39	DIO11	
DI10	B7	(914)	40	DIO10	
DI9	B8	(913)	41	DIO9	
DI8	B9	(912)	42	DIO8	
DI7	B10	(7)	43	DIO7	
DI6	B11	(6)	44	DIO6	
DI5	B12	(5)	45	DIO5	
DI4	B13	(4)	46	DIO4	
DI3	B14	(3)	47	DIO3	
DI2	B15	(2)	48	DIO2	
DI1	B16	(1)	49	DIO1	
DI0	B17	(0)	50	DIO0	
GND	B18	(Inner Drain)	9	GND	
PFLG	B19	(8)	13	PFLG	
PSTS	B20	(908)	14	PSTS	
EIR	B21	(918)	7	EIR	
STIO	B22	(916)	16	N/C	
STI1	B23	(917)	17	N/C	
GND	B24	(904)	12	GND	
Shield	B25	(Shield)	34	Chassis GND	

Subject Index

a

Accessories 5
Availability table 21

c

Checkread test 12
Computer connection 10
Configuration board 25

d

Directory: 21
 backup 21
Disk control ROM 2,12
Disks: 2
 capacity 23
 care guidelines 17
 installing 16
 manufacturers 3
 speed 23
 structure 19
 write-protection 18
Drive select switches 11

f

Files:
 directory 21
 structure 22
Front panel 15
Fuses 6

i

I/O connector 10
I/O expander 2,11
Inspection 5
Interface 10,11,13,24
 cable 24-25

l

Line:
 frequencies 7
 voltage: 7
 selector switches 6,7

m

Master drives 1,2,10,11,13
Multiple drives 2,10

p

Parts, replacement 24
Pattern test 12
Power cords 8
Power requirements 7

r

Rack mounting 9

s

Select code switch 10
Self test 12,13
Slave drives: 1,2,10,13
 connecting cable 2
Storage area 21
Systems area 20
Systems table 20

t

Tests:
 checkread 12
 pattern 12
 self 12,13

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