



# Helios II

*User's Manual*

Processor Technology



# Helios II

## User's Manual

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Corporation**

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Please read Section 2, "Unpacking and Installation" before unpacking any further and before you start using your Helios II.



Helios II, Model 2: Diskette Drive Cabinet, Controller and Formatter PCBs and Diskette containing PTDOS

# CONTENTS

SECTION		PAGE
1	INTRODUCTION	
1.1	SCOPE OF THIS MANUAL . . . . .	1-1
1.2	THE FLOPPY CONCEPT . . . . .	1-1
1.2.1	Diskettes, the Hard and the Soft of It . . . . .	1-2
1.2.2	Further Advantages of the Floppy . . . . .	1-2
1.3	THE HELIOS FLOPPY . . . . .	1-3
1.3.1	How It Works . . . . .	1-3
1.3.2	Physical Configuration of the Helios . . . . .	1-3
1.3.3	Two Heads are Better than One. . . . .	1-3
1.4	THE HELIOS CONTROLLER . . . . .	1-4
1.4.1	How the Controller Formats the Data . . . . .	1-6
2	UNPACKING AND INSTALLATION	
2.1	UNPACKING INSPECTION . . . . .	2-1
2.2	SETTING UP AND PLUGGING IN THE CONTROLLER BOARDS . . . . .	2-3
2.3	OBSERVING THE POLARITY OF THE CABLE CONNECTORS . . . . .	2-3
2.4	CONNECTING THE CABLES . . . . .	2-4
3	CARE AND HANDLING OF DISKETTES	
3.1	ALL YOU EVER WANTED TO KNOW ABOUT DISKETTES . . . . .	3-1
3.1.1	When You Order More Diskettes . . . . .	3-1
3.2	PRELIMINARY HANDLING TIPS . . . . .	3-1
3.3	LOADING AND UNLOADING THE DISKETTE . . . . .	3-3
3.4	WRITE PROTECTION . . . . .	3-4
4	GETTING ACQUAINTED	
4.1	SYSTEM REQUIREMENTS . . . . .	4-1
4.2	JARGON OF THE TRADE . . . . .	4-2
4.3	AT THE CONTROLS . . . . .	4-3
4.4	BELLS, WHISTLES, AND LIGHTS. . . . .	4-5

5	LOADING PTDOS THE POWERFUL	
5.1	ORIENTATION . . . . .	5-1
5.2	THE COUNTDOWN . . . . .	5-1
5.3	BOOTSTRAPPING IN THE RESIDENT PTDOS. . . . .	5-2
5.4	TO BOOT OR NOT TO BOOT . . . . .	5-2
6	MAINTENANCE	
	SAFETY WARNING . . . . .	6-1
6.1	THIS COULD BE THE MOST IMPORTANT SECTION IN THE WHOLE BOOK . . . . .	6-1
	YET ANOTHER WARNING . . . . .	6-1
6.2	REGULAR CLEANING . . . . .	6-1
	6.2.1 Cleaning Air Filters. . . . .	6-2
	6.2.2 Cleaning Outside Surfaces of the Cabinet. . . . .	6-2
6.3	RECOMMENDED CHECKS, INSPECTIONS, AND TESTS . . . . .	6-2
6.4	DO NOT REPLACE DEFECTIVE DIP DEVICES. . . . .	6-3
6.5	BASIC TROUBLE-SHOOTING, VERY BASIC . . . . .	6-3
	6.5.1 Electrical Continuity and Supply Check . . . . .	6-3
	6.5.2 Controller and Drive Continuity Check . . . . .	6-3
	6.5.3 Seek, Read, and Write Errors Encountered . . . . .	6-3

**FIGURES**

Frontispiece	Helios II, Model 2: Diskette Drive Cabinet, Controller Modules, and Diskette	
1-1	Helios II System, Generalized Block Diagram . . . . .	1-5
2-1	System Assembly, Interconnect Diagram . . . . .	2-2
3-1	Floppy Disk Handling and Storage . . . . .	3-2
3-2	Diskette Orientation for Loading . . . . .	3-4
4-1	Helios Terminology . . . . .	4-2
4-2	Helios II Indicator Panel, Model 2. . . . .	4-4
4-3	Helios II Indicator Panel, Model 4. . . . .	4-4

# SECTION 1

## INTRODUCTION

### 1.1 SCOPE OF THIS MANUAL

This is a simple operating and light maintenance manual for users of the Helios II floppy disk memory system, models 2 and 4. Its complementary manual is the system software manual, *PTDOS User's Manual*. (PTDOS stands for "Processor Technology Disk Operating System.") Your dealer has a third manual, a complete set of technical information and drawings, to help keep your Helios II in top condition. If you have need of the technical manual, you may order it through your dealer.

The first five sections of this manual will give you all the information you need to get your Helios II on-line. Section 1, the remainder of this section, is a layman's introduction to the concept of the floppy disk memory in general and the Helios II in particular.

Section 2, *Unpacking and Installation*, will guide you from opening the box to hooking up and plugging in the components and cabling of the system.

Section 3, *Care and Handling of Diskettes*, deliberately interrupts the manual because the diskette is so critical to the floppy disk system. We want to be sure that you read this section before you get too involved with your Helios.

Section 4, *Getting Acquainted*, introduces essential terminology that is required to prevent attempts at identifying and referring to the multiple diskette slots, from turning into a towering babel. It also tabulates the system requirements, controls and indicators.

Section 5, *Loading PTDOS*, provides operating instructions which culminate in bootstrap loading PTDOS. From there on you will be able to begin reading *PTDOS User's Manual* which is in a different volume.

Section 6, *TLC for Your Helios*, provides some light maintenance and trouble-shooting tips which you should read at least before the first calendar quarter that you shall have owned your Helios II. Preferably, you will read Section 6 before the sun sets on the first day of using your Helios.

### 1.2 THE FLOPPY CONCEPT

Floppy disk memory systems are designed to supplement and complement the solid state memory that resides inside the computer (mainframe memory). Since a floppy is a distinct entity outside the mainframe of the computer, it is in the category of devices called "peripherals."

Solid state memory is always at a premium in a computer system because it is relatively expensive, and space, power and interconnections must be provided for it. Floppies, on the other hand, have vast storage capacity at a relatively cheap cost and can be easily added as peripherals.

Solid state memory (except core and bubble memory) is not normally used for mass storage of data because it is too expensive and it is *volatile*. "Volatile" means that it dissipates into oblivion when DC power is removed. In contrast, the floppy stores programs and data on

magnetic media which is non-volatile. The floppy storage media, called diskettes, can be taken out of the system and stored in a library while other diskettes can be taken from the library and inserted on-line. Diskettes written on one Helios diskette drive can be read on any other Helios drive.

### **1.2.1 Diskettes, the Hard and the Soft of It**

The diskette is a thin, flexible, plastic disk, 20 cm in diameter (8 inches), covered with magnetic oxide which can be magnetically recorded, played back, and erased. The recorded surface can be read by a read/write head without erasing or changing the recorded data. The magnetic disk is permanently enclosed in a protective, semi-rigid plastic jacket which contains a liner material to clean the disk as it freely turns within, when it is loaded onto the drive spindle. Like a 45 rpm record on a runaway turntable, the diskette spins at 360 rpm while the electromagnetic head gently senses or induces the encoded data through a slot in the diskette jacket.

The Helios diskette is the "firm-sectored" disk type which means that the system locates and identifies recording areas by combining "hard" and "soft" formatting methods. The hard method is that the "hardware" in the drive assembly reads small, mechanical holes formed in the diskette. Arranged in a ring around the large central spindle hole, these sector and index holes, as they are called, serve as reference markers for a beam of light which is directed through them when the diskette is turning. The light beam is sensed by the drive and produces a signal which is used by the system to identify individual sectors of the diskette.

In the soft method, the individual recording areas are located by recording and reading back identifying codes on the diskette. The "firm-sectored" system finds and identifies sectors by counting the sector holes (this is the hard method) and then records more identifying information in the first part of the first sector of each block of data (this is the soft method). Since the sector-identifying data takes up considerable portions of the diskette, the firm-sectored system can load the diskette with more useable data by using less of the recording area for records-keeping and more for message data.

Other advantages of the firm-sectored system are higher speed and reliability, but the most significant advantage of the "firm-sectored" system is that it makes it possible for the Helios to vary the size the basic record in which data is recorded. The basic record is called a "block." Large blocks transfer fast between the diskette and the rest of the system; small blocks provide for many open files in a system.

Data is recorded on only one side of the diskette although there are provisions for double-sided recording built into the hardware. The importance of the diskette in the floppy system is critical. All of Section 3 of this manual is devoted to the care and handling of diskettes.

Incidentally, the diskette gives the floppy its name; the disk substrate used for the magnetic media in a floppy is flexible as opposed to the original "hard" disk system media which is rigid. This flexibility enables the floppy's read/write head to ride in contact with the media. This head-to-media contact is, in turn, the source of the floppy's low cost compared with the hard disk systems which must "fly" their heads scant microns above the disk surface.

### **1.2.2 Further Advantages of the Floppy**

Often a floppy will be acquired in order to upgrade a system by replacing a cassette tape player. A floppy reads and writes data far faster than tape drives because it is virtually a random access memory whereas tape drives are linear access memories. Linear access means that the data is stored sequentially along the tape. To get to data that is located, let's say, in the middle of the tape, the read/write head must wait until the transport has wound or unwound the tape to the spot: all the data between the present location of the head and the desired data must be traversed to get to the desired data. Once the head is positioned, if the computer needs to add any data in between existing fields, large extents of the tape may have to be entirely rewritten to make room for the new data.



Any location in random access memories can be addressed directly. A floppy is not a true random access because, first, it steps the head across the diskette to the desired track in about 55 ms average for the Helios. It loads the head in less than 40 ms. Then the head usually must wait until the proper sector on a given track has spun around beneath the head (83 ms average). That totals about 178 ms (0.178 seconds) average access time to any data on the diskette.

Naturally, the advantages don't come without tradeoffs. A floppy is much slower than solid state memory, or even hard disk memory. A floppy is a complex and sensitive electromechanical device with a lot of moving parts. All in all, however, the floppy is a great advantage in many computer systems.

### **1.3 THE HELIOS FLOPPY**

#### **1.3.1 How It Works**

The heart of the Helios II is the floppy diskette drive assembly, which is something like a tape recorder transport with electromagnetic heads and electronics which read and write digital data on the diskette and other electronics which control the operations of the transport and head positioning and report operational information and error messages to the system.

The read/write heads step inward and outward on an arm positioned over the diameter of the diskette which meanwhile is spinning more than ten times faster than a 33 rpm phonograph record. The recording areas on the diskette are arranged in 77 concentric circles, called tracks. The drive assembly watches a calibrated etched glass scale to tell over which concentric track it is positioning the head. When it is over the selected track, it lowers the head so that the head rides the track until it has written or read the desired data. The head is loaded, under software control, by the drive pressing the head, on its armature, into the disk.

Imagine that the diskette is further divided into 16 pie-shaped sections. Exactly on the center of each imaginary line dividing the pie slices is a mechanical hole. This ring of 16 holes is read by a photocell to tell the drive over which pie-section it is positioning the head. (Actually, there are 32 holes but half are not used by the Helios II.)

That portion of each track which falls within a given pie-section is called a sector. By counting these sector mark holes as sensed by the diskette drive, the Helios identifies the location of recorded data on any one of 1,232 different sectors. For example, track 77, sector 16. The drive provides the raw information to the system controller (the two circuit boards that plug into the computer) which performs the calculations and administers the operations. We will discuss the controller further but for now we must get back to the diskette drive.

#### **1.3.2 Physical Configuration of the Helios**

The diskette drive is contained in the large cabinet of Helios, as you may have guessed, behind the diskette slots on the front panel. To tell you what operation the Helios is performing on which of its units and if AC power is applied, there is an indicator panel on the front of the drive cabinet which lights up with LEDs (Light Emitting Diodes). If you have a Model 4 Helios, you will have two dual drives, one on either side of the indicator panel, which has two more LEDs. Inside the drive cabinet at the back of the drive(s) is the power supply which converts your household wall power from AC to DC so that it can be used by the drive(s), the indicator panel, and the fan(s) which is mounted on the rear panel. Cooling air is drawn into the cabinet and exhausted out the diskette slots. On the front panel of the drive cabinet, there is a keyswitch to turn the AC power on and off, the diskette unit slots, and an eject button for each diskette unit.

#### **1.3.3 Two Heads Are Better Than One**

Each Helios diskette drive assembly is a *dual* drive; that is, there are two diskette slots in each drive assembly in the cabinet. The most obvious advantage of a dual drive over a single unit floppy is double capacity: there are twice the diskettes available to the system. But the Helios design goes deeper. The Helios drive has two separate read/write heads, but these two heads share many of the same drive mechanisms, thereby achieving the double capacity without

doubling the number of drives, which makes the capacity more economical. Two diskette units make it possible to copy directly from one diskette to the another without storing the data to be copied in the computer memory and then shuffling diskettes in and out of a single slot. Copying makes it possible to easily "back up" files as a safety precaution. Two diskette units are convenient in a processing system which puts different types of files on different diskettes and then must move data from one file to another, or in a word processing system which requires editing from one diskette to another. One diskette can be removed or exchanged with another while the diskette in the other unit is being edited.

#### **1.4 THE HELIOS CONTROLLER**

(Refer to Fig 1-1, Helios II System, Generalized Block Diagram.)

A flat "ribbon" cable connects signals between the drive cabinet and the Helios controller assembly which resides in the S-100 backplane of your system. The controller assembly consists of two printed circuit board modules which are logically and virtually one unit packaged in two modules. They occupy adjoining slots in the computer backplane and are connected by ribbon cable. One module is called the Controller and the other is called the Formatter. In this discussion we shall refer to them collectively as "the controller."

The controller gets its name from the fact that it tells the diskette drive when and where to read and write and that it takes from the computer's memory the data which the computer wishes to write to disk, in the form of "blocks," which PTDOS uses and formats the blocks into sectors which the drive can understand. When PTDOS wants to get some blocks off the diskette, it sends a request with the address of the blocks to the controller; the controller tells the drive where to position its head, when to read the sectors, and when to stop. The controller then transfers the blocks to the computer's memory. The controller also keeps the computer posted with operational reports including possible failures which may occur.

The controller is the interface, or "translator" between the diskette drive, which is relatively slow and the computer which is relatively fast. The diskette drive can read and write about 31 kilobytes per second. The controller temporarily stores the data as it comes off the diskette and when the computer gives a sign that it is available to receive some of this data, the controller bursts it out to the computer at 0.66 megabytes per second, roughly 21 times faster than it reads it from the diskette drive! (A megabyte is a million bytes.) The controller reads from the computer and writes to the diskette drive in the same way. The fantastic speed of the controller saves the computer time to do other operations.

The controller does not have to read and write data from and to the computer's central processing unit (CPU). It reads and writes directly to the computer's memory. All it needs is a few brief signals from the CPU. This is called Direct Memory Access (DMA). This also saves the computer time, since the computer does not have to channel the data through itself, and when it wants to access the transferred data, it can go directly to its high-speed memory.

How does the controller bypass the central processing unit of the computer? It uses a system of 100 parallel wires called a bus, an industry standard called the S-100 bus. The controller is ranked as a full-fledged processor itself and, following bus protocol, when other devices have relinquished the use of the bus, it takes control of the bus to perform its transmissions.

The controller can manage up to four Helios dual drive units (for example, two Model 4's) which would provide a system with an immediately accessible data storage of 3.075 megabytes.

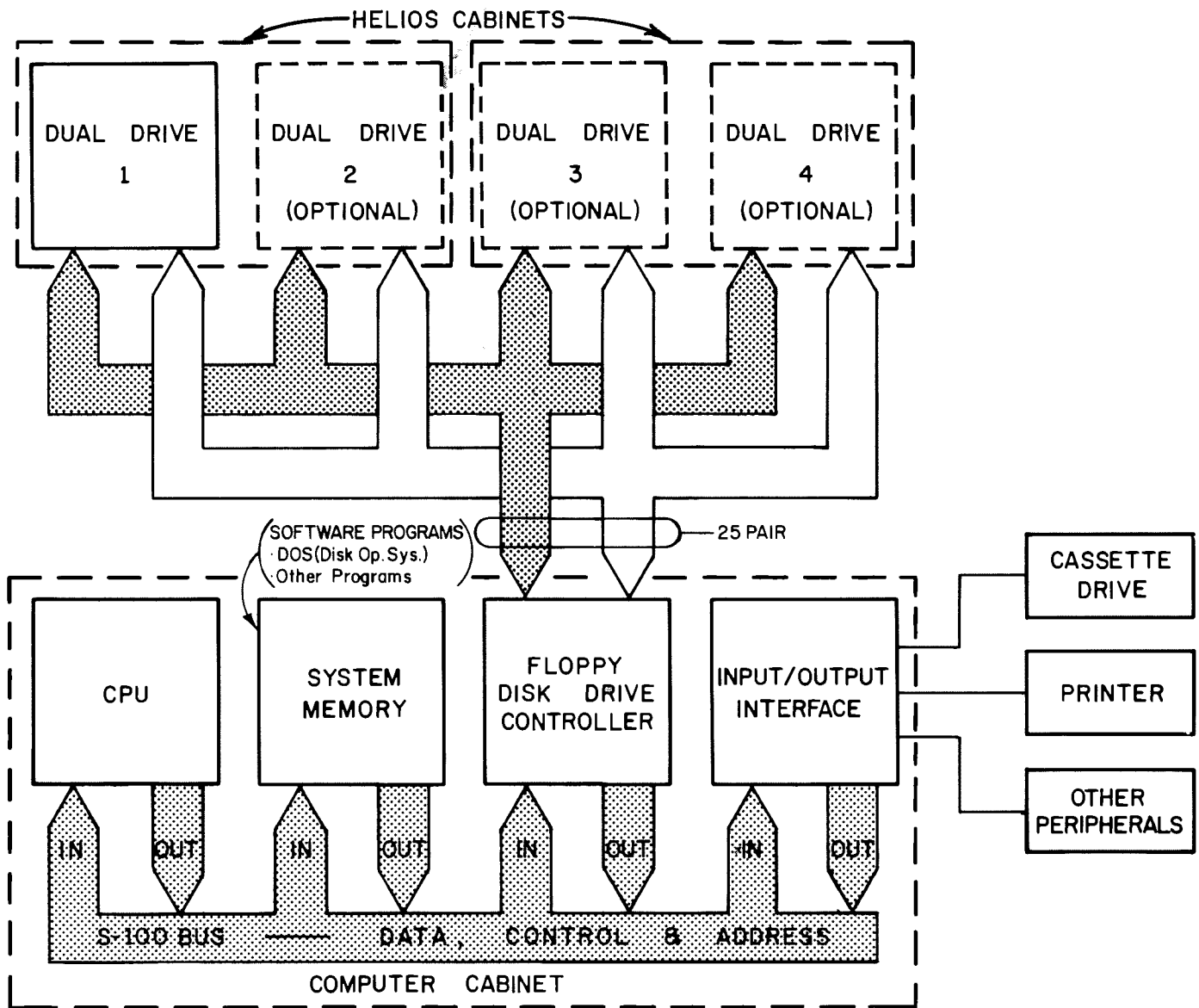


Fig. 1-1. Helios II System, Generalized Block Diagram

#### 1.4.1 How the Controller Formats the Data

Data is moved between the computer memory and the controller in blocks of variable length determined by PTDOS but within the range of capability of the controller and the drive. Each block has a "header" and a "tailer," so to speak. The header contains the track number and sector number and various other information about the data. It is about 48 bytes long. The tailer (19 bytes or more, depending on the block size) contains all zeros which give the controller time to get ready for the next sector. Together, the header and the tailer are referred to as the "intersector gap" or "inter-record gap."

Naturally, the data message, called text, is sandwiched between the head and tail. The text can be a block sized a maximum of 256 bytes if it is to fit within one sector. Formatted in this way, a diskette would contain 315,000 bytes. However, by virtue of the firm-sectored capability of the Helios, the controller knows where the end and the beginning of the sectors are, and, therefore, can continue writing a much longer block by using two or more contiguous sectors, as long as the block lies entirely within a given track. The controller can handle a block up to 4,095 bytes long. Writing a block of this length, the controller takes up 13 sectors on a track, leaving 3 sectors free.

Using this firm-sectored recording scheme, a greater capacity is achieved because the recording space that would ordinarily be taken up with headers and tails in a fixed block length system (a soft-sectored system), can be used for text, since no matter how large or small the block size, the header and tailer remain the same length. The maximum packing scheme available to the software is two blocks per track, each eight sectors long, totaling 384,384 bytes per diskette.

Since the Helios system uses some soft-sectoring, blank diskettes must be pre-written with headers to aid the identification of the sectors. Essentially, the system writes the entire diskette with dummy blocks one sector long. This is called formatting. PTDOS does this when it runs a certain form of the operation DISKCOPY. This primitive format enables the system to write to the diskette swiftly without elaborate preparation since the controller can get its bearings from the primitive format. The procedure for formatting blank diskettes is given in *PTDOS User's Manual*.

## SECTION 2

### UNPACKING AND INSTALLATION

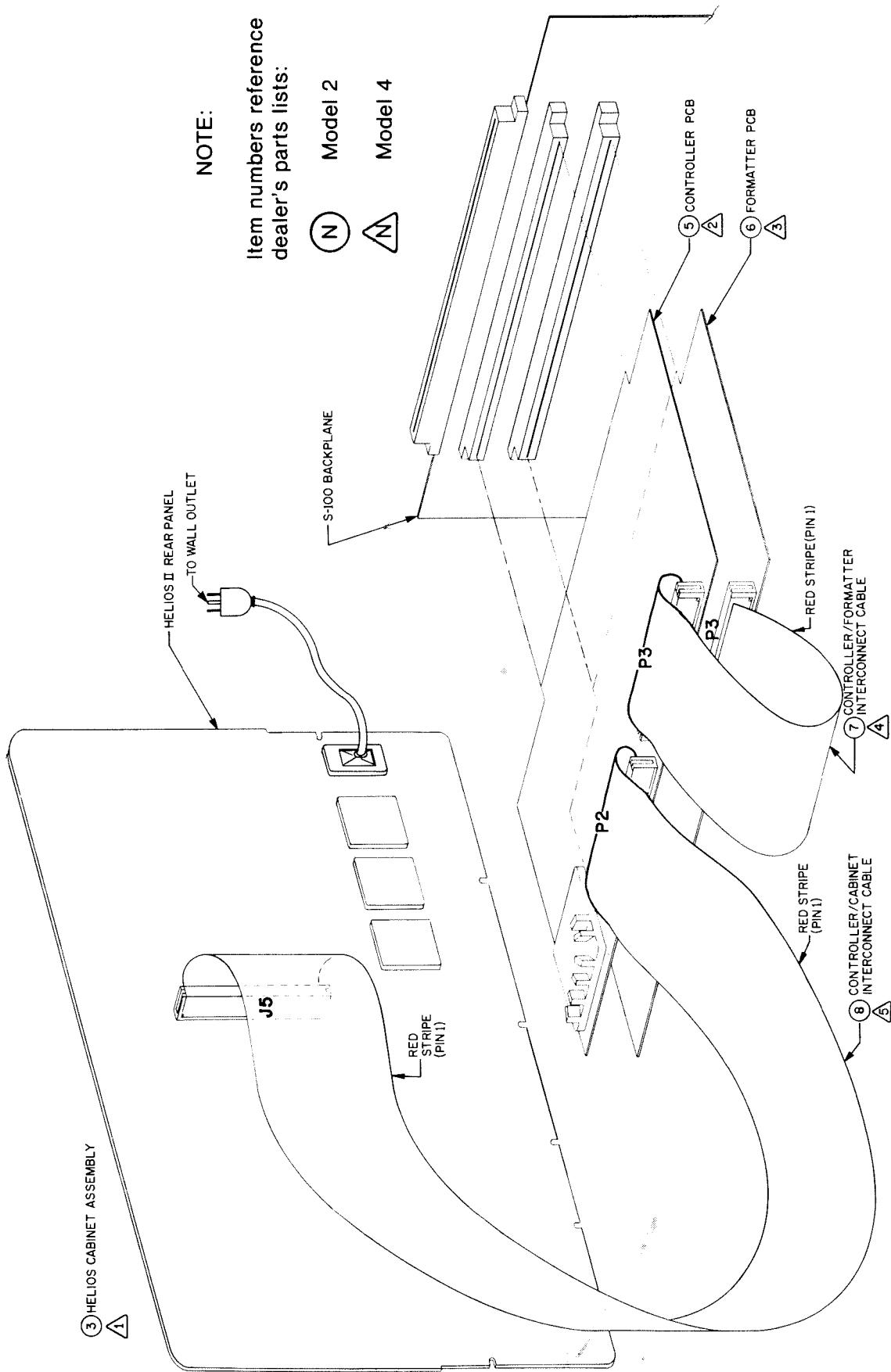
#### 2.1 UNPACKING INSPECTION

- 1) Choose a clear, clean, flat area to unpack.
- 2) Inspect for shipping damage. If damage is detected, contact the carrier and your dealer immediately. Describe the condition of both the shipping container and its contents.
- 3) Do *not* pull the cardboard retainers out of the diskette slots. Wait until you have read Section 5, Loading PTDOS. The cardboard must be ejected by the drive when AC power is applied.
- 4) Check the contents of the shipment against the following list. If any item is missing, notify your dealer.
  - a. Helios II cabinet(s) with 2 keys.
  - b. Controller circuit board.
  - c. Formatter circuit board.
  - d. Cable Assembly, Controller/Formatter.
  - e. Cable Assembly, Controller/Cabinet(s).
  - f. *Helios II Disk Memory System User's Manual* (this manual).
  - g. *PTDOS User's Manuals* (a book describing all PTDOS software.)
  - h. *Extended Disk BASIC User's Manual*.
  - i. Diskette, containing PTDOS and other programs.
  - j. Diskette, blank.
  - k. Warranty Registration Card

#### NOTE

*If you have purchased a Sol computer system containing one or more Helios II cabinets, compare the contents of the shipment package(s) against the list(s) in the Sol Terminal Computer User's Manual, instead of the above list.*

- 5) Fill out the warranty card and mail it. Be sure to fill out completely each and every warranty card you receive. There should be one card for each hardware product in your system. When registered with Processor Technology, the warranty cards not only establish you as the owner but also make it possible for Processor Technology to send you important new information about your system.
- 6) When you have unpacked your Helios, go to the next section in the manual. Do not play with your Helios II yet.



**NOTE:**  
 Item numbers reference  
 dealer's parts lists:  
 (N) Model 2  
 (N) Model 4

**Fig. 2-1. System Assembly, Interconnect Diagram**

## 2.2 SETTING UP AND PLUGGING IN THE CONTROLLER BOARDS

1) If your Helios is a 220/240 VAC version, check with your dealer to assure that it is wired to run on the local AC supply. These models come from the factory wired for 220; some minor wiring adjustments must be made to run on 240. Also, check to see if the appropriate local AC linecord outlet plug is installed.

2) Position the disk drive unit in the working area so that you can easily insert and remove diskettes. Do *not* plug in the AC linecord yet.

3) Make sure the fan opening(s), on the rear panel, is unobstructed, allowing adequate air flow. There should be at least six inches of free space all around the fan opening and disk slots.

4) Be sure that the power ON/OFF switches for both the Helios cabinet(s) and the host computer are OFF and that their AC linecords are disconnected.

5) Partially insert the formatter in the second from the top S-100 backplane slot (in the Sol); do not push the formatter in all the way yet because its cable must be connected.

6) Insert the controller circuit board in the top slot and push it in all the way. This will allow for the interconnecting cable to lie flat in the space between the controller circuit board and the Sol cover. This arrangement will also provide for the controller circuit board to dissipate its considerable heat. (Refer to Fig. 2-1, System Assembly, Interconnect Diagram.)

Do *NOT* position the controller and formatter circuit boards so that their connecting signal cable must be wedged between two boards. This may cause the signal cable to be punctured by the component leads and may also cause the boards to bow outward unless the cable is creased in a particular spot. (For proper cable orientation, refer to Fig. 2-1, System Assembly, Interconnect Diagram.)

### NOTE

*The formatter circuit board receives only DC power from the S-100 backplane. DC power can also be supplied to the formatter circuit board through its 5-pin connector P2. The formatter circuit board, therefore, does not have to be plugged into the computer backplane to function. If you wish to make use of this option, ask your dealer to provide you with the necessary equipment and information.*

## 2.3 OBSERVING THE POLARITY OF THE CABLE CONNECTORS

(Refer to Fig. 2-1, System Assembly, Interconnect Diagram.)

Take care to observe the correct polarity of the mating connectors. Triangular arrowheads are molded on matching ends of the connectors to indicate the polarity.

In addition to the arrowhead polarity indicators, there are two other aids in matching the polarity of the connectors. The pin numbers are molded (embossed) along their respective pin jacks on the face of the cable connectors. A colored stripe along one edge of the flat signal cable indicates the pin-1 signal line.

The connectors on the ends of the signal cables are designed to mate with the connectors on the formatter and controller circuit boards only one way. This is accomplished by the fact that Pin 15 of the P3 jacks on both PCBs are removed. Pin 31 of P2 on the controller PCB and J5 of the drive cabinet are also removed. Tiny polarizing plugs are inserted in the mating female connectors at the corresponding pin numbers to prevent putting the connectors together backwards.

## **2.4 CONNECTING THE CABLES**

(Refer to Fig. 2-1, System Assembly, Interconnect Diagram.)

- 1) Be sure that the controller and formatter circuit boards are positioned according to subsection 2.2, "Setup and Installation."
- 2) Select the controller/formatter interconnect cable (a flat signal cable about 10 inches long.)
- 3) Observing the proper pin polarity, orient the cable so that it is extending out from P3 (away from the computer). The color stripe should be on the side of the connector which is opposite the heatsink (to the right of the circuit board looking from the rear of the Sol.)
- 4) Plug the connector on the appropriate end of the cable into P3 of the formatter circuit board.
- 5) Observing the same pin polarity, connect the other end of the cable to P3 of the controller circuit board.
- 6) Push the formatter all the way into the backplane connector. Be sure that both circuit boards are securely plugged into the backplane.
- 7) Select the controller/cabinet signal cable (a flat 50-pin signal cable about 5 ft. long). Plug one end of this cable onto P2 of the controller circuit board and the other end onto J5 on the rear panel of the drive cabinet.
- 8) Fold the loop of the controller/formatter cable down flat on top the controller circuit board.
- 9) Replace the computer's cover.
- 10) Be sure that the cabinet end of the AC linecord is plugged into the 3-pin receptacle at the lower right-hand corner of the rear panel of the Helios cabinet.
- 11) If you have a 240 VAC version of the Helios II, is it wired properly? (See the first step of Section 2.2.)
- 12) Be sure that the Helios front panel keyswitch is turned OFF.
- 13) Plug the outlet end of the AC linecord into the power outlet.

Next read Section 3, Care and Handling of Diskettes.



## SECTION 3

### CARE AND HANDLING OF DISKETTES

#### 3.1 ALL YOU EVER WANTED TO KNOW ABOUT DISKETTES

We interrupt these instructions to draw to your attention the critical importance of the care and handling of diskettes. Please read this entire section before handling diskettes or operating the Helios.

##### 3.1.1 When You Order More Diskettes

Use *only* diskettes approved by Processor Technology. Ask your dealer for a list of approved diskettes. The diskette is 20 cm in diameter (eight inches). It is the hard-sectored type which must have 32 sector holes (plus one index hole), which are visible through the small hole near the spindle hole. (Refer to Fig. 3-2, Diskette Orientation for Loading.)

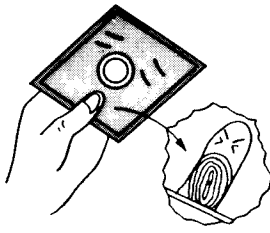
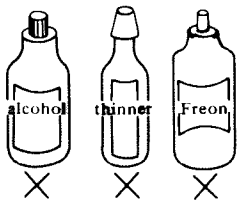
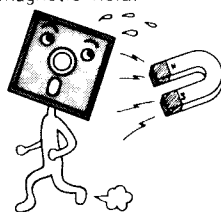
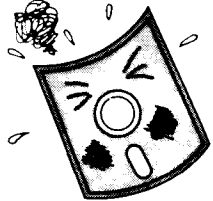
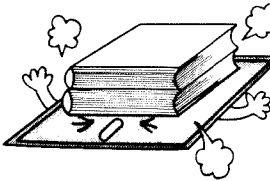
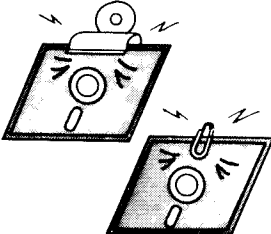
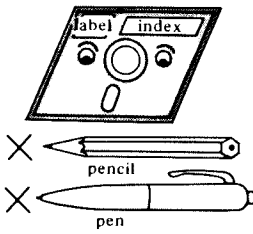
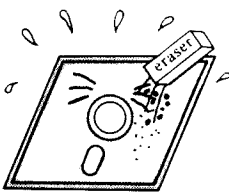
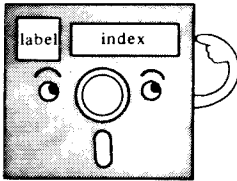
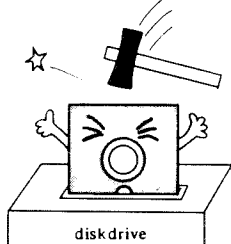
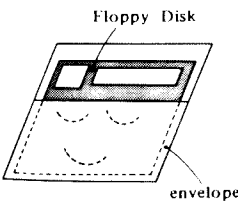
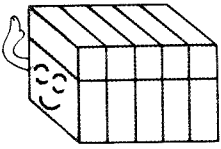
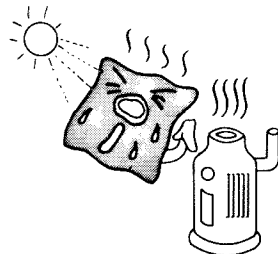
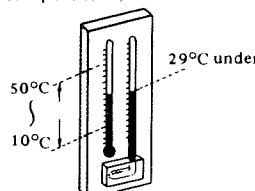
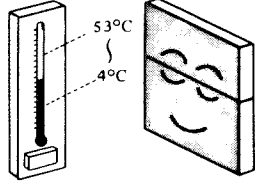
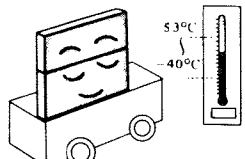
#### 3.2 PRELIMINARY HANDLING TIPS

The diskette is a precision component and must be handled with reasonable care to avoid damage or accidental erasure. Proper care will assure longer life and greater reliability. The main sources of problems are dirt, foreign matter, mechanical damage, magnetic fields, and heat.

- 1) Store the diskette in its protective envelope at all times when not in use. Store in a vertical position in a cool, dry place, out of direct sunlight. Do not leave it in a car or near sources of heat.
- 2) Do not bend or crease the diskette. Handle it carefully, and never touch the area inside the rectangular window with rounded ends. This is the head access slot. Fingerprints can destroy data and prevent the diskette from being written on. Fingerprints or other contamination cannot be cleaned off.
- 3) Protect the head access slot from contact with hands or other objects. A small crease from a fingernail or sharp object can render the diskette useless.
- 4) Avoid exposure to magnetic fields from magnets, transformers, etc. Avoid contact with all ferrous metals. Common tools, such as screwdrivers, often have magnetized tips which can erase valuable information stored on the diskette.
- 5) Keep the ambient air where you use and store your diskettes clean and free of particles, gases and colloids such as tobacco smoke. Tobacco smoke coats magnetic media and degrades its recording ability.
- 6) Do not clean diskettes.
- 7) Insert and remove the diskette from the drive carefully and gently.

# FLOPPY DISK HANDLING AND STORAGE

## Handling precautions to protect against possible failure

<p>1. Do not touch the disk surface. Easily contaminated, and causes errors.</p> 	<p>2. Do not use solutions: alcohol, thinner, Freon, to clean the disk.</p> 	<p>3. Do not use magnets or magnetized objects near the disk. Data can be lost from a disk when exposed to a magnetic field.</p> 	<p>4. Do not bend or fold the disk.</p> 
<p>5. Do not place heavy objects on the disk.</p> 	<p>6. Do not use rubber bands or paper clips on the disk.</p> 	<p>7. Do not write on a disk label with a pencil or a ball-point pen. Use a fiber-tip.</p> 	<p>8. Do not use erasers.</p> 
<p>9. Put I. D. labels in a right place, never use them in layers.</p> 	<p>10. Insert carefully, by grasping upper edge and placing it into the drive.</p> 	<p>11. Keep disk in its envelope.</p> 	<p>12. Store disk not for immediate use in their box, and set it up.</p> 
<p>13. Do not expose the disk to excessive heat or sunlight.</p> 	<p>14. Operating environment  <math>10^{\circ}\text{C}</math> to <math>50^{\circ}\text{C}</math> (<math>50^{\circ}\text{F}</math> to <math>122^{\circ}\text{F}</math>)          20% to 80% RH          less than <math>29^{\circ}\text{C}</math> (Wet bulb temperature)</p> 	<p>15. Storage environment  <math>4^{\circ}\text{C}</math> to <math>53^{\circ}\text{C}</math> (<math>40^{\circ}\text{F}</math> to <math>127^{\circ}\text{F}</math>)          8% to 80% RH</p> 	<p>16. Transportation          During transportation the disk shall be in its envelope, and in a protective box.          Temperature: <math>-40^{\circ}\text{C}</math> to <math>53^{\circ}\text{C}</math> (<math>-40^{\circ}\text{F}</math> to <math>127^{\circ}\text{F}</math>)          Relative humidity: 8% to 90% RH</p> 

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 Moonachie, New Jersey

Fig. 3-1. Floppy Disk Handling And Storage

### 3.3 LOADING AND UNLOADING THE DISKETTE

Do *not* execute the procedures in this section using a recorded diskette. You may practice using a blank diskette. This section is preparation for the operating instructions, Section 5, Loading PTDOS.

#### DISKETTE NO NOs

- A. *Do not attempt to insert a diskette with the power to the drive turned OFF. Acceptance of the diskette by the drive is motorized.*
- B. *Do not turn the drive cabinet or computer power OFF with a diskette in a slot. Eject the diskette(s) before turning off the power.*
- C. *Do not try to pull out the diskette manually with the power to the drive turned off. The diskette must be ejected by the ejection mechanism.*
- D. *Do not run the drive with one diskette in and one ejected. Fully remove the ejected diskette. Otherwise, the revolving hub for the ejected unit may wear into the ejected or partially removed diskette.*

1) The diskette should be approximately the same temperature as the drive while operating. The ambient temperature should be between 50 degrees and 100 degrees F (10 degrees C to 38 degrees C); nominal room temperature (77 degrees F, 25 degrees C) is recommended. If the diskette has been exposed to temperatures outside the temperature range given above, keep it at room temperature for about five minutes before inserting it in the drive.

2) Turn ON power to the drive cabinet using the keyswitch.

3) Turn ON power to the computer.

4) Grasp the diskette on its edge opposite the notched edge (opposite head access slot.) (Refer to Fig. 3-2, Diskette Orientation for Loading.)

5) Hold the diskette vertically on edge so that the large notch is pointing away from you and is in the lower 1/4 of the diskette.

6) The direction of insertion into the diskette aperture is forward from the notched edge. Insert the diskette gently into the appropriate slot (Unit 0 for the "system" diskette, which contains PTDOS). Push it in until the rear edge of the diskette is flush with the face of the slot. There should be no resistance to the insertion. A sensing device in the drive will cause the drive to grab the diskette and spin it when the diskette is inserted far enough.

If the diskette is inserted in the wrong orientation, it will be accepted by the drive unit and cause no damage, but no data can be read or written on the diskette; if PTDOS is already loaded and tries to read or write to a file on the diskette, PTDOS will report, on the system output device, the error message: "DRIVE NOT READY."

The heads for both units read or write only on one side of the diskette, the side opposite the side with the label(s).

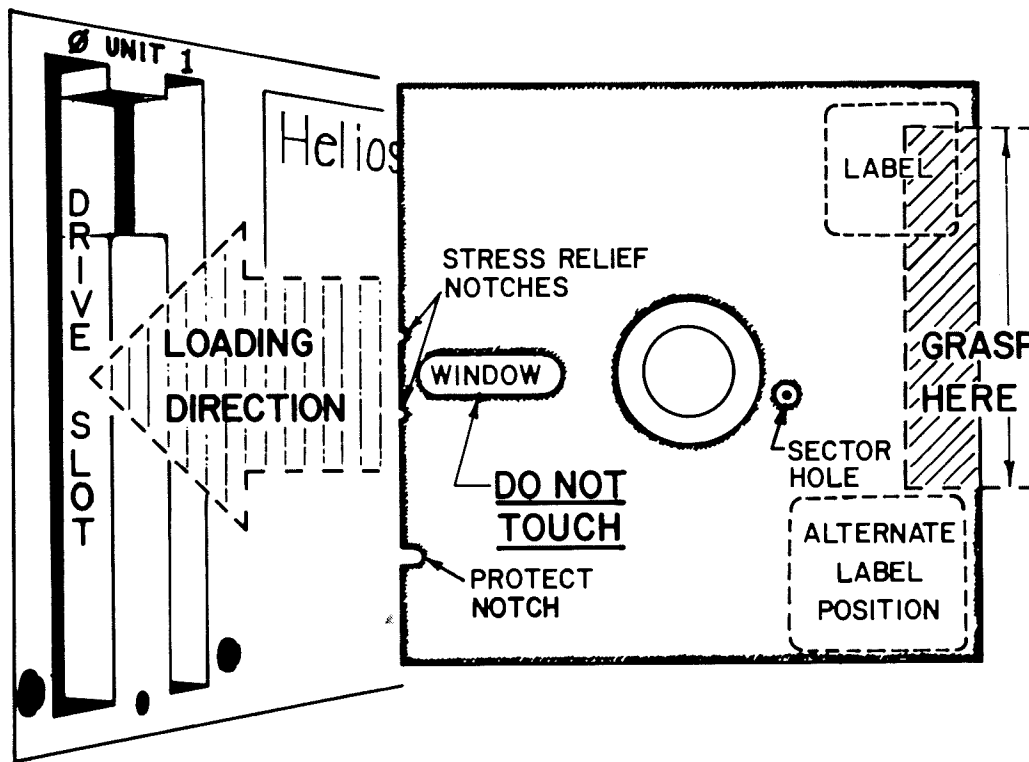


Fig. 3-2. Diskette Orientation for Loading

7) To eject the diskette, be sure the power is ON, and press the EJECT button next to the slot in which you have inserted the diskette. The diskette should move out far enough to where it can be removed easily from the unit. If the adjoining unit is revolving with a loaded diskette, remove the ejected diskette completely to avoid abrasion.

8) When you are going to leave your Helios idle with power on for more than a few minutes, eject the diskette(s) to minimize wear and tear on them and the drive mechanisms. This will also conserve energy.

### 3.4 WRITE PROTECTION

#### CAUTION

*Helios II diskettes that have data written on them are not protected from being overwritten by the protect label.*

The forward edge of the diskette has a large U-shaped notch in the lower quarter. In some floppy disk systems the diskettes are protected from being written upon when this notch is uncovered. When the notch is covered with a label, it can be written upon. In the Helios system the diskettes are always unprotected mechanically but can be protected by program control. Diskettes can be written on whether or not the notch is covered.

Diskettes containing data written by your Helios II may be used in any other Helios II system but will not be compatible in format with other systems.

## SECTION 4

### GETTING ACQUAINTED

#### 4.1 SYSTEM REQUIREMENTS

Check the following list of things you will need to run PTDOS in your Helios.

1) Helios II tested by a factory-authorized dealer.

2) Host computer (S-100 bus compatible), preferably a Sol Terminal Computer.

3) Keyboard input device (built into a Sol).

4) 48K of computer add-on memory is recommended. It should be unprotected and addressed from 0000 to BFFF, hexadecimal.

Or 16 kilobytes of unprotected RAM memory (bare minimum) configured in hexadecimal as follows:

4K: 0000 to 0FFF  
12K: 9000 to BFFF

5) Video monitor or black and white TV converted for video input. (For TV conversion instructions, see your dealer. (A serial output device such as a teletypewriter may be connected to the Sol's serial interface connector.)

6) The PTDOS system diskette.

7) A blank diskette. (For copying your original PTDOS diskette.)

8) BOOTLOAD program in any of three forms:

a. Processor Technology BOOTLOAD Personality Module.

b. BOOTLOAD recorded on cassette. To read this cassette you will need a Sol; or a host computer with CUTS interface, the CUTER operating system, and a cassette player connected to the audio cassette interface. The CUTS (Cassette Users Tape System) interface for other S-100 computers, and CUTER operating system are available from Processor Technology dealers in various forms such as Subsystem B.

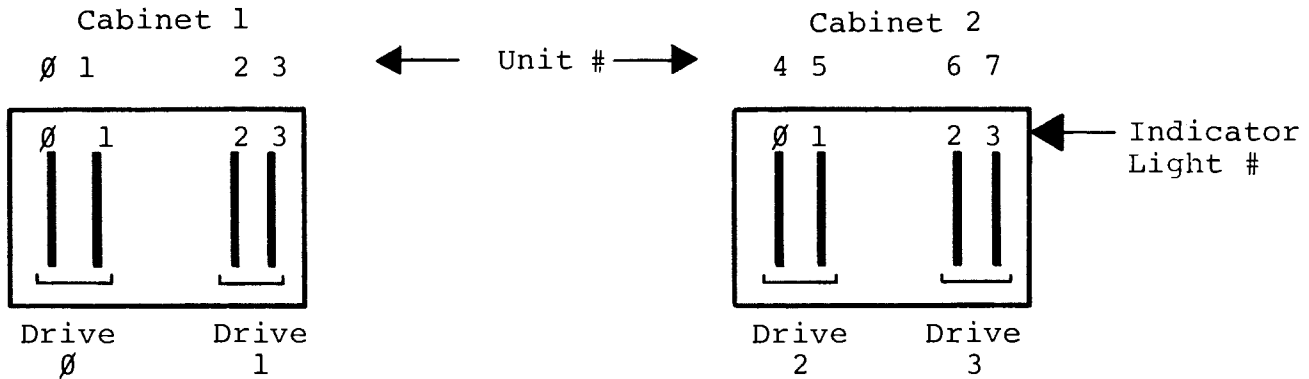
c. The bootstrap program typed into memory by hand. (Refer to *PTDOS User's Manual*.)

9) *Helios II Disk Memory System User's Manual* (this manual).

10) *PTDOS User's Manuals*.

## 4.2 JARGON OF THE TRADE

The terms used in this manual to reference drive unit configurations are illustrated in Figure 4-1, "Helios Terminology." The cabinets shown are Model 4's, which have two dual drives each. For information on configuring two-cabinet systems, ask your dealer.



**Figure 4-1. Helios Terminology**

(Model 2 contains only one drive on the left side of the cabinet (Drive 0 or Drive 2, units 0 and 1 or 4 and 5).

### HELIOS TERMS

#### CABINET

The enclosure containing one or two dual drives.

#### DRIVE

The dual diskette drive assembly, containing 2 slots to accept diskettes.

#### UNIT

The individual diskette slot with its accompanying drive mechanism, numbered by counting all the slots in the system, from 0 to 7, inclusive of drives absent from a cabinet. (For example, if there are two Model 2's in a system, cabinet 2 will have a drive 2, units 4 and 5, even though there are no units 2 and 3.)

#### SELECTED UNIT

The unit in the system currently being used by PTDOS and indicated by the light on one of the indicator panels in the system (0 up to 7 inclusive).

#### INDICATED UNIT

The individual diskette slot numbered by counting only the slots within a given cabinet. (0 up to 3 inclusive). The number of the indicated unit is the same as the number of its corresponding indicator light.

### 4.3 AT THE CONTROLS

#### CAUTION

*This section is to familiarize you with the controls only. For operating instructions, refer to Section 5, Loading PTDOS.*

#### KEY SWITCH

The key switch locks the AC power to the drive either ON or OFF. Its purpose is to protect the drive from unwanted access by locking the AC power OFF or to preserve power by locking the AC power ON. The key can be removed in either position. Two copies of the key are provided.

- |     |  |
|-----|--|
| ON  | To lock the drive power ON, turn the key clockwise and remove key.         |
| OFF | To lock the drive power OFF, turn the key counterclockwise and remove key. |

#### EJECT BUTTONS

There is one eject button for each diskette unit (the one closest to the unit).

To eject a diskette, hold the appropriate eject button in for about one second. The power must be ON.

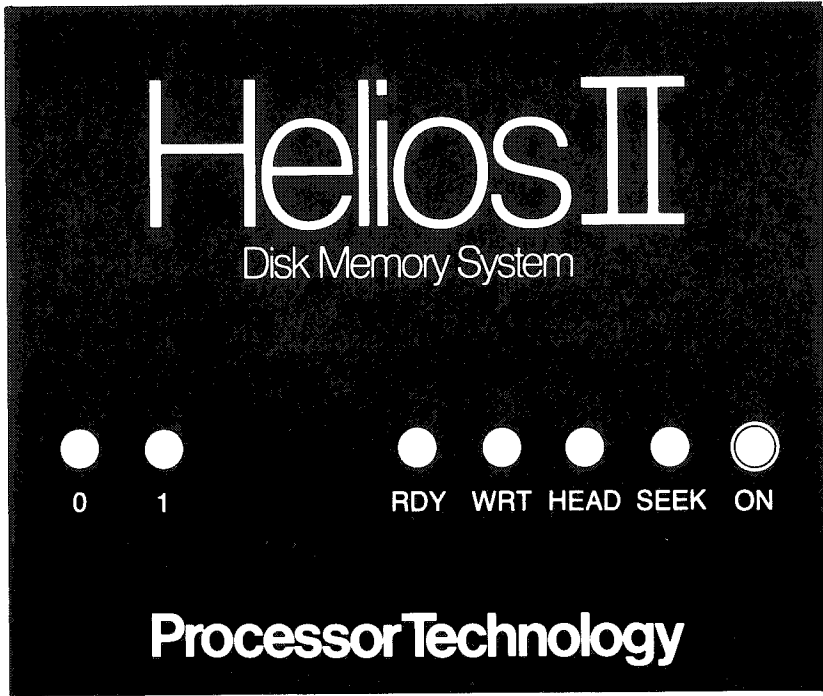


Fig. 4-2 Helios II Indicator Panel, Model 2

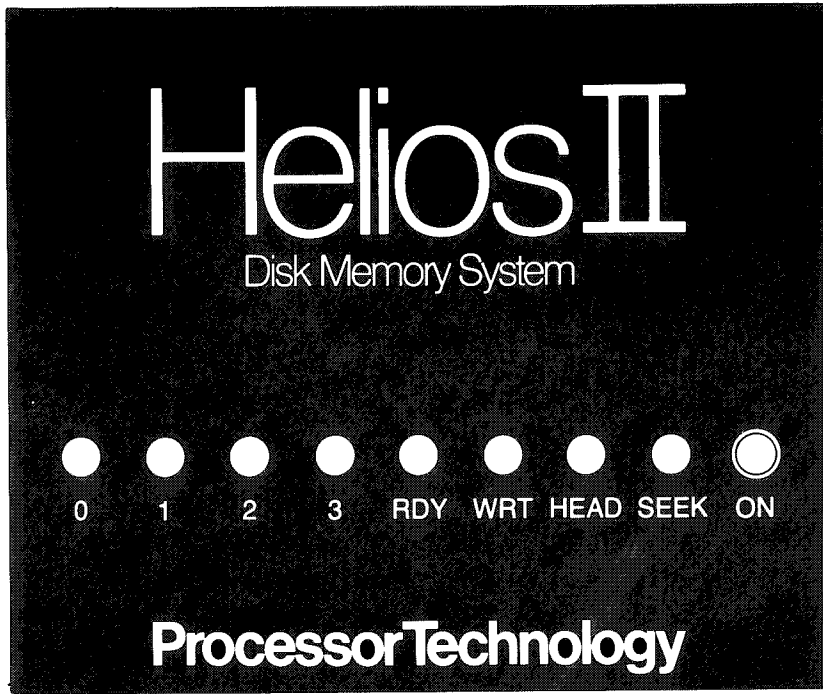


Fig. 4-3 Helios II Indicator Panel, Model 4



#### 4.4 BELLS, WHISTLES, AND LIGHTS

(Refer to Figs. 4-2 and 4-3, Helios II Indicator Panels and Fig. 4-1, Helios Terminology.)

In the Helios II, Model 2, there are seven indicator lights on the front panel. They are small round windows back-lighted by LEDs (Light Emitting Diodes). There are nine LEDs on the Model 4 indicator panel.

LEGEND	POSITION	DESCRIPTION	
ON	Far right (Both Models)	The ON LED glows when AC power is applied to the drive, the fuse is installed, and the power keyswitch is ON.	
0	Far left (Both Models)	The 0 (zero) LED glows to indicate that the left-hand unit of the left-hand dual drive is selected by the system.	
1	Second from left (Both Models)	The 1 (one) LED glows to indicate that the right-hand unit of the left-hand dual drive is selected by the system. <i>Note:</i> the system selects only one unit at a time. Normally unit 0 is ON when the system is initialized. If the system by mistake selects a unit not in your configuration, no indicator will light.	
2	Third from left	The 2 LED glows to indicate that the left-hand unit of the right-hand dual drive is selected by the system.	
3	Fourth from left	The 3 LED glows to indicate that the right-hand unit of the right-hand dual drive is selected by the system.	
A C T I O N  I N D I C A T O R S	READY	Fifth from right	The selected unit is ready and its drive is rotating at speed. The diskette is positioned properly.
	WRITE	Fourth from right	When lighted, the system is writing on the diskette in the selected unit. When off, the system is reading or idle.
	HEAD	Third from right	The selected head is loaded.
	SEEK	Second from right	(SEEK COMPLETE) When the light is OFF, the selected unit is seeking the track requested by the system. When light is ON, the selected unit is on the last track requested.



## SECTION 5

### LOADING PTDOS THE POWERFUL

#### 5.1 ORIENTATION

The purpose of this section is to help the user to quickly get his/her Helios II to load Processor Technology Disk Operating System (PTDOS) from diskette into the host computer. The host computer is generally assumed to be a Processor Technology Sol Terminal Computer.

Once PTDOS is loaded, you, the reader and Helios II user, are requested to move on into a different, very interesting book called *PTDOS User's Manual*, which is the official handbook of PTDOS. At that point, this manual, *Helios II User's Manual*, should become merely an occasional reference book because your Helios II is simple to operate and should provide many hours of reliable service.

#### 5.2 THE COUNTDOWN

The Helios II itself has only two types of controls, AC power and diskette insertion/ejection. Once a diskette is loaded, everything is automatically controlled by PTDOS, which in turn is controlled by the operator through the computer keyboard.

1) Be sure you have at least 16K of unprotected computer memory addressed in hexadecimal as follows:

4K: 0000 to 0FFF  
12K: 9000 to BFFF

48K of memory is recommended. Address the 48K from 0000 to BFFF. If you have more than 48K of memory in a Sol, skip C000 to CFFF because the Sol's built-in memory is addressed there.

(Refer to your memory module manual(s) for instructions on addressing and plugging in the memory modules.)

2) Be sure your Sol or other computer is properly set up and connected to a video monitor according to the computer's manual.

3) Assure the cables are connected as described in Section 2 of this manual.

4) Turn on AC power to the computer and to the video monitor.

5) Turn on AC power to the disk drive by turning the key in the keyswitch CLOCKWISE.

6) Initialize the SOLOS or CUTER by pressing simultaneously:

UPPER CASE and REPEAT

The command mode prompt character ( **⏏** ) should appear to indicate that the computer is ready, with the cursor block to the right.

7) Be sure you have read Section 3, Care and Handling of Diskettes.

8) Insert a diskette containing PTDOS in unit 0. You must have a known good copy of the PTDOS diskette.

### 5.3 BOOTSTRAPPING IN THE RESIDENT PTDOS

Bootstrap is a short program which bootstraps a longer BOOTLOAD program called BOOTLOAD off the diskette. BOOTLOAD in turn loads PTDOS itself and transfers control to it. Resident portions of PTDOS are loaded into RAM in the computer. For the listing of the bootstrap program and additional information, refer to *PTDOS User's Manual*. The bootstrap program is contained in the Processor Technology Personality Module, BOOTLOAD.

1) If your computer is a Sol equipped with the BOOTLOAD Personality module (a Helios II accessory), load PTDOS from the diskette by typing, in capital letters: BO

And press: RETURN

OR:

2) If your computer is other than a Sol, load and execute the bootstrap program from cassette. The bootstrap program is in CUTS format which requires the CUTS interface module with the CUTER operating system. (Refer to Processor Technology's *SOLOS/CUTER User's Manual*.)

OR:

3) If you must, handload the bootstrap object code into computer memory:

- a) Refer to *PTDOS User's Manual* for the listing.
- b) Use the SOLOS/CUTER command ENTR 800 to load the code by hand. If you have a computer other than Sol, use the prescribed methods.
- c) Check the code after you have entered it. It is possible to damage the program on the diskette with improper code in the loader.
- d) When you are satisfied that the bootstrap code is correct, save the loader to cassette by typing: SAVE BOOT 800 84E

To reload, type: XEQ BOOT

The loader can be placed in PROM if you do not have the BOOTLOAD Personality Module. It may be given any convenient origin at or above 800 hex.

- e) Give the program the execute command at the starting address of the bootstrap program.

### 5.4 TO BOOT OR NOT TO BOOT

If the bootload is successful, portions of PTDOS that need to be in memory will be loaded into memory. Control will be passed to this code, which presents "PTDOS" on the output device, with the current version number and other system information. On a second line it presents its prompt character, an asterisk, followed by the cursor: \*█

The prompt character indicates that the Command Interpreter (CI) program within PTDOS is waiting for a command input.

If the prompt does not appear, eject the diskette, go back to 5.2, The Countdown, and try again. Read 6.5.2, Controller and Drive Continuity Check. Reread, if necessary, the parts of this manual or other manuals indicated in the steps.

If you got the prompt the first time around, congratulations! Now is the time to turn to your *PTDOS User's Manual* to learn how to fully exploit PTDOS. Your first PTDOS operation will be making a "backup" copy of the PTDOS diskette using the DISKCOPY command.

# SECTION 6

## MAINTENANCE

### SAFETY WARNING

*BEFORE PERFORMING ANY SERVICE, DISCONNECT THE AC LINECORDS OF BOTH THE HELIOS AND THE COMPUTER TO WHICH IT IS CONNECTED, FROM THE AC POWER RECEPTACLE.*

#### 6.1 THIS COULD BE THE MOST IMPORTANT SECTION IN THE WHOLE BOOK

This section contains or refers to routine cleaning, inspections, checks, and tests which you should perform regularly. The Helios II is a complex electromechanical device (especially the diskette drive assembly); repair and adjustment is complicated and sensitive. All problems other than those solved by the following procedures must be referred to a factory-authorized dealer.

Repair and readjustment of drives which have been worked on by unauthorized persons, and problems caused by improper adjustment or repair, are not covered under warranty.

Your Helios II will probably require adjustment from time to time. These adjustments must be performed only by a factory-authorized dealer. But even if nothing goes wrong, you should have your dealer perform routine preventative maintenance procedures regularly every quarter. As old Ben said, "An ounce of prevention is worth a pound of cure." A convenient and economical way to arrange for preventative maintenance and to be prepared for eventual adjustments as well as unexpected problems is to purchase a maintenance contract if your dealer has it available for you.

#### YET ANOTHER WARNING

There should never be any need for you to remove the top cover of the Helios cabinet. To do so would only be exposing yourself to a shock hazard and the inner components to possible damage. The latch on the top front of the cabinet does not, of itself, detach the cover; there are also screws on the rear panel. There is no safety interlock in the cover release; if the power is on, the inner components continue to be 'HOT' when the cover is removed. All the following procedures can be performed with the top cover in place.

#### 6.2 REGULAR CLEANING

Protect the disk drive at all times from dust and dirt which could accumulate and interfere with optical and mechanical components, causing read errors.

If the air in which the drive is operating contains large amounts of dust, humidity, tobacco smoke, or corrosives, the cleaning intervals may be shorter than the nominal three months suggested.

Do *not* clean diskettes.

### **6.2.1 Cleaning Air Filter(s) (As often as required)**

The metal mesh filter screen and the plastic foam filter element, which comprise the cleanable portions of the Helios air filter, should be inspected and cleaned regularly, as often as required by environmental conditions. Clean as follows:

- 1) Turn off AC power to the Helios Cabinet. (The fan should not be running without the filter installed.)
- 2) Disconnect the AC linecord from the rear panel. If the Helios is connected to the computer, turn off AC power to the computer and disconnect its AC linecord also.
- 3) Remove the screws and lock washers holding the plastic filter frame.
- 4) Remove the filter frame.
- 5) Remove the metal filter screen and the foam filter element.
- 6) Immerse the screen and the foam element separately in a solution of hot water and mild detergent.
- 7) Rinse them in clear warm water.
- 8) Wring dry the foam filter element.
- 9) Dry the parts with compressed air or allow sufficient time to drain and air dry.
- 10) Put the screen against the outside of the rear panel; put the foam element next, then replace filter frame.

### **6.2.2 Cleaning Outside Surfaces of the Cabinet (As often as required.)**

- 1) Disconnect the AC linecord from the rear panel. If the Helios is connected to the computer, turn off AC power to the computer and disconnect its AC linecord also.

#### **CAUTION**

*In the following cleaning procedures, do not use acetone or similar solvent. Acetone will melt the indicator panel screen and probably the paint. Do not use audio/ video head cleaner or alcohol with olive oil added. These will leave a residue.*

- 2) Use a damp cloth or sponge to clean dust off the painted metal cabinet surfaces. For stubborn spots, use a mild detergent solution with the cloth or sponge.
- 3) To clean the plexiglass indicator panel screen, use a cloth or sponge moistened in clean warm or cool water. For stubborn spots, use window solution, ammonia solution, or 95% isopropyl alcohol solution. (Isopropyl alcohol is available at most pharmacies.)

### **6.3 RECOMMENDED CHECKS, INSPECTIONS, AND TESTS (Dealer Performs Quarterly)**

Have your dealer make the following checks regularly each quarter:

- 1) Examine the read/write head for scratches, wear and oxide deposits. Clean if dirty. Replacement of heads is rarely necessary, since they are made from a hard ceramic material.
- 2) Examine pressure arm pads for wear and contamination. This is done in conjunction with the head inspection.
- 3) Quarterly, run the Disk System Test to verify proper operation of diskette drive. The dealer performs this test whenever the heads are cleaned, whenever the Helios is modified, repaired or parts replaced, and whenever the Helios system or component thereof has been shipped or re-installed (except for plugging in the PCBs).

## CAUTION

*Do not attempt to adjust the transducer adjustment screws. Do not touch the positioner scale with your fingers or tools. Both the mechanical alignment and the optical cleanliness of the positioner scale are extremely critical. The positioner scale is a glass plate engraved with a row of precision slots. It is mounted on the carriage which holds the read/write head, below the small horizontally-mounted PCB. It is enclosed by a plastic rectangular dust shield. Do not remove this dust shield and do not clean the positioner scale surfaces. If a symptom, such as consistent seek errors, indicates that the scale may be dirty, have your dealer inspect the scale.*

### 6.4 DO NOT REPLACE DEFECTIVE DIP DEVICES

Do not replace a DIP device thought to be defective on in a Helios II which is still on warranty. This may void the warranty. Refer the problem to your dealer, even if the warranty is expired.

### 6.5 BASIC TROUBLE-SHOOTING, VERY BASIC

#### 6.5.1 Electrical Continuity and Supply Check

- 1) If the ON LED does not light when the AC linecord is plugged in and the front panel keyswitch is ON, disconnect the AC linecord from the AC receptacle, then check the lower fuse (7A) on the rear panel.
- 2) Is the fan(s) running when the power is ON? If not, disconnect the AC linecord from the AC receptacle, then check the upper fuse (3.2A) on the rear panel.
- 3) If the fuses are good and the fan(s) still does not run, ask your dealer to check out the rear panel wiring.

#### 6.5.2 Controller and Drive Continuity Check

- 1) If PTDOS will not load, first turn off the power, disconnect the AC linecord from the AC receptacle, then recheck the installation of the controller and formatter PCBs, the Sol Personality Module, the memory modules, and the cable connections, according to Section 2 of this manual.
- 2) Are the memory modules addressed properly? Are they plugged in securely?
- 3) Recheck your bootloading method. (Refer to 5.3, Bootstrapping In the Resident Loader.)

If any problem is not solved by these basic procedures, do not proceed any further; refer the problem to your dealer.

#### 6.5.3 Seek, Read, and Write Errors Encountered

Seek, write and read errors may be caused by factors in the system other than the Helios, namely: loose cable interconnects, a bad diskette, a faulty memory, a failing host computer, or even a software problem. If you can determine that all the mentioned components in the system are operating without failure, the probability is that the errors are being caused by alignment problem(s) in the diskette drive assembly. To correct such problems, the system must be returned to the factory-authorized dealer.

## NOTE

*The serial number of the Helios is printed on a label affixed to the rear panel.*











