Computer
Museum

9895A Flexible Disc
Memory User's Manual

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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.
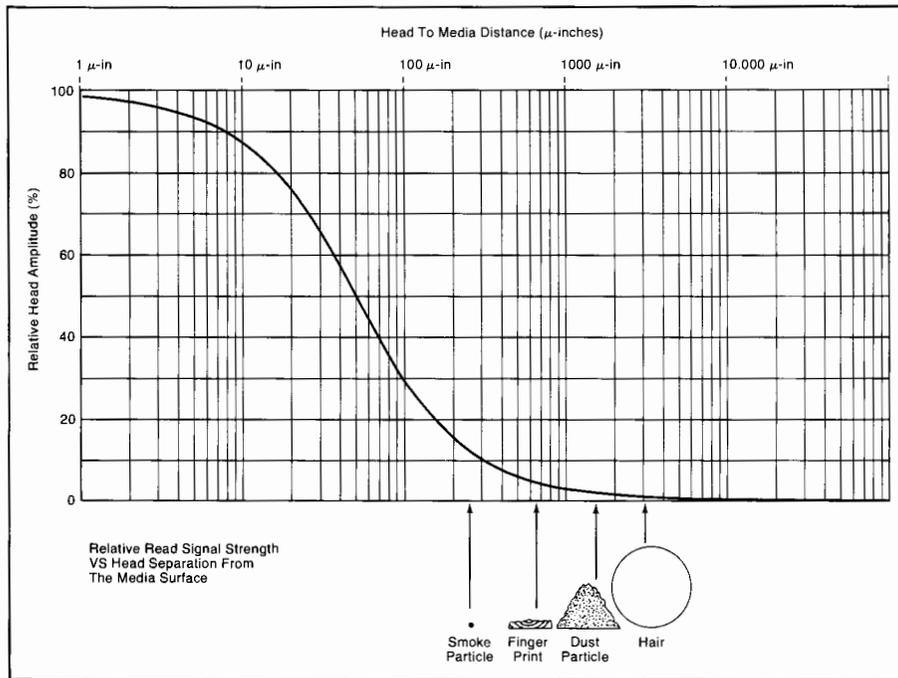
Head/Media Critical Requirements

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
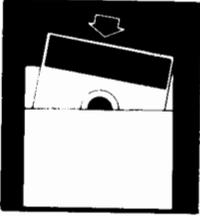
This is the single most important thing to remember about handling your disc because it prolongs disc life by protecting it from dust and scratches. Between uses discs should be stored upright in a dust free container. The box the discs are shipped in, or a similar container, is a good choice.

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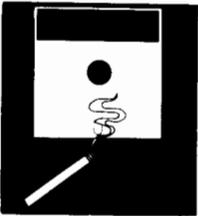
Airborne contaminates and particles accidently dropped onto the disc will cause your disc to wear out prematurely and may cause unreliable data storage and retrieval operations. Some of the most common contaminates are DUST, SMOKE, ASHES, ERASER CRUMBS, and BREADCRUMBS. Chemical vapors may also cause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

Maintain Proper Temperature And Humidity
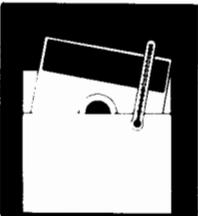
The proper operating range is 10 C (50 F) to 40 C (104 F) and 20% to 80% relative humidity. While temperature is usually easy to control, it may be necessary to make special provisions to keep the humidity in the proper range. Although the disc will continue to operate outside the normal humidity range, 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. Additionaly, 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
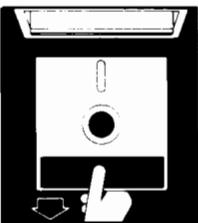
Remove the disc completely from the drive when access is not needed for an extended period of time. The disc continues to rotate as long as it is in a drive which is turned on, even if it is not accessed. This rotation will eventually wear the disc out over long periods of time.

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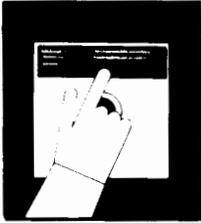
Use a soft felt tip pen to label your disc, and be careful to write only in the label area. Avoid the exposed media while labeling the disc. If possible, write on the large labels provided BEFORE applying them to the disc.

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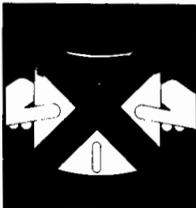
The disc is flexible but will not operate if it is creased. Using ball point pens, rubber bands, paper clips, etc. can crease the disc.

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.)
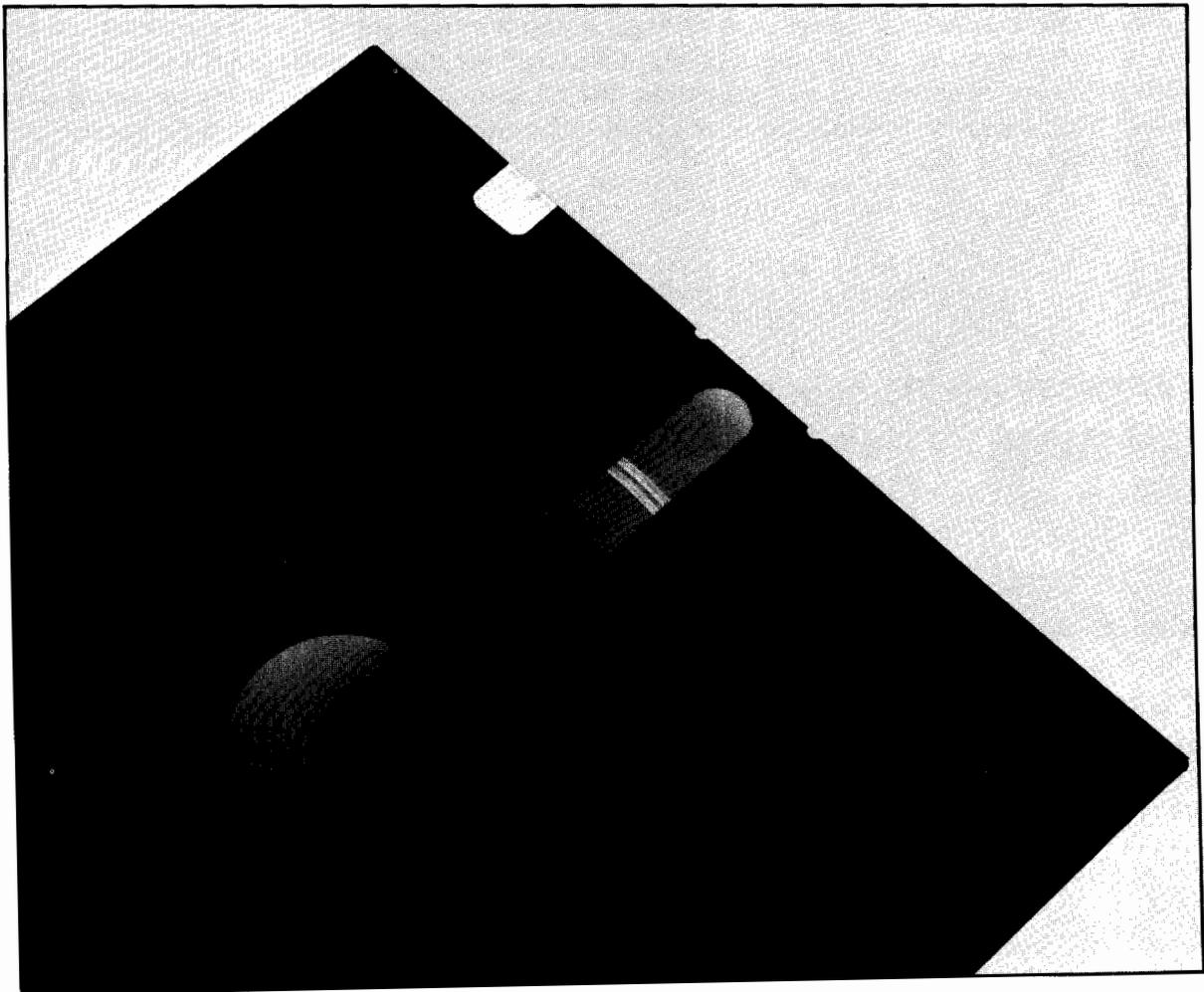
Chapter 2
Installation

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
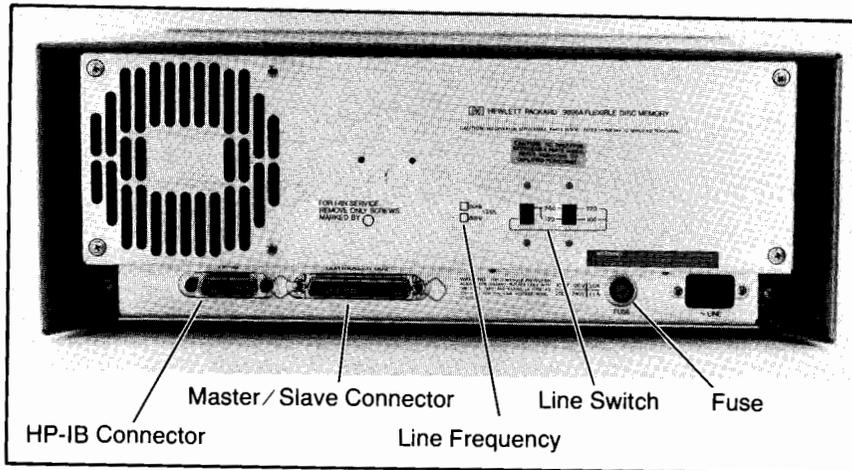
Power Connections

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 |
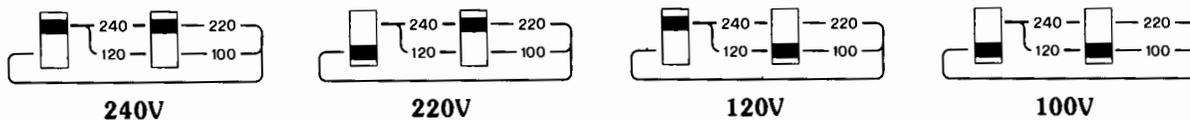
Fuses

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.
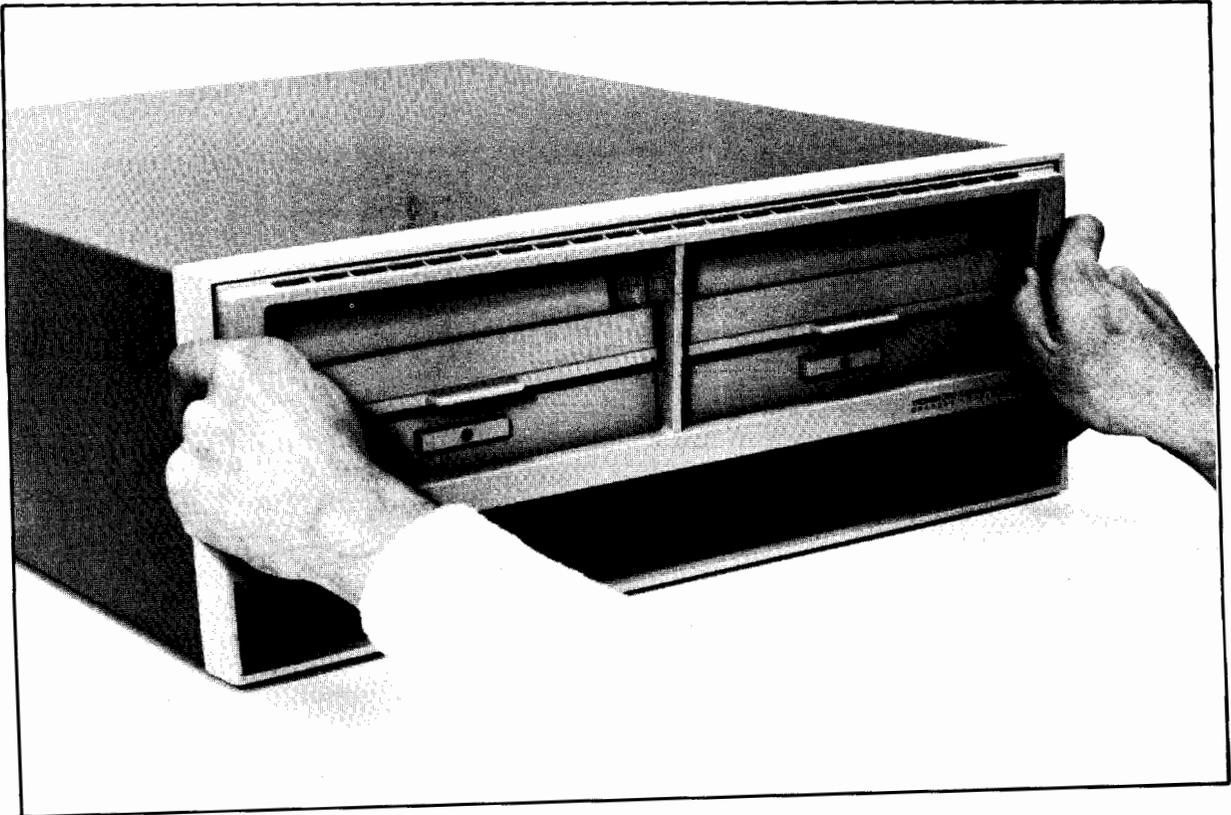
Removing Front Panel

Device Address Switch
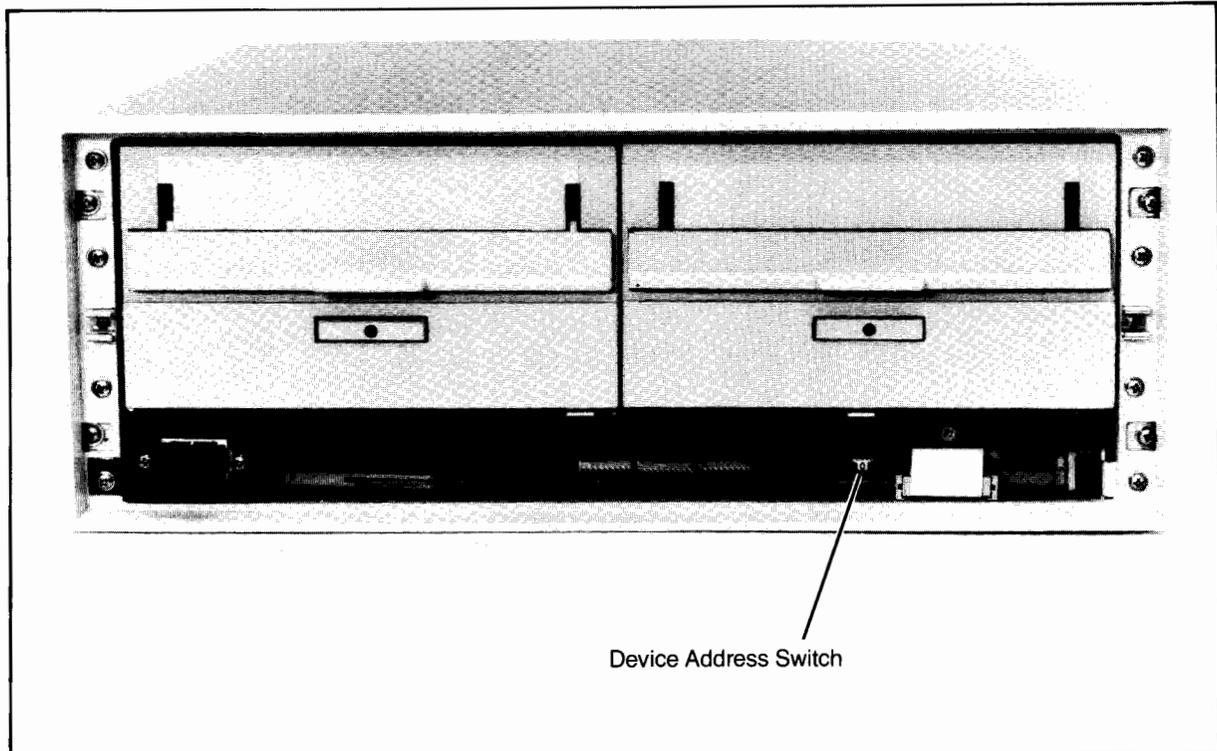
Device Address

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.
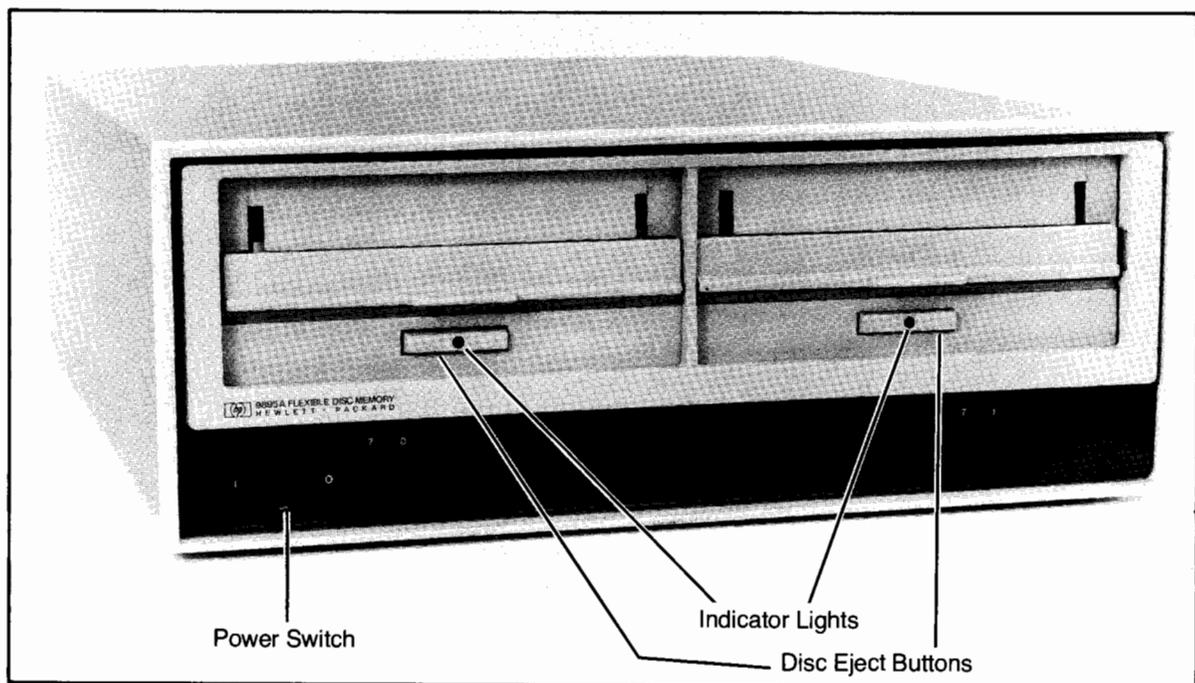
Disc Installation

CAUTION

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For your convenience, HP offers a package of 10 discs for the 9895 under part number 92195A.
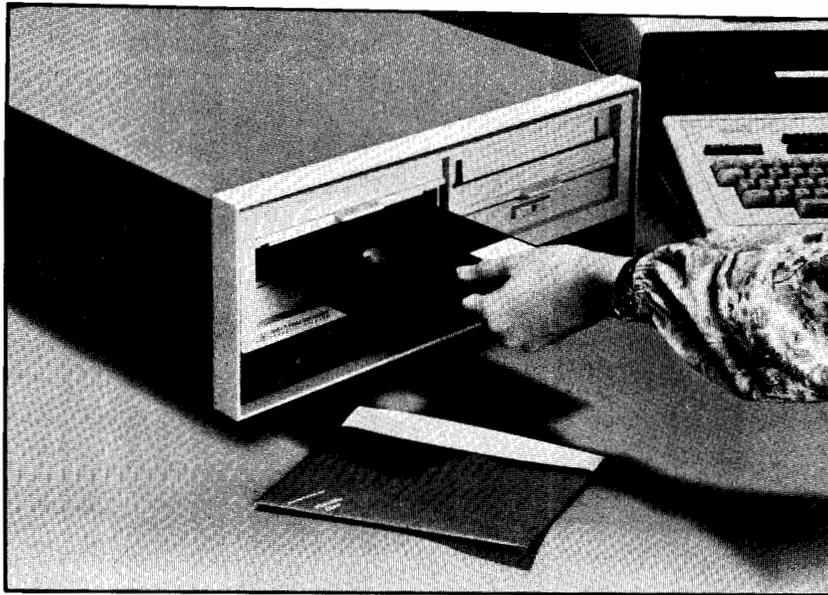
Follow these steps to install a disc:

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
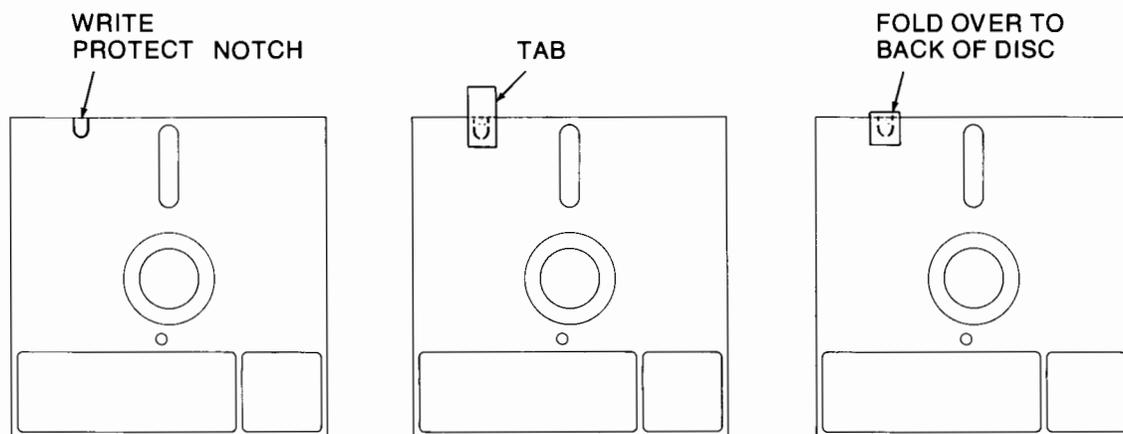
Disc Structure

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.
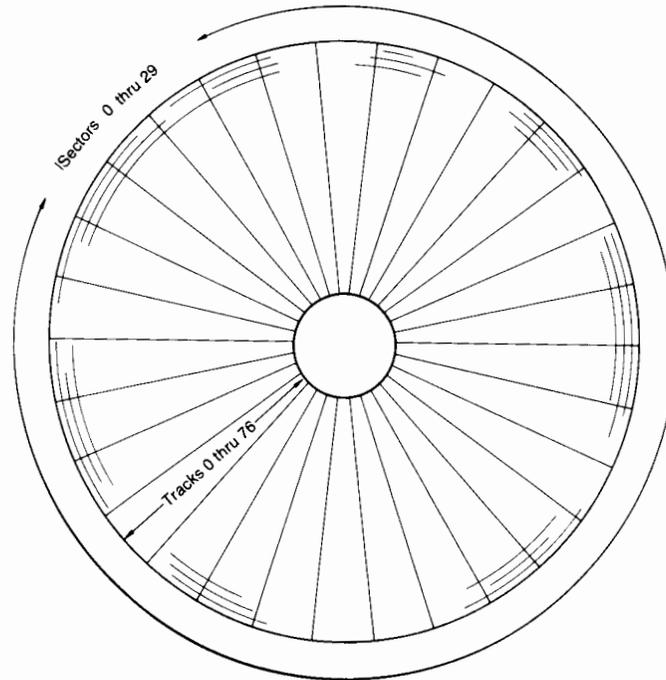
The file structure and available data-access methods depend on the computer language. Most computers require add-on language enhancements to enable disc control. Some computers have built-in mass storage commands for fundamental data and program storage. For advanced mass storage control, however, a 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
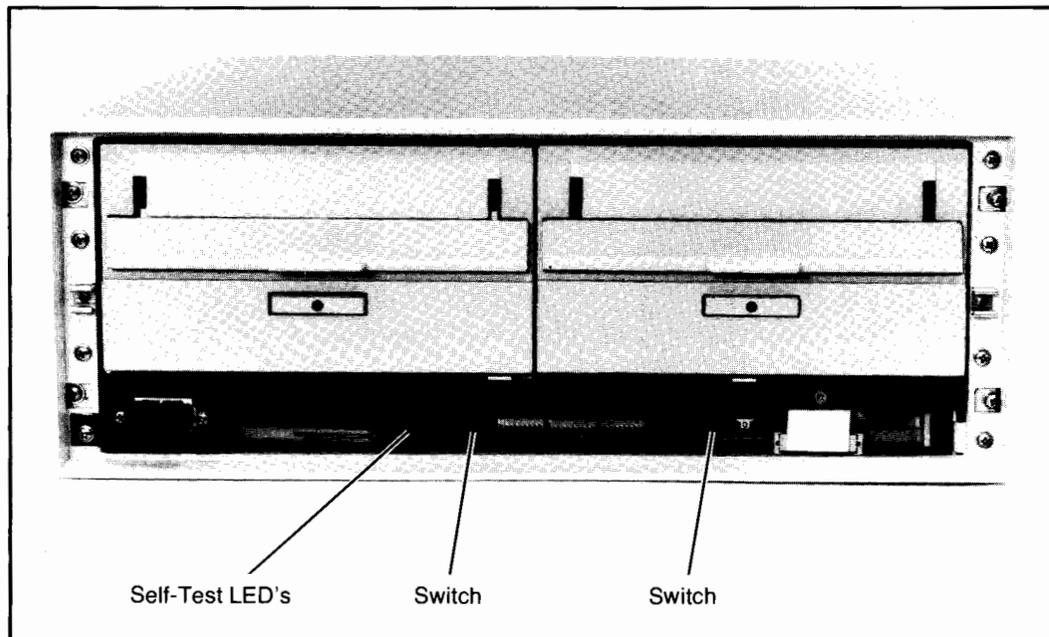
To repeat the self test, press and release the right-most switch. The LED's should blink as the self test routine progresses, then stop, with the right-most LED lit.

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.

AFRICA, ASIA, AUSTRALIA

ANGOLA
Telectra
Empresa Técnica de Equipamentos Eléctricos, S.A.R.L.
R. Barbosa Rodrigues, 41-I°DT.°
Caixa Postal, 6487
Luanda
Tel: 35515/6
Cable: TELECTRA Luanda

AUSTRALIA
Hewlett-Packard Australia Pty. Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
P.O. Box 36
Doncaster East,
Victoria 3109
Tel: 896351
Telex: 31-024
Cable: HEWPARD Melbourne

Hewlett-Packard Australia Pty. Ltd.
31 Bridge Street
Pymble
New South Wales, 2073
Tel: 4496566
Telex: 21561
Cable: HEWPARD Sydney

Hewlett-Packard Australia Pty. Ltd.
153 Greenhill Road
Parkside, S.A., 5063
Tel: 2725911
Telex: 82536
Cable: HEWPARD Adelaide

Hewlett-Packard Australia Pty. Ltd.
141 Stirling Highway
Nedlands, W.A. 6009
Tel: 3865455
Telex: 93859
Cable: HEWPARD Perth

Hewlett-Packard Australia Pty. Ltd.
121 Wollongong Street
Fyshwick, A.C.T. 2609
Tel: 804244
Telex: 62650
Cable: HEWPARD Canberra

Hewlett Packard Australia Pty. Ltd.
5th Floor
Teachers Union Building
495-499 Boundary Street
Spring Hill, Queensland
4000
Tel: 2291544
Cable: HEWPARD Brisbane

BANGLADESH
The General Electric Co. of Bangladesh Ltd.
Magnet House 72
Dilkusha Commercial Area
Motijhell, Dacca 2
Tel: 252415, 252419
Telex: 734
Cable: GECDAC Dacca

ETHIOPIA
Abdella Abdulmalik
P.O. Box 2635
Addis Ababa
Tel: 11 93 40

GUAM
Guam Medical Supply, Inc.
Suite C, Airport Plaza
P.O. Box 8947
Tamuning 96911
Tel: 646-4513
Cable: EARMED Guam

HONG KONG
Hewlett-Packard Hong Kong Ltd.
Room 105, Austin Centre
1st Floor
21 Austin Avenue
TST P.O. Box 98524
Kowloon
Tel: 3-697446 (5 lines)
Telex: 36678 HX
Cable: HEWPACK Hong Kong

Medical/Analytical Only
Schmidt & Co. (Hong Kong) Ltd.
Wing On Centre, 28th Floor
Connaught Road, C.
Hong Kong
Tel: 5-455644
Telex: 74766 SCHMX HX

INDIA
Blue Star Ltd.
Sahas
414/2 Vir Savarkar Marg
Prabhadevi
Bombay 400 025
Tel: 45 78 87
Telex: 011-4093
Cable: FROSTBLUE

Blue Star Ltd.
Band Box House
Prabhadevi
Bombay 400 025
Tel: 45 73 01
Telex: 011-3751
Cable: BLUESTAR

Blue Star Ltd.
Bhavdeep
Stadium Road
Ahmedabad 380 014
Tel: 43922
Telex: 012-234
Cable: BLUEFROST

Blue Star Ltd.
7 Hare Street
Calcutta 700 001
Tel: 23-0131
Telex: 021-7655
Cable: BLUESTAR

Blue Star Ltd.
Bhandari House
91 Nehru Place
New Delhi 110 024
Tel: 682547
Telex: 031-2463
Cable: BLUESTAR

Blue Star Ltd.
T.C. 7/603 'Poornima
Maruthankuzhi
Trivandrum 695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR

Blue Star Ltd.
11 Magarath Road
Bangalore 560 025
Tel: 55668
Telex: 0845-430
Cable: BLUESTAR

Blue Star Ltd.
Meeakshi Mandiram
XXXXV/1379-2 Mahatma
Gandhi Rd.
Cochin 682 016
Tel: 32069
Telex: 085-514
Cable: BLUESTAR

Blue Star Ltd.
1-1-117/1 Sarojini Devi Road
Secunderabad 500 033
Tel: 70126
Telex: 0155-459
Cable: BLUESTAR

Blue Star Ltd.
133 Kodambakkam High Road
Madras 600 034
Tel: 82057
Telex: 041-379
Cable: BLUESTAR

INDONESIA
BERCA Indonesia P.T.
P.O. Box 496/Jkt.
Jln. Abdul Muis 62
Jakarta
Tel: 349255, 349886
Telex: 46748 BERSIL IA
Cable: BERSAL

BERCA Indonesia P.T.
P.O. Box 174/Sby.
23 Jln. Jimerto
Surabaya
Tel: 42027
Cable: BERCACON

JAPAN
Yokogawa-Hewlett-Packard Ltd.
29-21, Takaido-Higashi 3-chome
Suginami-ku, **Tokyo** 168
Tel: 03-331-6111
Telex: 232-2024 YHP-Tokyo
Cable: YHPMARKET TOK 23 724

Yokogawa-Hewlett-Packard Ltd.
Chuo Bldg., 4th Floor
4-20, Nishinakajima 5-chome
Yodogawa-ku, Osaka-shi
Osaka, 532
Tel: 06-304-6021
Telex: 523-3624

Yokogawa-Hewlett-Packard Ltd.
Sunitomo Seimei Nagaya Bldg.
11-2 Shimosasajima-cho,
Nakamura-ku, **Nagoya,** 450
Tel: 052 571-5171

Yokogawa-Hewlett-Packard Ltd.
Tanigawa Building
2-24-1 Tsuruya-cho
Kanagawa-ku
Yokohama, 221
Tel: 045-312-1252
Telex: 382-3204 YHP YOK

Yokogawa-Hewlett-Packard Ltd.
Mito Mitsui Building
105, 1-chome, San-no-maru
Mito, Ibaragi 310
Tel: 0292-25-7470

Yokogawa-Hewlett-Packard Ltd.
Inoue Building
1348-3, Asahi-cho, 1-chome
Atsugi, Kanagawa 243
Tel: 0462-24-0452

Yokogawa-Hewlett-Packard Ltd.
Kumagaya Asahi
Hachijuni Building
4th Floor
3-4, Tsukuba
Kumagaya, Saitama 360
Tel: 0485-24-6563

KENYA
ADCOM Ltd., Inc.
P.O. Box 30070
Nairobi
Tel: 331955
Telex: 22639

Medical Only
International Aeradio (E.A.) Ltd.
P.O. Box 19012
Nairobi Airport
Nairobi
Tel: 336055/56
Telex: 22201/22301
Cable: INTAERIO Nairobi

Medical Only
International Aeradio (E.A.) Ltd.
P.O. Box 95221
Mombasa

KOREA
Samsung Electronics Co., Ltd.
22nd Floor Dongbang Bldg.,
250, 2-KA, Taepyung-Ro
Chung-Ku,
Seoul
Tel: 777-4886
Telex: SAMSAN 27364

MALAYSIA
Hewlett-Packard Sales (Malaysia) Sdn. Bhd.
Suite 2.21/2.22
Bangunan Angkasa Raya
Jalan Ampang
Kuala Lumpur
Tel: 483680, 485653

Protel Engineering
P.O. Box 1917
Lot 259, Satok Road
Kuching, **Sarawak**
Tel: 53544
Cable: PROTELENG

MOZAMBIQUE
A.N. Goncalves, Ltd.
162, 1° Apt. 14 Av. D. Luis
Caixa Postal 107
Maputo
Tel: 27091, 27114
Telex: 6-203 NEGON Mo
Cable: NEGON

NEW GUINEA
Hewlett-Packard Australia Pty. Ltd.
Development Bank Building
Ground Floor
Ward Strip
Port Moresby, Papua
Tel: 258933

NEW ZEALAND
Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington

Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland

Analytical/Medical Only
Northrop Instruments & Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291

Northrup Instruments & Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091

Northrup Instruments & Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NIGERIA
The Electronics Instrumentations Ltd.
N6B/770 Oyo Road
Oluseun House
P.M.B. 5402
Ibadan
Tel: 461577
Telex: 31231 TEIL NG
Cable: THETIEL Ibadan

The Electronics Instrumentations Ltd.
144 Agege Motor Road, Mushin
P.O. Box 481
Mushin, **Lagos**
Cable: THETEIL Lagos

PAKISTAN
Mushko & Company Ltd.
Oosman Chambers
Abdullah Haroon Road
Karachi-3
Tel: 511027, 512927
Telex: 2894
Cable: COOPERATOR Karachi

Mushko & Company, Ltd.
10, Bazar Rd.
Sector G-6/4
Islamabad
Tel: 28264
Cable: FEMUS Rawalpindi

PHILIPPINES
The Online Advanced Systems Corporation
Rico House
Amorsolo cor. Herrera Str.
Legaspi Village, Makati
P.O. Box 1510
Metro **Manila**
Tel: 85-35-81, 85-34-91, 85-32-21
Telex: 3274 ONLINE

RHODESIA
Field Technical Sales
45 Kelvin Road North
P.O. Box 3458
Salisbury
Tel: 705231 (5 lines)
Telex: RH 4122

SINGAPORE
Hewlett-Packard Singapore (Pte.) Ltd.
1150 Depot Road
P.O. Box 58
Alexandra Post Office
Singapore 3
Tel: 270-2355
Telex: HPSG RS 21486
Cable: HEWPACK, Singapore

SOUTH AFRICA
Hewlett-Packard South Africa (Pty.), Ltd.
Private Bag Wendywood,
Sandton, Transvaal, 2144
Hewlett-Packard Centre
Daphne Street, Wendywood,
Sandton, 2144
Tel: 802-5111/25
Telex: 8-4782
Cable: HEWPACK Johannesburg

Hewlett-Packard South Africa (Pty.), Ltd.
P.O. Box 120
Howard Place,
Cape Province, 7450
Pine Park Centre, Forest Drive,
Pinelands,
Cape Province, 7405
Tel: 53-7955 thru 9
Telex: 57-0006

SRI LANKA
Metropolitan Agencies Ltd.
209/9 Union Place
Colombo 2
Tel: 35947
Telex: 1377METROLTD CE
Cable: METROLTD

SUDAN
Radison Trade
P.O. Box 921
Khartoum
Tel: 44048
Telex: 375

TAIWAN
Hewlett-Packard Far East Ltd.
Taiwan Branch
Bank Tower, 5th Floor
205 Tun Hau North Road
Taipei
Tel: (02) 751-0404 (15 lines)
Cable: HEWPACK TAIPEI

Hewlett-Packard Far East Ltd.
Taiwan Branch
68-2, Chung Cheng 3rd. Road
Kaohsiung
Tel: (07) 242318-Kaohsiung

Analytical Only
San Kwang Instruments Co., Ltd.
20 Yung Sui Road
Taipei
Tel: 3615446-9 (4 lines)
Telex: 22894 SANKWANG
Cable: SANKWANG Taipei

TANZANIA
Medical Only
International Aeradio (E.A.), Ltd.
P.O. Box 861
Dar es Salaam
Tel: 21251 Ext. 265
Telex: 41030

THAILAND
UNIMESA Co. Ltd.
Elcom Research Building
2538 Sukumvit Ave.
Bangchak, Bangkok
Tel: 3932387, 3930338
Cable: UNIMESA Bangkok

ZAMBIA
R.J. Tilbury (Zambia) Ltd.
P.O. Box 2792
Lusaka
Tel: 73793
Cable: ARJAYTEE, Lusaka

OTHER AREAS NOT LISTED, CONTACT:
Hewlett-Packard Intercontinental
3495 Deer Creek Road
Palo Alto, California 94304
Tel: (415) 856-1501
TWX: 910-373-1267
Cable: HEWPACK Palo Alto
Telex: 034-8300, 034-8493

CANADA

ALBERTA
Hewlett-Packard (Canada) Ltd.
11620A - 168th Street
Edmonton T5M 3T9
Tel: (403) 452-3670
TWX: 610-831-2431

Hewlett-Packard (Canada) Ltd.
210, 7220 Fisher St. S.E.
Calgary T2H 2H8
Tel: (403) 253-2713
TWX: 610-821-6141

BRITISH COLUMBIA
Hewlett-Packard (Canada) Ltd.
10691 Shellbridge Way
Richmond V6X 2W7
Tel: (604) 270-2277
TWX: 610-925-5059

MANITOBA
Hewlett-Packard (Canada) Ltd.
380-550 Century St.
St. James,
Winnipeg R3H 0Y1
Tel: (204) 786-6701
TWX: 610-671-3531

NOVA SCOTIA
Hewlett-Packard (Canada) Ltd.
P.O. Box 931
800 Windmill Road
Dartmouth B3B 1L1
Tel: (902) 469-7820
TWX: 610-271-4482

ONTARIO
Hewlett-Packard (Canada) Ltd.
1020 Morrison Dr.
Ottawa K2H 8K7
Tel: (613) 820-6483
TWX: 610-563-1636

Hewlett-Packard (Canada) Ltd.
6877 Goreway Drive
Mississauga L4V 1M8
Tel: (416) 678-9430
TWX: 610-492-4246

Hewlett-Packard (Canada) Ltd.
552 Newbold Street
London N6E 2S5
Tel: (519) 686-9181
TWX: 610-352-1201

QUEBEC
Hewlett-Packard (Canada) Ltd.
275 Hymus Blvd.
Pointe Claire H9R 1G7
Tel: (514) 697-4232
TWX: 610-422-3022

**FOR CANADIAN
AREAS NOT
LISTED:**
Contact Hewlett-Packard (Canada)
Ltd. in Mississauga.

CENTRAL,
SOUTH AMERICA

ARGENTINA
Hewlett-Packard Argentina S.A.
Santa Fe 2035, Martinez
6140 Buenos Aires
Tel: 792-1239, 798-6086
Telex: 122443 AR CIGY
Cable: HEWPACKARG

Biotron S.A.C.I.y M.
Avda. Paseo Colon 221
9 piso
1399 Buenos Aires
Tel: 30-4846/1851/8384
34-9356/0460/4551
Telex: (33) 17595 BIO AR
Cable: BIOTRON Argentina

BRAZIL

Hewlett-Packard do Brasil
I.e.C. Ltda.
Alameda Rio Negro, 750
Alphaville
06400 Barueri SP
Tel: 429-3222
Cable: HEWPACK São Paulo

Hewlett-Packard do Brasil
I.e.C. Ltda.
Rua Padre Chagas, 32
90000-Pôrto Alegre-RS
Tel: 22-2998, 22-5621
Cable: HEWPACK Pôrto Alegre

Hewlett-Packard do Brasil
I.e.C. Ltda.
Av. Epitacio Pessoa, 4664
22471-**Rio de Janeiro**-RJ
Tel: 286-0237
Telex: 021-21905 HPBR-BR
Cable: HEWPACK Rio de Janeiro

CHILE
Jorge Calcagni y Cia. Ltda.
Arturo Burhle 065
Casilla 16475
Correo 9, **Santiago**
Tel: 220222
Telex: JCALCAGNI

COLOMBIA
Instrumentación
Henrik A. Langebaek & Kier S.A.
Carrera 7 No. 48-75
Apartado Aéreo 6287
Bogotá, 1 D.E.
Tel: 269-8877
Telex: 44400
Cable: AARIS Bogotá

Instrumentación
H.A. Langebaek & Kier S.A.
Carrera 63 No. 49-A-31
Apartado 54098
Medellin
Tel: 304475

COSTA RICA
Cientifica Costarricense S.A.
Avenida 2, Calle 5
San Pedro de Montes de Oca
Apartado 10159
San José
Tel: 24-38-20, 24-08-19
Telex: 2367 GALGUR CR
Cable: GALGUR

ECUADOR
CYEDE Cia. Ltda.
P.O. Box 6423 CCI
Av. Eloy Alfaro 1749
Quito
Tel: 450-975, 243-052
Telex: 2548 CYEDE ED
Cable: CYEDE-Quito

Medical Only
Hospitalar S.A.
Casilla 3590
Robles 625
Quito
Tel: 545-250
Cable: HOSPITALAR-Quito

EL SALVADOR
IPESA
Bulevar de los Heroes 11-48
Edificio Sarah 1148
San Salvador
Tel: 252787

GUATEMALA
IPESA
Avenida Reforma 3-48
Zona 9
Guatemala City
Tel: 316627, 314786, 66471-5,
ext. 9
Telex: 4192 Teletro Gu

MEXICO
Hewlett-Packard Mexicana,
S.A. de C.V.
Av. Periférico Sur No. 6501
Tepepan, Xochimilco
Mexico 23, D.F.
Tel: 905-676-4600
Telex: 017-74-507

Hewlett-Packard Mexicana,
S.A. de C.V.
Ave. Constitución No. 2184
Monterrey, N.L.
Tel: 48-71-32, 48-71-84
Telex: 038-410

PANAMA
Electrónico Balboa, S.A.
Aparatado 4929
Panama 5
Calle Samuel Lewis
Edificio "Alfa," No. 2
Ciudad de Panama
Tel: 64-2700
Telex: 3483103 Curundu,
Canal Zone
Cable: ELECTRON Panama

PERU
Compañía Electro Médica S.A.
Los Flamencos 145
San Isidro Casilla 1030
Lima 1
Tel: 41-4325
Telex: Pub. Booth 25424 SISIDRO
Cable: ELMED Lima

SURINAM
Surtel Radio Holland N.V.
Grote Hofstr. 3-5
P.O. Box 155
Paramaribo
Tel: 72118, 77880
Cable: Surtel

**TRINIDAD &
TOBAGO**
CARTEL
Caribbean Telecoms Ltd.
P.O. Box 732
69 Frederick Street
Port-of-Spain
Tel: 62-53068

URUGUAY
Pablo Ferrando S.A.C.el.
Avenida Italia 2877
Casilla de Correo 370
Montevideo
Tel: 40-3102
Telex: 702 Public Booth
Para Pablo Ferrando
Cable: RADIUM Montevideo

VENEZUELA
Hewlett-Packard de Venezuela C.A.
P.O. Box 50933
Caracas 105
Los Ruices Norte
3a Transversal
Edificio Segre
Caracas 107
Tel: 239-4133 (20 lines)
Telex: 25146 HEWPACK
Cable: HEWPACK Caracas

FOR AREAS NOT
LISTED,
CONTACT:
Hewlett-Packard Intercontinental
3495 Deer Creek Road
Palo Alto, California 94304
Tel: (415) 856-1501
TWX: 910-373-1260
Cable: HEWPACK Palo Alto
Telex: 034-8300, 034-8493

EUROPE,
NORTH AFRICA,
MIDDLE EAST

AUSTRIA
Hewlett-Packard Ges.m.b.H.
Wehlistrasse 29
P.O. Box 7
A-1205 **Vienna**
Tel: 35-16-21-0
Cable: HEWPACK Vienna
Telex: 13582/135066

Hewlett-Packard Ges.m.b.H.
Wehlistrasse, 29
A-1205 **Wien**
Tel: 35-16-21
Telex: 135066

BAHRAIN
Medical Only
Wael Pharmacy
P.O. Box 648
Bahrain
Tel: 54886, 56123
Telex: 8550 WAEL GJ
Cable: WAELPHARM

Al Hamidiya Trading and
Contracting
P.O. Box 20074
Manama
Tel: 259978, 259958
Telex: 8895 KALDIA GJ

BELGIUM
Hewlett-Packard Benelux S.A./N.V.
Avenue du Col-Vert, 1,
(Groenkraaglaan)
B-1170 **Brussels**
Tel: (02) 660 50 50
Cable: PALOBEN Brussels
Telex: 23-494 paloben bru

CYPRUS
Kypronics
19 Gregorios Xenopoulos Street
P.O. Box 1152
Nicosia
Tel: 45628/29
Cable: Kypronics Pandehis
Telex: 3018

CZECHOSLOVAKIA
Hewlett-Packard
Obchodni zastupitelstvi v CSSR
Pisemny styk
Post. schranka 27
CS 118 01 **Praha** 011
CSSR

Vyvojova a Provozni Zakladna
Vyzkumnych Ustavu v Bechovicich
CSSR-25097 **Bechovice u
Prahy**
Tel: 89 93 41
Telex: 12133

Institute of Medical Bionics
Vyskumny Ustav Lekarskej Bioniky
Jedlova 6
CS-88346 **Bratislava-
Kramare**
Tel: 44-551
Telex: 93229

DENMARK
Hewlett-Packard A/S
Datavej 52
DK-3460 **Birkerod**
Tel: (02) 81 66 40
Cable: HEWPACK AS
Telex: 37409 hpas dk

Hewlett-Packard A/S
Navervej 1
DK-8600 **Silkeborg**
Tel: (06) 82 71 66
Telex: 37409 hpas dk
Cable: HEWPACK AS

EGYPT
I.E.A.
International Engineering
Associates
24 Hussein Hegazi Street
Kasr-el-Aini
Cairo
Tel: 23 829
Telex: 93830
Cable: INTENGASSO

SAMITRO
Sami Amin Trading Office
18 Abdel Aziz Gawish
Abdine-Cairo
Tel: 24932
Cable: SAMITRO CAIRO

FINLAND
Hewlett-Packard Oy
Revontulentie, 7
SF-02100 **Espoo** 10
Tel: (90) 455 0211
Cable: HEWPACKOY
Telex: 121563 hewpa sf

FRANCE
Hewlett-Packard France
Zone d'activites de Courtaboeuf
Avenue des Tropiques
Boite Postale 6
91401 **Orsay**-Cédex
Tel: (1) 907 78 25
TWX: 600048F

Hewlett-Packard France
Chemin des Mouilles
B.P. 162
69130 **Ecully**
Tel: (78) 33 81 25
TWX: 310617F

Hewlett-Packard France
20, Chemin de La Cépière
31081 **Toulouse
Le Mirail**-Cédex
Tel: (61) 40 11 12

Hewlett-Packard France
Le Ligoures
Place Romée de Villeneuve
13100 **Aix-en-Provence**
Tel: (42) 59 41 02
TWX: 410770F

Hewlett-Packard France
2, Allee de la Bourgonette
35100 **Rennes**
Tel: (99) 51 42 44
TWX: 740912F

Hewlett-Packard France
18, rue du Canal de la Marne
67300 **Schiltigheim**
Tel: (88) 83 08 10
TWX: 890141F

Hewlett-Packard France
Immeuble péricentre
rue van Gogh
59650 **Villeneuve** D'Ascq
Tel: (20) 91 41 25
TWX: 160124F

Hewlett-Packard France
Bâtiment Ampère
Rue de la Commune de Paris
B.P. 300
93153 **Le Blanc Mesnil**-
Cédex
Tel: (01) 931 88 50
Telex: 211032F

Hewlett-Packard France
Av. du Pdt. Kennedy
33700 **Merignac**
Tel: (56) 97 01 81

Hewlett-Packard France
Immeuble Lorraine
Boulevard de France
91035 **Evry**-Cédex
Tel: 077 96 60
Telex: 692315F

Hewlett-Packard France
23 Rue Lothaire
57000 **Metz**
Tel: (87) 65 53 50

**GERMAN FEDERAL
REPUBLIC**
Hewlett-Packard GmbH
Vertriebszentrale Frankfurt
Berner Strasse 117
Postfach 560 140
D-6000 **Frankfurt** 56
Tel: (06011) 50041
Cable: HEWPACKSA Frankfurt
Telex: 04 13249 hpffm d

Hewlett-Packard GmbH
Technisches Büro Böblingen
Herrenberger Strasse 110
D-7030 **Böblingen,**
Württemberg
Tel: (07031) 667-1
Cable: HEWPACK Böblingen
Telex: 07265739 bbn

Hewlett-Packard GmbH
Technisches Büro Düsseldorf
Emanuel-Leutze-Str. 1 (Seestern)
D-4000 **Düsseldorf**
Tel: (0211) 5971-1
Telex: 085/86 533 hpdd d

Hewlett-Packard GmbH
Technisches Büro Hamburg
Kapstadtring 5
D-2000 **Hamburg** 60
Tel: (040) 63804-1
Cable: HEWPACKSA Hamburg
Telex: 21 63 032 hphh d

Hewlett-Packard GmbH
Technisches Büro Hannover
Am Grossmarkt 6
D-3000 **Hannover** 91
Tel: (0511) 46 60 01
Telex: 092 3259

Hewlett-Packard GmbH
Technisches Büro Nürnberg
Neumeyerstrasse 90
D-8500 **Nürnberg**
Tel: (0911) 52 20 83
Telex: 0623 860

SALES OFFICES (cont.)

EUROPE, NORTH AFRICA, MIDDLE EAST

Hewlett-Packard GmbH
Technisches Büro München
Eschenstrasse 5
D-8021 **Taufkirchen**
Tel: (089) 6117-1
Telex: 0524985

Hewlett-Packard GmbH
Technisches Büro Berlin
Kaithstrssse 2-4
D-1000 **Berlin** 30
Tel: (030) 24 90 86
Telex: 018 3405 hpbln d

GREECE
Kostas Karayannis
8 Omirou Street
Athens 133
Tel: 32 30 303/32/37 731
Telex: 21 59 62 RKAR GR
Cable: RAKAR ATHENS

ICELAND
Medical Only
Elding Trading Company Inc.
Hafnarnvoli - Tryggvagötu
P.O. Box 895
IS-**Reykjavik**
Tel: 1 58 20/1 63 03
Cable: ELDING Reykjavik

IRELAND
Hewlett-Packard Ltd.
King Street Lane
Winnersh, Wokingham
Berkshire, RG11 5AR
GB-England
Tel: (0734) 78 47 74
Telex: 847178
Cable: Hewpie London

Hewlett-Packard Ltd.
Kestrel House
Clanwilliam Place
Lower Mount Street
Dublin 2, Eire

Hewlett-Packard Ltd.
2C Avongberg Ind. Est.
Long Mile Road
Dublin 12
Tel: 514322/514224
Telex: 30439

Medical Only
Cardiac Services (Ireland) Ltd.
Kilmore Road
Artane
Dublin 5, Eire
Tel: (01) 315820

Medical Only
Cardiac Services Co.
95A Finaghy Rd. South
Belfast BT10 0BY
GB-Northern Ireland
Tel: (0232) 625566
Telex: 747626

ISRAEL
Electronics Engineering Div.
of Motorola Israel Ltd.
16, Kremenetski Street
P.O. Box 25016
Tel-Aviv
Tel: 38973
Telex: 33569, 34164
Cable: BASTEL Tel-Aviv

ITALY
Hewlett-Packard Italiana S.p.A.
Via G. Di Vittorio, 9
20063 **Cernusco Sul Naviglio** (MI)
Tel: (2) 903691
Telex: 334632 HEWPACKIT

Hewlett-Packard Italiana S.p.A.
Via Turazza, 14
35100 **Padova**
Tel: (49) 664888
Telex: 430315 HEWPACKI

Hewlett-Packard Italiana S.p.A.
Via G. Armellini 10
1-00143 **Roma**
Tel: (06) 54 69 61
Telex: 610514
Cable: HEWPACKIT Roma

Hewlett-Packard Italiana S.p.A.
Corso Giovanni Lanza 94
I-10133 **Torino**
Tel: (011) 659308
Telex: 221079

Hewlett-Packard Italiana S.p.A.
Via Principe Nicola 43 G/C
I-95126 **Catania**
Tel: (095) 37 05 04
Telex: 970291

Hewlett-Packard Italiana S.p.A.
Via Nuova san Rocco A
Capadimonte, 62A
80131 **Napoli**
Tel: (081) 710698

Hewlett-Packard Italiana S.p.A.
Via Martin Luther King, 38/111
I-40132 **Bologna**
Tel: (051) 402394
Telex: 511630

JORDAN
Mouasher Cousins Co.
P.O. Box 1387
Amman
Tel: 24907/39907
Telex: SABCO JO 1456
Cable: MOUASHERCO

KUWAIT
Al-Khaldiya Trading & Contracting
P.O. Box 830-Safat
Kuwait
Tel: 42 4910/41 1726
Telex: 2481 Areeg kt
Cable: VISCOUNT

LUXEMBURG
Hewlett-Packard Beneluz S.A./N.V.
Avenue du Col-Vert, 1
(Groenkraaglaan)
B-1170 **Brussels**
Tel: (02) 660 5050
Cable: PALOBEN Brussels
Telex: 23 494

MOROCCO
Dolbeau
81 rue Karatchi
Casablanca
Tel: 3041 82
Telex: 23051/22622
Cable: MATERIO

Gerep
2, rue d'Agadir
Boite Postal 156
Casablanca
Tel: 272093/5
Telex: 23 739
Cable: GEREP-CASA

NETHERLANDS
Hewlett-Packard Benelux N.V.
Van Heuven Goedhartlaan 121
P.O. Box 667
1181KK **Amstelveen**
Tel: (20) 47 20 21
Cable: PALOBEN Amsterdam
Telex: 13 216

NORWAY
Hewlett-Packard Norge A/S
Ostendalen 18
P.O. Box 34
1345 **Osteraas**
Tel: (02) 1711 80
Telex: 16621 hpnas n

Hewlett-Packard Norge A/S
Nygaardsgaten 114
P.O. Box 4210
5013 Nygaardsgaten,
Bergen
Tel: (05) 21 97 33

POLAND
Biuro Informacji Technicznej
Hewlett-Packard
Ul Stawki 2, 6P
PL00-950 **Warszawa**
Tel: 39 59 62, 39 51 87
Telex: 81 24 53

PORTUGAL
Telectra-Empresa Técnica de
Equipamentos Eléctricos S.a.r.l.
Rua Rodrigo da Fonseca 103
P.O. Box 2531
P-**Lisbon** 1
Tel: (19) 68 60 72
Cable: TELECTRA Lisbon
Telex: 12598

Medical Only
Mundinter
Intercambio Mundial de Comércio
S.a.r.l.
P.O. Box 2761
Avenida Antonio Augusto
de Aguiar 138
P-**Lisbon**
Tel: (19) 53 21 31/7
Telex: 16691 munter p
Cable: INTERCAMBIO Lisbon

QATAR
Nasser Trading & Contracting
P.O. Box 1563
Doha
Tel: 22170
Telex: 4439 NASSER
Cable: NASSER

ROMANIA
Hewlett-Packard Reprezentanta
Bd.n. Balcescu 16
Bucuresti
Tel: 15 80 23/13 88 85
Telex: 10440

SAUDI ARABIA
Modern Electronic
Establishment (Head Office)
P.O. Box 1228, Baghdadiah Street
Jeddah
Tel: 27 798
Telex: 40035
Cable: ELECTA JEDDAH

Modern Electronic Establishment
(Branch)
P.O. Box 2728
Riyadh
Tel: 62596/66232
Telex: 202049

Modern Electronic Establishment
(Branch)
P.O. Box 193
Al-Khobar
Tel: 44678-44813
Telex: 670136
Cable: ELECTA AL-KHOBAR

SPAIN
Hewlett-Packard Española, S.A.
Calle Jerez 3
E-**Madrid** 16
Tel: (1) 458 26 00 (10 lines)
Telex: 23515 hpe

Hewlett-Packard Española S.A.
Colonia Mirasierra
Edificio Juban
c/o Costa Brava, 13
Madrid 34

Hewlett-Packard Española, S.A.
Milanesado 21-23
E-**Barcelona** 17
Tel: (3) 203 6200 (5 lines)
Telex: 52603 hpbe e

Hewlett-Packard Española, S.A.
Av Ramón y Cajal, 1
Edificio Sevilla, planta 9°
E-**Sevilla** 5
Tel: 64 44 54/58

Hewlett-Packard Española S.A.
Edificio Albia II 7° B
E-**Bilbao** 1
Tel: 23 83 06/23 82 06

Hewlett-Packard Española S.A.
C/Ramon Gordillo 1
(Entlo.)
E-**Valencia** 10
Tel: 96-361.13.54/361.13.58

SWEDEN
Hewlett-Packard Sverige AB
Enighetsvägen 3, Fack
S-161 **Bromma** 20
Tel: (08) 730 05 50
Telex: 10721
Cable: MEASUREMENTS
Stockholm

Hewlett-Packard Sverige AB
Frötallsgatan 30
S-421 32 **Västra Frölunda**
Tel: (031) 49 09 50
Telex: 10721 via Bromma office

SWITZERLAND
Hewlett-Packard (Schweiz) AG
Zürcherstrasse 20
P.O. Box 307
CH-8952 **Schlieren-Zürich**
Tel: (01) 7305240
Telex: 53933 hpag ch
Cable: HPAG CH

Hewlett-Packard (Schweiz) AG
Château Bloc 19
CH-1219 **Le Lignon-Geneva**
Tel: (022) 96 03 22
Telex: 27333 hpag ch
Cable: HEWPACKAG Geneva

SYRIA
General Electronic Inc.
Nuri Basha-Ahnaf Ebn Kays Street
P.O. Box 5781
Damascus
Tel: 33 24 87
Telex: 11215 ITIKAL
Cable: ELECTROBOR DAMASCUS

Medical only
Sawah & Co.
Place Azmé
B.P. 2308
Damascus
Tel: 16 367- 19 697- 14 268
Telex: 11304 SATACO SY
Cable: SAWAH, DAMASCUS

Suleiman Hilal El Mlawi
P.O. Box 2528
Mamoun Bitar Street, 56-58
Damascus
Tel: 11 46 63
Telex: 11270
Cable: HILAL DAMASCUS

TUNISIA
Tunisie Electronique
31 Avenue de la Liberte
Tunis
Tel: 280 144

Corema
1 ter. Av. de Carthage
Tunis
Tel: 253 821
Telex: 12319 CABAM TN

TURKEY
TEKNIM Company Ltd.
Riza Sah Pehlevi
Caddesi No. 7
Kavaklidere, **Ankara**
Tel: 275800
Telex: 42155

Teknim Com., Ltd.
Barbaros Bulvari 55/12
Besikyas, **Istanbul**
Tel: 613 546
Telex: 23540

E.M.A.
Muhendislik Kollektif Sirketi
Mediha Eldem Sokak 41/6
Yüksel Caddesi
Ankara
Tel: 17 56 22
Cable: EMATRADE/Ankara

Yilmaz Ozyurek
Milli Mudafaa Cad 16/6
Kizilay
Ankara
Tel: 25 03 09 - 17 80 26
Telex: 42576 OZEK TR
Cable: OZYUREK ANKARA

UNITED ARAB EMIRATES
Emitac Ltd. (Head Office)
P.O. Box 1641
Sharjah
Tel: 354121/3
Telex: 8136

Emitac Ltd. (Branch Office)
P.O. Box 2711
Abu Dhabi
Tel: 331370/1

UNITED KINGDOM
Hewlett-Packard Ltd.
King Street Lane
Winnersh, Wokingham
Berkshire RG11 5AR
GB-England
Tel: (0734) 784774
Telex: 84 71 78/9

Hewlett-Packard Ltd.
Fourier House,
257-263 High Street
London Colney
St. Albans, Herts
GB-England
Tel: (0727) 24400
Telex: 1-8952716

Hewlett-Packard Ltd.
Trafalgar House
Navigation Road
Altrincham
Cheshire WA14 1NU
GB-England
Tel: (061) 928 6422
Telex: 668068

Hewlett-Packard Ltd.
Lygon Court
Hereward Rise
Dudley Road
Halesowen,
West Midlands, B62 8SD
GB-England
Tel: (021) 501 1221
Telex: 339105

Hewlett-Packard Ltd.
Wedge House
799, London Road
Thornton Heath
Surrey, CR4 6XL
GB-England
Tel: (01) 684-0103/8
Telex: 946825

Hewlett-Packard Ltd.
14 Wesley St
Castleford
Yorks WF10 1AE
Tel: (0977) 550016
TWX: 5557335

Hewlett-Packard Ltd.
Tradax House
St. Mary's Walk
Maidenhead
Berkshire, SL6 1ST
GB-England

Hewlett-Packard Ltd.
Morley Road
Staplehill
Bristol, BS16 4QT
GB-England

Hewlett-Packard Ltd.
South Queensferry
West Lothian, EH30 9TG
GB-Scotland
Tel: (031) 331 1188
Telex: 72682

Hewlett-Packard Ltd.
Kestrel House
Clanwilliam Place
Lower Mount Street
Dublin 2, Eire

Hewlett-Packard Ltd.
2C Avonberg Ind. Est.
Long Mile Road
Dublin 12
Tel: 514322/514224
Telex: 30439

USSR
Hewlett-Packard
Representative Office
USSR
Pokrovsky Boulevard 4/17-kw 12
Moscow 101000
Tel: 294.20.24
Telex: 7825 hewpak su

YUGOSLAVIA
Iskra Commerce, n.sol.o.
Zastopstvo Hewlett-Packard
Obilicev Venac 26
YU 11000 **Beograd**
Tel: 636-955
Telex: 11530

Iskra Commerce, n.sol.o.
Zastopstvo Hewlett-Packard
Miklosiceva 38/VII
YU-61000 **Ljubljana**
Tel: 321-674, 315-879
Telex: 31583   9/79