HEWLETT-PACKARD

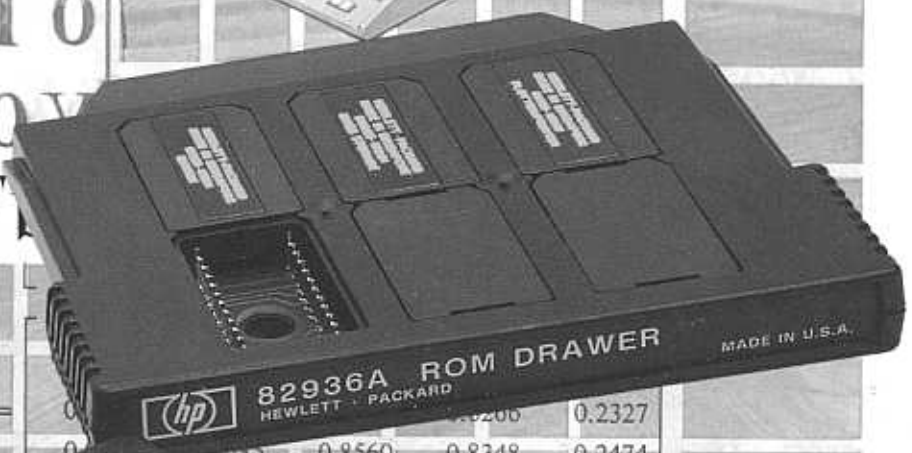
Extended Mass Storage ROM

OWNER'S MANUAL

SERIES 80

$$Z=\left[\begin{array}{cc|cc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ \hline 0 & 0 & V_{11} & V_{12} \\ 0 & 0 & V_{21} & V_{22} \end{array}\right]=\left[\begin{array}{cc} I & 0 \\ 0 & V \end{array}\right]$$

$$X=(A^TA)^{-1}A^T$$



$$A=\begin{bmatrix} 0 & & & 0.2327 \\ 0 & & 0.8560 & 0.8348 & 0.2474 \\ & 0198 & 0.0080 & 0.7610 & 1.0506 \end{bmatrix}$$

$$K=\begin{bmatrix} & & 0.0 & 0.0569 & -0.2520 \\ 0.12 & 389 & 0.0 & -0.4688 & -0.5963 \\ -0.0709 & 0.1861 & -0.8383 & -0.4806 & 0.1632 \\ 0.0726 & -0.4109 & -0.5354 & 0.7253 & -0.1144 \\ -0.2002 & -0.6231 & 0.1027 & -0.1411 & 0.7357 \end{bmatrix}$$

$$R=\begin{bmatrix} 1.4446 & 1.6867 & 1.2530 \\ 0.0 & -1.3389 & -0.1486 \\ 0.0 & 0.0 & 1.1831 \end{bmatrix}$$

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Notice

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Portable Computer Division
1000 N.E. Circle Blvd.
Corvallis, OR 97330, U.S.A.

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Section 1

Getting Started

Introduction

The Hewlett-Packard Extended Mass Storage ROM enables your HP Series 80 Personal Computer to communicate with any of the Hewlett-Packard disc drives which use the Subset-80 (SS-80) protocol. A disc protocol is the set of rules used by a computer and disc drive when they talk and listen to each other. Before the Extended Mass Storage ROM was introduced, Series 80 computers supported only a disc protocol known as Amigo. Disc drives that use the Amigo protocol include the HP 82901M, HP 82902M, HP 9121D/S, HP 9133V, HP 9133XV, and HP 9134XV.

The most recently introduced Hewlett-Packard disc drives use the SS-80 protocol. These include the HP 9133D/H/L, HP 9134D/H/L, HP 9122D/S, HP 9153A, and HP 9154A. These drives can only be used with Series 80 computers equipped with the optional Extended Mass Storage ROM. With the Extended Mass Storage ROM installed, both Amigo and SS-80 protocol disc drives can be used.

Before attempting to use the HP Extended Mass Storage ROM and this manual, you should be familiar with the operation of your HP-85 or HP-86/87 Personal Computer.

Compatibility with Other HP Series 80 Products

The HP 85B Extended Mass Storage ROM (00085-15013) is compatible only with:

- The HP-85B Personal Computer.
- The HP-85A Personal Computer that has been upgraded to the functionality of an HP-85B through installation of the HP 82972 Upgrade Kit.

The HP 86B Extended Mass Storage ROM (00087-15013) is compatible with all HP-86 and HP-87 Personal Computers.

Maximizing Disc Drive Storage

Some HP micro-Winchester disc drives can be configured to divide the disc into more than one logical unit and into more than one volume. Consult your disc drive manual for details. A disc divided into two units, for instance, appears to the computer to be like two mechanically separate disc drives, each with its own mass storage unit specifier (msus). A disc (or a disc unit) divided into several volumes allows the disc's file catalog to be divided into several smaller catalogs, each containing files relating to a single subject.

We explain below how to use multi-unit and multi-volume discs with your Series 80 Computer in ways that maximize the available disc storage.

Using Multi-Unit Discs

The maximum disc capacity that can be accessed by a Series 80 Computer equipped with the Extended Mass Storage ROM is 16.7 megabytes. When using an HP micro-Winchester that can be configured into two or more units, choose a configuration that causes the storage of each unit to be as close to 16.7 megabytes as possible. For instance, the HP 9133L Disc Drive has a capacity of 40 megabytes, and can be configured into two units of 20 megabytes each. When using this drive, you should configure it as a two-unit disc so that disc storage is maximized to 33.4 megabytes.

Using Multi-Volume Discs

A Series 80 Computer equipped with the Extended Mass Storage ROM can access only the first volume of a disc configured to have several volumes. So always configure such a disc as a one-volume disc to maximize storage.

Installing the HP Extended Mass Storage ROM

NOTE: Always turn power off before removing or installing the ROM Drawer.

The ROM must be properly installed in one of the six slots in the HP 82936A ROM Drawer. The ROM Drawer is then plugged into one of the module ports on your Series 80 computer. Please refer to the *HP 82936A ROM Drawer Instruction Sheet* or to the portion of your owner's manual dealing with the ROM Drawer for complete instructions. You should never have more than one Mass Storage ROM installed in the ROM Drawer.

Using the Extended Mass Storage ROM

Except for the `INITIALIZE` command, mass storage operations with the Extended Mass Storage ROM installed are no different from those without the ROM installed. Simply connect your disc drive or drives to your computer following the instructions in your HP-85 or HP-86/87 operating manual. Then use your mass storage commands (except `INITIALIZE`) as you normally would without the Extended Mass Storage ROM installed.

The `INITIALIZE` command provided by the Extended Mass Storage ROM differs from that used without this ROM only in the fourth optional parameter, "interleave parameter." When using the Extended Mass Storage ROM, you use this fourth parameter to specify both the interleave factor and a new value, the format option, explained below.

Initializing a Flexible or Fixed Disc (`INITIALIZE`)

Before a disc can be used to store information, it must be initialized and formatted. This is done with the `INITIALIZE` command, whose form is:

```
                                 " :msus "
INITIALIZE["new volume label"[,  " .old volume label" [, directory size[, interleave parameter]]]]
```

Here are the meanings of each optional parameter:

- *new volume label*: This is the name you may assign to the disc being initialized. This label offers you a convenient way to specify a particular disc. A volume label may be up to six characters in length. If you specify a label longer than six characters, only the first six characters are accepted. The only characters that you may not use in a volume label are: . (period), : (colon), and " (quotes). If the *new volume label* is omitted, the label consists of blanks.

- *old volume label* or *msus*: This is the existing label of the disc being initialized or the msus (mass storage unit specifier) of the disc drive being used to initialize the disc. If you omit this parameter, you must use your system's default disc drive (normally drive 0) or the disc drive specified by the MASS STORAGE IS statement.
- *directory size*: This specifies the number of records on the disc to be used for the file directory. Each record holds directory information for eight files. If you omit this parameter, the catalog of your initialized disc will contain 14 records, which allows a maximum of $14 \times 8 = 112$ files.
- *interleave parameter*: This parameter is a three digit number containing two pieces of information, the *format option* and *interleave factor*. The first digit is the format option. The default value is 0. The last two digits of the three digit *interleave parameter* define the interleave factor. The default value is 00. If only one or two digits are entered for this parameter, they are interpreted as the interleave factor, and the format option becomes the default value. If you omit this parameter, the default values for both the format option and the interleave factor are used.
  - *format option*: Some newer HP disc drives allow several choices for sector size to be made when a disc is initialized. These sector size choices are made by choosing an appropriate format option. (A larger sector size increases the available memory on an initialized and formatted disc.) However, a Series 80 computer equipped with the Extended Mass Storage ROM *can only use a format option that specifies a 256-byte sector size.*

    The format options for the HP 9122 Disc Drive are given on page 8. To find the format options for other HP disc drives, refer to your disc drive manual.

    NOTE: Format option 4 allows easy data transfer from a Series 80 Computer equipped with an HP 9122 Disc Drive to one equipped with an HP 9121 Disc Drive. This format option, as defined for the HP 9122 Disc Drive, specifies a single sided format and a 256-byte sector size.

  - *interleave factor*: This specifies how physical records on the disc are to be numbered. When the number is 1, 2, 3, ...etc., records are numbered consecutively, by every other record, every third record, ...etc. Consult documentation accompanying your disc drive for the range of permissible values. If the interleave factor is omitted, these default values are used:

Series 80 Model	Default Value for Interleave Factor
HP-85B	5
HP-86A/B	6
HP-87A/XM	6

The ability to renumber records on a disc by specifying an interleave factor allows you to control the efficiency of your disc drives and to minimize the time required to access mass storage files.

The interleave factor affects how many revolutions of the disc are necessary to transfer information to and from mass storage. Because it takes a finite amount of time to perform accessing operations, and because the disc is spinning rapidly, it is possible that a full revolution might be required to access successive records on the disc. By placing a physical separation between records, the appropriate interleave factor can minimize the number of unnecessary revolutions.

The speed of your mass storage system during a particular application can be improved by adapting the interleave factor to the structure of your data. Since there is no easy way to compute the best interleave factor for a particular data configuration, the simplest way to determine the most efficient interleave factor is by experimentation.

One method of testing interleave factors involves copying your program and data from a master disc to a test disc that has been initialized to a different interleave factor. Then, time the execution of the program, using the computer's internal timer. To compare execution times, you may repeatedly initialize the test disc using a different interleave factor each time, COPY the same data onto the disc (remember, the data was lost when the disc was reinitialized), and re-execute the program.

NOTE: The following option numbers apply to the HP 9122 Disc Drive. To find the format options for other HP disc drives, refer to your disc drive manual.

Format Option	Usable With Series 80?	Description for HP 9122 Disc Drive
0	Yes	Specifies the default format option for any disc drive. The definition of the default option depends on the disc drive used.
1	Yes	Specifies a 256-byte sector, double-sided disc format. This is the default option for the HP 9122 Disc Drive.
2	No	Specifies a 512-byte sector, double-sided disc format.
3	No	Specifies a 1024-byte sector, double-sided disc format.
4	Yes	Specifies a 256-byte sector, single-sided disc format. This format is compatible with the HP 9121 Disc Drive.

Examples:

`INITIALIZE`	Initializes the disc in the default disc drive. No volume label is assigned. The directory size, the format option, and the interleave factor are all chosen to be the default values.
`INITIALIZE "MEMOS1",":D701"`	Initializes the disc in drive D701 and assigns volume label MEMOS1. The default values for directory size, format option, and interleave factor are assigned.

`INITIALIZE "BETSY1",".JUNK5",15,002`
`INITIALIZE "BETSY1",".JUNK5",15,02`
`INITIALIZE "BETSY1",".JUNK5",15,2`
	Each of these commands initializes disc JUNK5 and assigns the new volume label BETSY1. The directory consists of 15 records, the default format option is specified, and the interleave factor is 2.

`INITIALIZE "BETSY1",".JUNK5",15,405`	The only differences between this and the previous example are in the interleave (last) parameter. This specifies format option 4 and interleave factor 5.

Section 2

Maintenance, Service, and Warranty

Maintenance

The Extended Mass Storage ROM does not require maintenance. However, you should be aware of the following warning and cautions:

WARNING

Do not place fingers, tools, or other foreign objects into the plug-in ports. Such actions may result in minor electrical shock hazard and interference with some pacemaker devices. Damage to plug-in port contacts and the computer's internal circuitry may also result.

CAUTIONS

Always switch off the HP Series 80 Computer and any peripherals involved when inserting or removing modules. Use only plug-in modules designed by Hewlett-Packard specifically for the HP Series 80 Computer. Failure to do so could damage the module, the computer, or the peripherals.

If a module or ROM drawer jams when inserted into a port, it may be upside down or designed for another port. Attempting to force it may damage the computer or the module. Remove the module carefully and reinsert it.

Do not touch the spring-finger connectors in the ROM drawer with your fingers or other foreign objects. Static discharge could damage electrical components.

Handle the plug-in ROMs very carefully while they are out of the ROM drawer. Do not insert any objects in the contact holes on the ROM. Always keep the protective cap in place over the ROM contacts while the ROM is not plugged into the ROM drawer. Failure to observe these cautions may result in damage to the ROM or ROM drawer.

When You Need Help

Hewlett-Packard is committed to providing after-sale support to its customers. To this end, our customer support department has established phone numbers that you can call if you have questions about this product.

Product Information. For information about Hewlett-Packard dealers, products, and prices, call:

(800) FOR-HPPC
(800 367-4772)

Technical Assistance. For assistance by telephone, call one of the following numbers:

- In the U.S. call the North American Response Center at 1-800/858-8867. There may be a charge for this call.
- In Canada call 1-800/267-6115.
- In other countries call your HP Sales and Service Office—ask for the "Personal Computer Response Center."

Service

If at any time, you suspect that the Extended Mass Storage ROM or the ROM Drawer may be malfunctioning, do the following:

1. Turn the computer and all the peripherals off. Disconnect all peripherals and remove the ROM drawer from the HP Series 80 port. Turn the computer back on. If it doesn't respond or displays `ERROR 23 : SELF TEST`, the computer requires service.
2. If your system passes the above test, turn the computer off again. Install the ROM drawer, with the Extended Mass Storage ROM installed, into any port. Turn the computer on again.
   - If `ERROR 110 : E.M.S ROM` is displayed, indicating that the ROM is not operating properly, turn the computer off and try the ROM in another ROM drawer slot. This will help you determine if particular slots in the ROM drawer are malfunctioning, or if the ROM itself is malfunctioning.
   - If the cursor does not appear, the system is not operating properly. To help determine what is causing the improper operation, repeat step 2 with the ROM drawer installed in a different port, both with the Extended Mass Storage ROM installed in the ROM drawer and with the ROM removed from the ROM drawer.
3. If your unit is malfunctioning, refer to "Warranty Information" and "How to Obtain Repair Service" directly below.

Warranty Information

The complete warranty statement is included in the information packet shipped with your Extended Mass Storage ROM. Additional copies may be obtained from any authorized Hewlett-Packard dealer, or the HP Sales and Service Office where you purchased your system.

If you have any questions concerning the warranty, please contact one of the Field Repair Centers listed on the Service Information Sheet packaged with your owner's documentation.

How to Obtain Repair Service

For information on service in your area, contact your nearest authorized HP dealer or the nearest Hewlett-Packard Sales and Service Office.

If your Extended Mass Storage ROM malfunctions and repair is required, you can help assure efficient servicing by having the following items with your ROM at the time of service:

1. A description of the configuration of the computer and peripheral devices, exactly as they were at the time of malfunction, including such items as disc drives, plug-in modules, tape cartridges, flexible discs, executing programs, etc.
2. A brief description of the malfunction symptoms for service personnel.
3. Printouts or any other materials that illustrate the problem area.
4. If a warranty repair, a copy of the sales slip or other proof of purchase to establish the warranty coverage period.

Potential for Radio/Television Interference (For U.S.A. Only)

The Extended Mass Storage ROM uses radio frequency energy and may cause interference to radio and television reception. The ROM has been type-tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of the FCC Rules. These specifications provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If the ROM does cause interference to radio or television, which can be determined by turning the Series 80 computer on and off with the ROM installed and with the ROM removed, you can try to eliminate the interference problem by doing one of more of the following:

- Reorient the receiving antenna.
- Change the position of the computer with respect to the receiver.
- Move the computer away from the receiver.
- Plug the computer into a different outlet so that the computer and the receiver are on different branch circuits.

If necessary, consult an authorized HP dealer or an experienced radio/television technician for additional suggestions. You may find helpful the following booklet, prepared by the Federal Communications Commission: *How to Identify and Resolve Radio-TV Interference Problems.* This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4.

General Shipping Instructions

Should you ever need to ship the Extended Mass Storage ROM, be sure that it is packed in a protective package (use the original shipping case) to avoid in-transit damage. Hewlett-Packard suggests that the customer always insure shipments.

Appendix A

Error and Warning Messages

A complete list of your computer's error and warning messages is presented in your operating manual. This table lists computer errors that involve mass storage, plus the 14 errors and one warning generated by the Extended Mass Storage ROM. The ERROM number identifies which ROM generates an error. Errors generated by the computer are identified as ERROM 0 or ERROM 208, and errors generated by the Extended Mass Storage ROM are identified as ERROM 207.

Error Number	Error Message	ERROM Number	Description
60	WRITE PROTECT	0	The mass storage medium is write protected.
70	READ	0	The system cannot read the mass storage medium.
72	RECORD	0	While recording, you're • Attempting to access a record that doesn't exist. • Attempting to READ#/PRINT# at the end of a file. • Lost in a record. Close the file to release the buffer.
89	INVALID PARAM	0	An invalid interleave parameter was used in an INITIALIZE statement.
Warning 101	MEDIA WEAR	207	The disc will soon fail. Copy all files onto a new disc.
110	E.M.S. ROM	207	The Extended Mass Storage ROM has failed its self-test. The ROM or the ROM Drawer requires service or replacement.
111	M.S. DEVICE FAILURE	207	The disc drive reports a fault. The drive requires service.
111	IOP	208	An invalid I/O operation has been attempted.
112	M.S. ERROR	207	The disc drive is not able to follow SS-80 protocol. The drive requires service.
113	DEVICE NOT SUPPORTED	207	The Extended Mass Storage ROM only supports discs with 256-byte sectors. Execute INITIALIZE again, using a different format option.
125	VOLUME	208	The specified volume label wasn't found.
126	MSUS	208	You used an invalid mass storage unit specifier.
129	MEDIUM	208	The disc is damaged.
130	DISC	208	The disc is not initialized, the drive latch is open, or the drive number specified is not present.
131	TIME-OUT	208	The interface select code or device address specified is not present, or system hardware has failed.

Portable Computer Division
1000 N.E. Circle Blvd., Corvallis, OR 97330, U.S.A.

European Headquarters
150, Route Du Nant-D'Avril
P.O. Box, CH-1217 Meyrin 2
Geneva-Switzerland

HP-United Kingdom
(Pinewood)
GB-Nine Mile Ride, Wokingham
Berkshire RG11 3LL

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