

# **OPERATIONS MANUAL**

# **ORION V**



**dy-4 Systems Inc.**

Document No. DY00468  
Revision B

ORION V  
OPERATIONS MANUAL

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## SECTION 1

### GENERAL INFORMATION

#### 1.1 INTRODUCTION

The ORION V is a general purpose microcomputer system designed for maximum versatility: its architecture provides compatibility with standard hardware (STD BUS) and software components (CP/M).

The ORION V (Figure 1 - 1) is a dual disk drive based system. The ORION V system includes:

DSTD-1000	System enclosure with power supply, line filter, power cord, fuse holder, power switch with indicator and reset switch.
DSTD-806	6 slot card cage, containing the following cards (printed circuit board modules) and four spare slots for expansion:
DSTD-102	Z80-based, Central Processing Unit (CPU) with two serial input/output channels.
DSTD-711	64K Byte memory and diskette controller

Two 8 inch disk drives (various combinations are available):  
ORION V-C SS/DD 600K Bytes per drive  
ORION V-D DS/DD 1.2 MBytes per drive

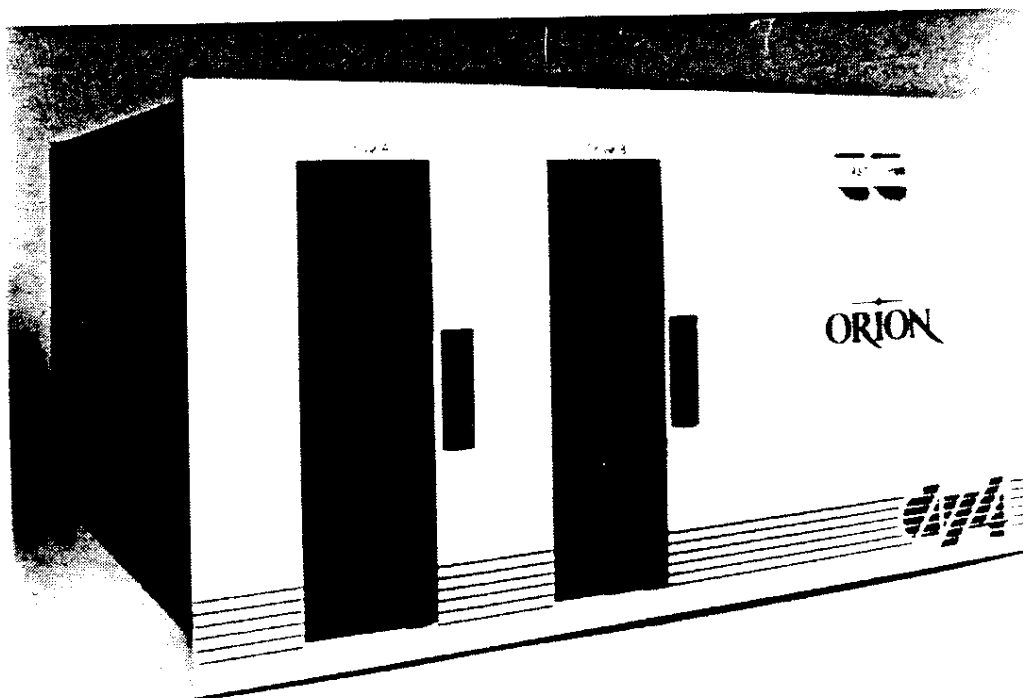
ORION V CP/M operating system diskette

Blank (unused) diskette

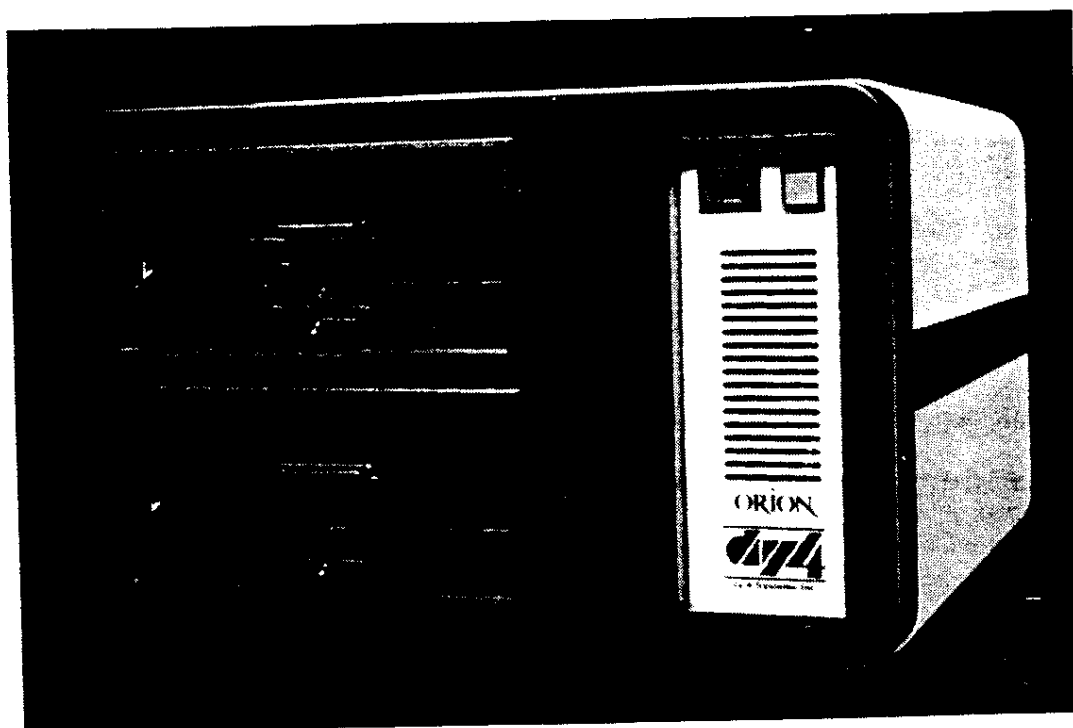
This configuration provides the user with a complete Z80 based microcomputer system with 64K bytes of RAM, 4K bytes PROM firmware, diskette memory (500K bytes and up, depending on the type of disk drives included) and two serial input/output interfaces.

With this configuration, the ORION V may be connected to a standard RS-232 device (i.e. CRT, keyboard, serial printer) for either Z80 software development or any application requiring this type of microcomputer configuration.

GENERAL INFORMATION



Industrial Model



Desk-Top Model

FIGURE 1 - 1

ORION V

## GENERAL INFORMATION

The following software is supplied with the ORION V :

1. The ORION V system diskette contains the CP/M operating system modules for reconfiguration and generation of the system. CP/M is a Control Program for Microcomputers and provides the environment for program construction, storage and checkout, by managing the various components connected in the ORION V system (the console keyboard and CRT, memory, disk storage, printer, etc.). In addition, the CP/M diskette contains various support programs to help the user in copying files, editing files, debugging programs, etc. The programs are executed by commands typed in by the user at the console. For more detail see Transient Commands, Section 5.
2. PROM (programmable read-only memory) contains the Disk Control Monitor (DCM), which handles the input/output of the disk controller (DSTD-711), and the debug monitor, which can be used to examine, test and modify memory. This is more accurately called firmware and is installed in two of the sockets on the CPU card (DSTD-102-4.0).

Commands to the monitor are entered via the console using single character commands. For more detail see Section 5.3 and Appendix C.

Optional software packages on disk which are compatible with the ORION V system but not supplied with the system include:

- Fortran 80
- BASIC Compiler
- BASIC Interpreter
- PASCAL MT+
- MACRO 80
- PL/1-80 Compiler
- AMX Real Time Operating System
- Accounting - Accounts Receivable, Accounts Payable,  
General Ledger
- Word Processing
- Inventory Control
- Electronic Worksheet
- ....and many others

Virtually all common application packages are now available for CP/M-based systems.

### 1.2 OTHER FEATURES OF THE ORION V SYSTEM

The ORION V can be easily modified, allowing the user to have a system custom-tailored to his specifications. The ORION V's capabilities can be expanded to meet the user's growing needs in the future.



## GENERAL INFORMATION

The modifications and expansion are achieved by adding or changing the STD board level modules that fit into the card cage of the system. Up to two additional disk drives may be added to the system. Specialized STD modules are available from dy-4 and over 80 other manufacturers of STD Bus cards. The standard ORION V system uses 2 cards (circuit boards) leaving 4 spare slots in the 6 slot card cage. If necessary, a 12 slot system chassis may be added for future expansion.

System options include:

1. **RAMDISK** : a high performance all solid state RAM based disk emulation available in 256K Byte modules up to 1.5 Mbytes. The RAMDISK option offers performance improvements varying from 2 to 10 depending on the application.
2. **dynasty** (distributed network processing): ORION computers can share facilities e.g., printers, programs, databases, disks. Ask for the **dynasty** system brochure for further details.

### 1.3 DEFINITION OF SYMBOLS USED IN THIS MANUAL

1. <CR> Indicates carriage return (RETURN Key)
2.      Underline; all user-entered text is underlined e.g. DIR
3. A All capitalized characters in a command are entered exactly as shown
4. ^C or CNTRL-C Indicates that the CONTROL Key should be held down at the same time as the following key (in this case C).

## **SECTION 2**

### **INSTALLATION**

#### **2.1 INTRODUCTION**

This section provides installation instructions for the ORION V double disk microcomputer system. Procedures described include unpacking, preliminary checks, and system power-up. For more details, refer to later chapters of this manual or other manuals associated with the system (e.g. Hardware Technical Manual).

#### **2.2 UNPACKING**

The ORION V system should be removed from the shipping container by carefully removing the foam packing material surrounding the enclosure. The foam packing material and shipping container should be retained for later shipping, if required.

#### **2.3 INSPECTION**

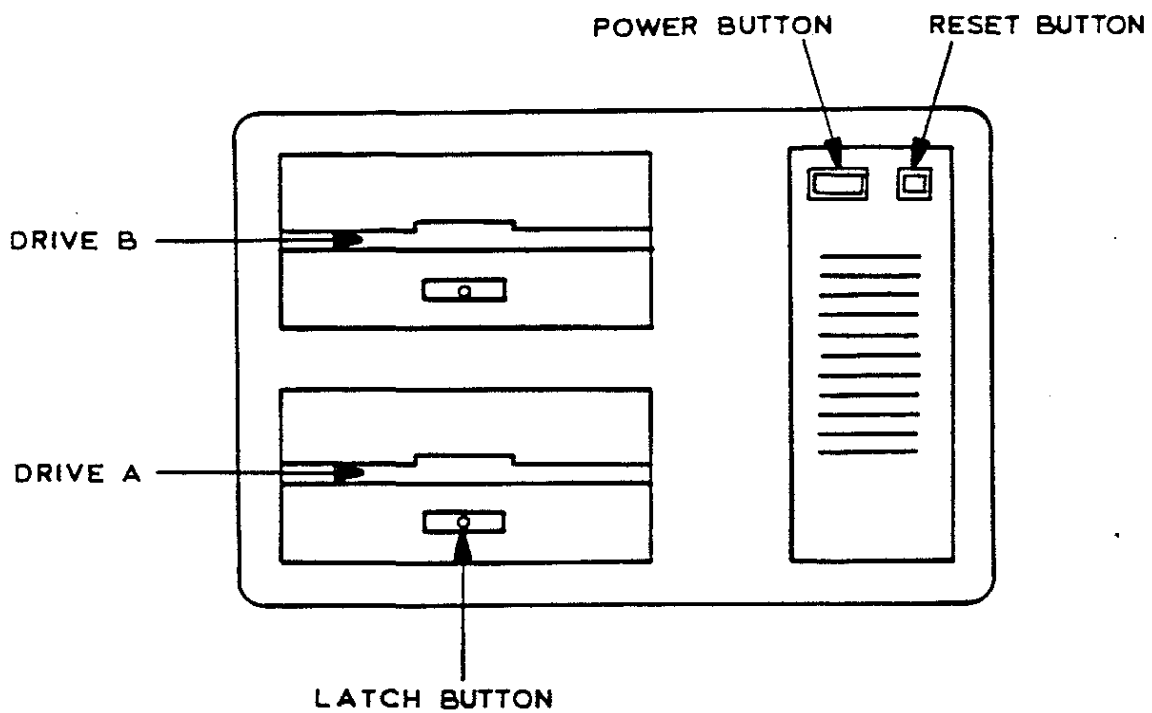
Inspect the system for shipping damage. In case of damage, place a claim against the shipping agent who delivered the system.

#### **2.4 CONSOLE AND PRINTER CONFIGURATION**

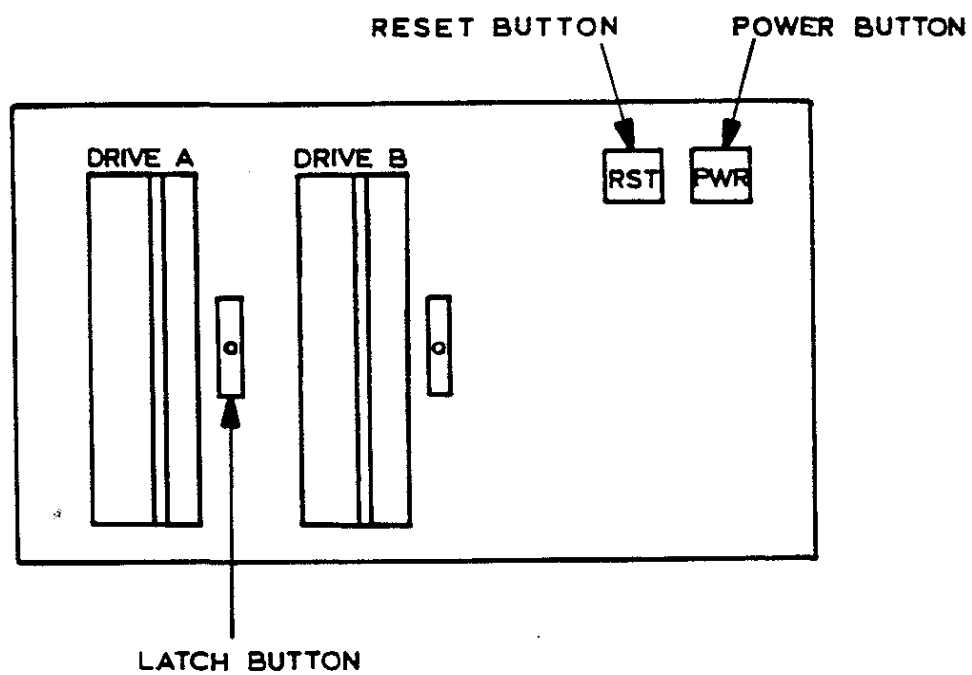
The circuit board DSTD-102 contains the baud rate programming for the two serial input/output channels (for the console and listing device). When the ORION V is shipped, both serial channel speeds are set to 9600 baud. Consult the manufacturer's specifications for your console and printer to see if that baud rate is appropriate. The baud rate settings can be changed if necessary: this involves altering a section of the IODRVR.ASM file (included on your master system diskette) which contains specific values corresponding to different baud rates. The values may be changed using DDT (Dynamic Debugging Program) and then the IODRVR.ASM must be re-assembled using the ASM program. The section of IODRVR.ASM to be altered is clearly marked with comments. Read the UPDATE file (see section 4.3.3) for the method of making changes to the IODRVR.ASM.

The standard BIOS section of the CP/M system shipped by dy-4 is set up to be compatible with a serial RS-232C printer with 8 data bits, no parity and 9600 baud. The handshake protocol (printer buffer full/empty signal) is assumed to be XON/XOFF (corresponding to hexadecimal codes 13H and 11H respectively).

# INSTALLATION



ORION V - Desk-top Model



ORION V - Industrial Model

FIGURE 2 - 1

## INSTALLATION

If the printer was purchased through dy-4, your system will be configured for and tested with that printer. If the printer was not purchased through dy-4, and it cannot be configured (usually accomplished by setting switches located on the front or back panel of the printer) to match the above requirements, then the user can modify the printer driver (refer to the UPDATE and IODRVR.ASM files on your master disk)..

Alternately, the user may request dy-4 to perform IODRVR modifications for an additional charge. Contact the factory for more information.

### 2.5 INPUT/OUTPUT - REAR PANEL OF ORION V

The input/output rear panel of the ORION V (see Figure 2 - 2) has cutouts for four (4) 25 pin "D" type connectors and one (1) BNC type connector. The cutouts are labelled CONSOLE, PRINTER, AUX1 and AUX2. They are used for the following:

CONSOLE	Serial RS-232C Terminal (CRT and keyboard)
PRINTER	Serial RS-232C printer
AUX1 and AUX2	Optional parallel input/output (requires an additional card)

The BNC connector is for future connection with coaxial cable.

### 2.6 POWER SELECTION

The ORION V is factory set for 115Vac/60Hz operation.

### 2.7 PERIPHERAL CONNECTIONS

The standard ORION V can support the following peripherals without any modification of software or hardware by the user. Other input/output devices (i.e. parallel printer) must be interfaced by the user, or by dy-4 Inc. on request.

#### 2.7.1 CONSOLE TERMINAL

The CRT and Keyboard, in system connector marked CONSOLE.

#### 2.7.2 LINE PRINTER

In the standard ORION V, a serial RS-232C interface is provided for a serial type printer on system connector marked PRINTER. The operating system is configured for this type.

# INSTALLATION

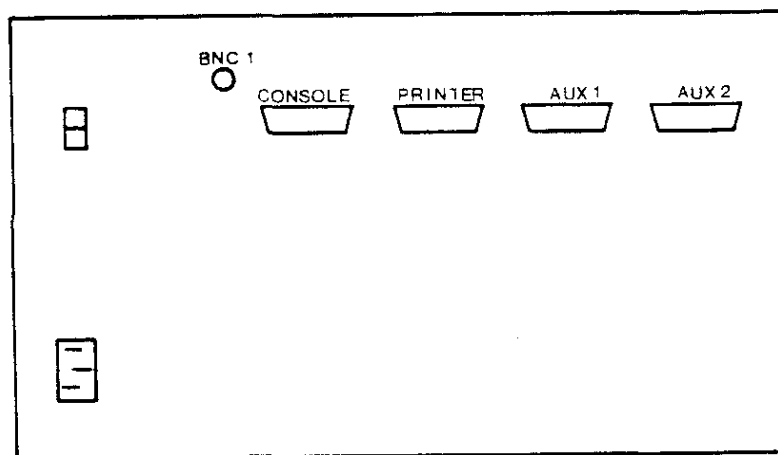
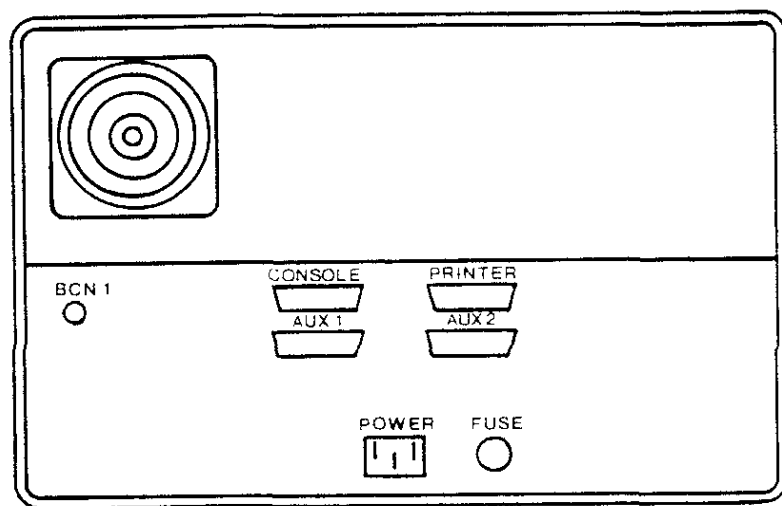


FIGURE 2 - 2

REAR CONNECTOR PANEL OF ORION V

## INSTALLATION

### 2.8 SET-UP FOR OPERATION OF ORION V SYSTEM AND CONNECTION OF PERIPHERALS

1. Plug in power cord at back of ORION V.
2. Plug in power cord for CRT terminal (Plug keyboard to CRT if applicable).
3. Connect CRT terminal to back of ORION V to the connector marked CONSOLE, using flat cable.
4. Connect printer (if applicable) to back of ORION V, to the connector marked PRINTER if using a serial RS-232C printer.

## SECTION 3

### DISKETTE CARE AND HANDLING

#### 3.1 INTRODUCTION

The diskette is a flexible disk enclosed in a plastic jacket. The interior of the jacket is lined with a special low-friction material which cleans the disk of foreign material. The disk is coded magnetically on one side (single-sided disks) or on both sides (double-sided disks). The read/write head of the disk drive moves horizontally along a radius of the disk through a hole in the cover called the "access-hole".

Information on the disk is structured into tracks and sectors. The disk is divided into concentric rings called tracks. Tracks are divided into radial sectors, like slices of a pie.

Disks can be:

single density (SD)	128 bytes/sector
double density (DD)	256 bytes/sector
extended density (XD)	1024 bytes/sector

They can also be single-sided or double sided.

Single-sided disks can be read in double-sided drives without any problem; however, double-sided disks will not read in single-sided drives. Make sure you know what kind of drives and what kind of disks you are working with.

In order to access information within a disk, it is necessary to locate the sector on which it is stored, then transfer information to or from it via the read/write head.

A diskette is the medium used to store the CP/M operating system and associated programs provided with the ORION V system. Other application and utility programs are also available on diskettes. User data files are stored on diskettes.

#### 3.2 FILES ON DISKETTES

Information is stored on disk in distinct units or "files"; a file may contain a word, a paragraph or a chapter of a book, a program, a mailing list or a series of numbers. This information is stored in a variety of formats, but each file must have a filename to identify it. For each filename, there is a corresponding entry in the directory of the disk, which allows fast

## DISKETTE CARE AND HANDLING

access to the information in the file.

All files consist of fields: numbers, single words, or any convenient, small unit of information. Files can also be divided into records, which are units of information larger than fields. For example, in a mailing list file, some fields might be name, city, postal code. Each individual address would be a record. All the addresses would constitute the file.

Filenames are in the form of

xxxxxxx.yyy

Where xxxxxxx is the filename and can consist of up to 8 characters with the exception of < > . , ; : = ? [ ] but generally consists of letters and numbers.

The extension yyy is the optional filetype and generally gives information of the type of file or function.

Some commonly accepted filetype standards are:

.ASM	Assembly language source file
.BAK	Backup file
.BAS	BASIC program file
.DAT	Data file
.TXT	Text file
.COM	Directly executable programs (e.g., command files)

The filetype may be omitted when you are creating (naming) a file. However, whenever you wish to address a particular file in a command, if that file was given a filetype when it was first named, then you must specify that filetype explicitly in your command; the filetype may not be omitted. (Special cases will be described in some commands).

When a directory listing of a disk is printed on the console, it takes the following format:

Drive:Filename Type:Filename Type:Filename Type

A:LETTER	BAK:PROGRAM	BAS:NUMBER
A:FILES	DAT:CHAPER	ONE:

This example shows the directory listing containing the files:

LETTER.BAK  
FILES.DAT  
PROGRAM.BAS  
CHAPTER.ONE  
NUMBER

Each file on the disk will have a file indicator. These indicators can be set or reset using the STAT command (see



## DISKETTE CARE AND HANDLING

Section 5.1.5.1)). The indicator remains on the file until changed by a subsequent STAT command.

These indicators determine the access status of the file.

### File indicators:

R/O - read-only, means that the file is write-protected; the file can only be read from, not written to.

R/W - read/write, means that the file can be read from or written to; this is the default status.

DIR - directory; means that the file will show up in the directory listing.

SYS - system; means that the file is a system file and cannot be written to and will not show up in the directory listing of the disk.

## 3.3        **FORMATTING DISKETTES**

Every new diskette must be initialized to use with a particular system: this process is called formatting, and involves checking the diskette for bad sections, setting up the appropriate format on the disk and preparing a directory. It is not necessary to format a disk that has already been used in the system - it is only necessary on first usage. A disk will be totally erased after formatting, therefore, never format a disk which contains any files or information that you wish to keep. Make sure that you know the characteristics of the disks you are using. Single-sided disks cannot be formatted double-sided. All disks distributed with the standard ORION V are single-sided. For the steps involved in formatting a disk see Section 5.1.5.11.

The standard format for eight inch diskettes is IBM 3740 single-sided, single density. This common format allows the transfer of disks from one system to another.

## DISKETTE CARE AND HANDLING

### 3.4 DISKETTE HANDLING

The following are handling suggestions for extending the life of diskettes used in the ORION V. Every attempt has been made to design the system for maximum diskette life; however, poor handling practices can cause premature failure of diskette media and/or loss of valuable data.

1. Avoid touching exposed areas of the magnetic medium.
2. Avoid exposure of diskette to magnetic fields such as motors, fluorescent lamps, transformers, etc. (A magnetic field sufficient to erase a diskette surrounds airport x-ray equipment.)
3. Avoid exposure of diskette to direct sunlight. Do not allow its temperature to change suddenly over large ranges. Store flexible diskette in an environment that is between 50 degrees F and 125 degrees F with a relative humidity between 0% and 80%.
4. Avoid contamination and warpage by returning diskette to its envelope when not in use. Store envelope in its box.
5. Avoid placing objects on diskette.
6. Do not write on diskette except on label with a felt-tipped pen.
7. Always return diskette to its protective envelope when not in use. Do not attempt to clean diskette.
8. The flexible diskette should be in the same temperature and humidity environment as the disk drive for a minimum of five minutes before use.

```
*****
*
*  CAUTION: IT IS VERY IMPORTANT THAT POWER NOT *
*  BE APPLIED OR REMOVED WHEN A DISKETTE IS *
*  INSERTED WITH THE DOOR CLOSED.  SPURIOUS WRITE *
*  PULSES MAY OCCUR WHICH COULD DESTROY DATA ON *
*  THE DISK.  ALSO "RESET" SHOULD NOT BE PRESSED *
*  DURING DISK ACCESSES. *
*
*****
```

# DISKETTE CARE AND HANDLING

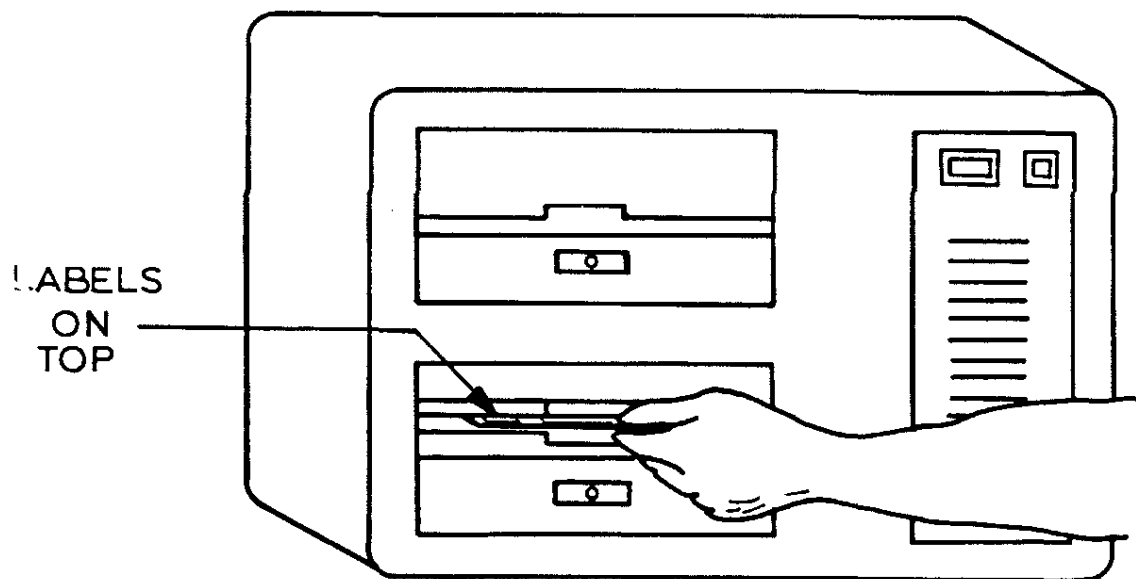


FIGURE 3 - 1  
DISKETTE LOADING

## DISKETTE CARE AND HANDLING

### 3.5 DISKETTE LOADING

Power should be on (power button should be lit: PWR button on the ORION V Industrial model, left button on the front of the ORION V Desk-top model) before loading a diskette. Figure 3 - 1 shows the proper method of loading a diskette into a Disk Drive. To load the diskette, depress the latch, insert the diskette with the label facing towards the disk drive door (label facing up on the ORION V Desk-top model, label facing left on the ORION V Industrial model). Press the diskette in gently; the diskette is loaded when a "click" is heard. Move the door slowly closed to lock the diskette on the drive spindle.

### 3.6 DISKETTE UNLOADING

Diskettes are removed from the disk drive unit by depressing the latch button. The disk unit door will open and the diskette will be pushed out of the unit. Do not remove diskette while it is being accessed (i.e. when the small, red light at the disk drive is on).

### 3.7 WRITE PROTECT ON DISKETTES

There is a write-protect feature on the 8" diskettes: on the lower edge of each diskette there is a notch. If the notch is uncovered (exposed) then the diskette is write-protected - the user may only read from the diskette, not write on it. In order to write on the diskette, the user must cover the notch with a small sticky tab wrapped over the edge (these are provided with new diskettes). Also, in order to format a new diskette, a tab must be placed over the notch, otherwise the user will get a READ error. See Figure 3.2.

### 3.8 DISK DRIVE NAMES

On the ORION V Industrial model, the disk drive are labelled Drive A and Drive B.

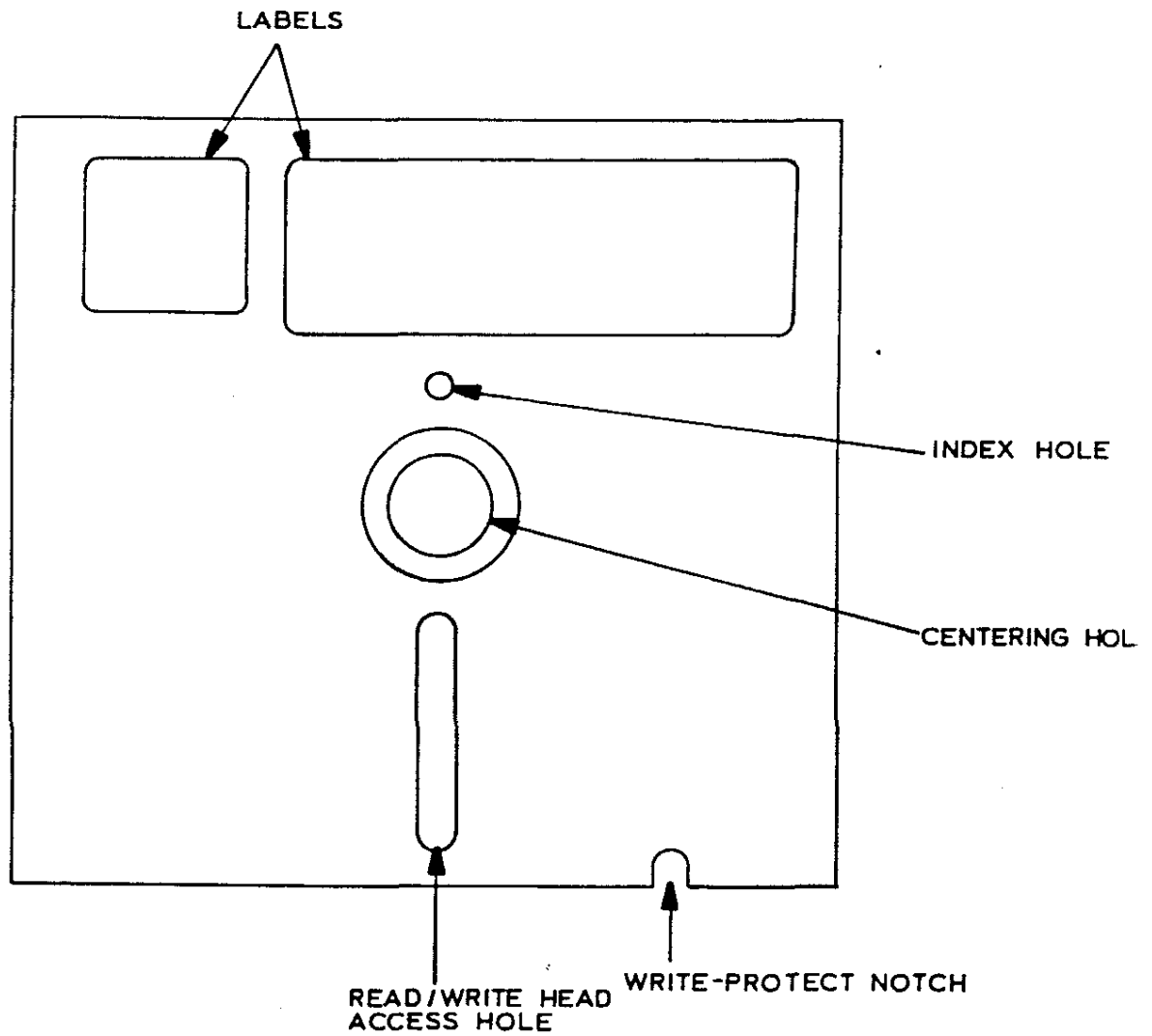
On the ORION V Desk-top model, the lower disk drive is Drive A and the upper disk drive is Drive B.

If the Ramdisk option is included on the system, it will be accessed as another disk drive. Ramdisk option is semi-conductor memory which is programmed to simulate a disk drive; it appears to be, and is accessed in the same manner as, a floppy drive. If the Ramdisk option is included on the system, the drive name by which it can be accessed will be shown in the CP/M sign-on message.

#### IMPORTANT:

Information stored in RAMDISK, because it is semi-conductor memory, is volatile: if the power is turned off, anything stored in RAMDISK is lost. Therefore care must be taken to copy all files which you have edited from RAMDISK onto diskette at regular intervals and at the end of a session.

# DISKETTE CARE AND HANDLING



8" DISKETTE

FIGURE 3 - 2

A DISKETTE

## SECTION 4

### OPERATION

#### 4.1 INTRODUCTION

The ORION V has been fully tested and burned-in by dy-4 Systems prior to shipment. An initial checkout procedure is included here to provide a simple functional check. If the system fails to perform any of the steps outlined, proceed to Section 8 on Troubleshooting.

##### 4.1.1 KEYBOARD CONVENTIONS

Before entering any commands or instructions into the ORION V, some basic points must be covered concerning the form of commands and a number of special keyboard functions.

1. Where blanks or spaces are shown in a command, do not omit them: the commands will usually not be executed properly without them.
2. Commands are always finished by hitting the carriage return or RETURN Key (represented in this manual by <CR>). The command is not processed until the <CR> is hit. Hence, you may correct mistakes, change the command or omit it entirely if the carriage return has not been entered.
3. If typing mistakes are made they can be corrected using the "Rubout" or "Delete" key, which deletes the previous character. A whole command line may be cancelled by typing ^U (Control-U: pressing both the control key and the letter U at the same time).
4. Do not confuse the number zero (0) and the letter O. In this manual, the zero is shown with a slash through it. When the number 1 is shown, do not use lower case l as you would on an ordinary typewriter.
5. The Control (CNTRL) Key is used in conjunction with another key to send a signal to perform a certain function. The two keys must be pressed at the same time (see Section 5.1.3).
6. Where upper-case letters are shown in a command, do not use lower-case. The CAP-LOCK Key can be used to lock upper-case letters in; the other keys are not affected. CP/M translates lower-case letters (internally) into upper-case letters, but it is a good practice to always use upper-case letters in commands. Refer to the operations manual for your specific terminal for other special functions.

## 4.2 HARDWARE SYSTEM CHECKOUT

The following simple checks will ensure that the system is now functioning properly. All user input is underlined. Each command entered is terminated with a "carriage return" <CR>.

1. Ensure that there is no diskette in the system.
2. Turn the power ON (switch on the right side of the back of the ORION V Industrial model, left button on the front of the ORION V Desk-top model).
3. The Monitor period prompt (.) should appear at the left side of the console screen. If the (.) prompt does not appear, check to see that the screen brightness on your terminal has not been turned down. Refer to the operations manual for your specific terminal.
4. Run Memory test by typing the following command:

.T 0,DFFF <CR>

Note: Upper-case letters must be used (0 represents zero).

For each successful pass, the monitor types a 'P' at the console. Refer to the Debug Monitor Manual, Appendix C, for further information on monitor commands. Allow at least two passes (2 'P's printed) before stopping the test by typing ".".

## 4.3 OPERATING SYSTEM CHECKOUT

The following sections will require the use of the ORION V CP/M System diskette and the blank diskette. A procedure is given to load and execute CP/M, inspect the directory, read a disk file and back up (copy) the master system diskette.

### 4.3.1 LOADING CP/M (BOOTING THE SYSTEM)

Insert the ORION V CP/M System diskette in Drive A (lower disk drive on the ORION V Desk-top model). Depress the Reset button (RST button on the front of the ORION V Industrial Model; button on the right of the front panel of the ORION V Desk-top model). There should be a slight delay while the operating system is loaded from the disk into memory. During loading, the LED indicator on the disk unit should illuminate, indicating that the read/write head is being loaded onto the diskette surface. The system should type on the console the sign-on message followed by the system prompt:

## Operation

dy-4 Systems, Inc.  
64K CP/M for the ORION  
BIOS Version n.n-n  
A>

The system prompt indicates that the currently selected disk drive (the drive which the system is currently working with, also called the "logged" drive) is 'A' and CP/M is ready to accept commands.

If the system fails to perform as described above, refer to the Troubleshooting Section (8) of this manual.

### 4.3.2 CP/M COMMANDS

Once the CP/M system disk has been loaded into memory, the system is ready to accept commands or instructions from the user. The CP/M accepts the following built-in commands, which are loaded along with the system and are always in memory, ready to be executed. These commands are:

DIR	To display a directory listing of the files on a particular disk drive
ERA	To erase files (remove) from the currently logged disk
REN	To change the names of files on disk
SAVE	To store on disk a number of "pages" from the Transient Program Area
TYPE	To display the contents of a file on the currently logged disk drive.

See Section 5 for the exact format for using these commands.

There are other transient commands accepted by CP/M. These are present on the system disk in the form of .COM files (files with the filetype COM). These are only loaded and executed when the individual commands are given. These commands are specified in the same manner as built-in commands, but they must be present as a COM file in the directory (built-in commands do not). Some of the transient commands are FORMAT (to format new disks), PIP (to copy and concatenate files), ED (text editor), STAT (to give statistical information on files and disk drives) etc. See Section 5.1.5 for the exact format of these commands.

### 4.3.3 THE UPDATE FILE

The operator can obtain a directory listing on the console of all the files currently on the logged disk drive by typing the following (user input is underlined):



## Operation

A>DIR <CR>

What should result is a list of all the filenames included on the master diskette. [Note that the operating system is not listed, since it resides on a special area of the diskette separate from the active storage area. More about this later.] There should be a file called "Update" listed in the directory. This file is used to communicate information pertinent to the current ORION V CP/M release (i.e. new programs included but not mentioned in this manual). To read this file, enter the following command, which prints the contents of this file on the console. The user can halt the display of the Update file by typing Control-S (press the CTRL key and S at the same time). To continue the display, type Control-S again.

A>TYPE UPDATE <CR>

### 4.3.4 BACKING UP THE MASTER SYSTEM DISKETTE

It is always good practice to maintain the supplied master diskette(s) as backup and store them in a different location from the working copies. To generate the working copy of the master, mount the supplied blank diskette in Drive B, then type the following command:

A>PIP B:=\*.\*[V] <CR>

This invokes the CP/M Peripheral Interchange Program and causes it to copy from the currently logged disk (A) to the disk in B all files, verifying that the copy was correct.

The master disk is not completely copied, however, since the system has not been copied to the "special area" mentioned earlier. To accomplish this, enter the following command and responses:

A>SYSGEN

sysgen version m.m

from disk size (8/5): 8  
source drive name (or RETURN to skip): A  
source on A then type RETURN: <CR>  
done system transfer

to disk size (8/5): 8  
destination drive name (or RETURN to reboot): B  
destination on B then type RETURN: <CR>  
done system transfer

ENTER DISK SIZE (8/5): CTRL-C  
A>

## Operation

Test the new working copy of the system diskette by replacing the diskette in drive A (the master) with the diskette just created. Repeat the procedure to "boot the system" given in 4.3.1.

For those who wish to obtain some hands-on experience with the creation of files and the use of some of the CP/M commands, turn to Appendix B which contains the directions for a practice session.

### 4.3.5 INSTALLATION OF APPLICATION SOFTWARE

Some software application packages must be "installed" to operate on a particular terminal. This involves a specific procedure which is outlined in the documentation of each individual application package and usually involves answering questions concerning the cursor addressing on your terminal and various other features (reverse video, variable intensity, etc.).

Any software packages which you receive from dy-4 Systems will already be installed for your terminal, so there is no need to run the installation program. However, the disks for these application programs, such as Wordstar, Calcstar etc. (the master disks which you receive with your ORION V) do not contain a CP/M system, so it is not possible to "boot the system" with these disks. To obtain a working copy of your application program to use, follow the procedure in the next section. Put your master disk away in a safe place. (NOTE: The master disk will still not have a CP/M system on it).

### 4.4 BACKING UP PROCEDURES

It is of the utmost importance that the user develop the habit of backing up (creating working copies of) all master disks; the master disks should be stored in a safe place. Also the user should make back-ups, on a regular basis, of all data files. The importance of this procedure must not be underestimated: the first time the user erases a disk by mistake and does not have a back-up, much more time and energy will be wasted replacing the lost data than would have been spent backing-up the disks properly in the first place.

To back-up a program disk use the following procedure:

1. Insert CP/M system disk in drive A and boot the system.
2. Insert a blank disk in drive B.
3. If the blank disk is new, it must be first formatted. After the A> type FORMAT <CR> (See Section 5.1.5.11 for more information.)

## Operation

4. If you are backing-up a disk with programs on it, generally you will want the CP/M on it also. After the formatting is finished, type SYSGEN <CR>. (See Section 5.1.5.9.)
5. Copy PIP to you new disk by  
PIP B:=A:PIP.COM <CR>
6. Remove the system disk from drive A.
7. Take the new disk out of drive B and place it in drive A.
8. Reboot the system.
9. Place your master disk which you wish to back-up into drive B.
10. Type the command  
PIP A:=B:\*. \*[V] <CR>  
to copy all files from drive B onto drive A.
11. Remove the master from drive B and put away in a safe place.

Once this is completed, you have a working copy of a master disk, with the CP/M system on it so that you may use it by itself.

To back-up a data disk (to be only used in drive B, not to be used to boot the system), use the following procedure:

1. Place the CP/M system disk in Drive A and boot the system.
2. When the sytem prompt is displayed, type PIP <CR>
3. The prompt '\*' will be displayed; this indicates that the PIP program is ready to accept commands.
4. Remove the system disk from Drive A and replace it with your data disk to be copied.
5. Place a blank, formatted disk in Drive B.
6. Type B:=A:\*. \*[V] ; this copies all files from drive A to drive B.
7. Remove data disk from Drive A and replace it with the system disk again. Your data disk is now backed-up.

## Operation

### 4.5 CUSTOMIZED BIOS MODIFICATION

The CP/M operating system consists of three distinct parts.

CCP (Command Control Processor): Accepts operator input from console

BDOS (Basic Disk Operating System): Handles disk input/output

BIOS (Basic Input/Output System): Depends on the hardware being used; the input/output devices.

The CCP and BDOS are both device-independent; that is, these portions of CP/M are identical no matter what type of hardware the system is run on. The BIOS portion defines the hardware environment in which CP/M is executing and must be modified for the particular input and output devices being used. dy-4's ORION V is delivered with the necessary setup (CBIOS) to operate in a standard configuration, including CRT disk drive units, and serial printer. For any other configuration, the user must modify the CBIOS portion to include the different input and output devices in his particular system. Details are given in the UPDATE file included with the ORION V's CP/M system.

### 4.6 ENDING A SESSION

To finish off a session on the ORION V the user should exit from any programs in the normal manner, then remove all disks from the drives before turning the power off. If the computer will be used later in the day, the power may be left on if desired. However, never leave disks in a drive unattended for any length of time.

## SECTION 5

### SOFTWARE DESCRIPTION AND DOCUMENTATION

#### 5.1 OPERATING SYSTEM

The software supplied with the ORION V consists of the CP/M operating system Version 2.2 and support programs for the development of 8080/8085 and Z80 programs. CP/M was written for the 8080 CPU, but runs also on a 8085 CPU or Z80 CPU. The 8080 and 8085 machine language instructions are almost identical but the Z80 has an enhanced instruction set, of which CP/M does not take full advantage.

CP/M is a Control Program for Microcomputers, specifically Z80 or 8080/8085. It provides the environment for program construction, storage and checkout by managing the various resources included in the ORION V system (the console keyboard and CRT, memory, disk storage, printer, PROM programmer, etc.).

##### 5.1.1 DESCRIPTION

CP/M is divided into several distinct parts:

CCP	Console Command Processor
BDOS	Basic Disc Operating System
BIOS	Basic Input/Output System (hardware dependent)
TPA	Transient Program Area

BDOS controls one or more disk drives and organizes files to minimize access operations. The BIOS provides the operations needed to access the disk drives and to connect specified peripheral equipment (console, printer, paper tape reader, etc.). The user can modify this portion of CP/M to work with any hardware configuration, using the procedure described in the UPDATE file included with the ORION V CP/M system. See Section 4 of this manual.

The Transient program Area (TPA) is the work area and holds programs which are loaded from disk (user programs or support programs included with the system: see transient commands, Section 4.3.2 of this manual).

The CCP accepts input, in the form of commands, from the console and performs the necessary operations. In the standard ORION V system, the CCP can operate with up to four separate disk drives (referred to as A, B, C and D). The disk drive that the CCP is currently working with is said to be the "logged" drive. The logged drive name is displayed every time the system is ready to accept another command in the form "A>", where "A" is the logged disk drive and the symbol ">" shows that the system is ready to accept a command from the user, via the console. To change the logged drive (i.e. to address a different drive), the user types

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in the new drive name, followed by ":" and carriage return. The system then responds with the newly addressed drive and the prompt symbol ">".

Example:

```
A>          "A" is the logged drive
A>B:<CR>   User types in the underlined characters
B>          "B" is now the logged drive
```

### 5.1.2 FILE REFERENCES

A file reference describes a particular file or group of files on a disk. File references are in the form pppppppp.sss where pppppppp is the primary name referred to as file name, consisting of 8 characters or less and sss is the optional secondary name, referred to as filetype, which usually describes the type of file. For example the secondary name "ASM" refers to an assembly language file. Filetype .COM refers to a readily executable program (can be executed simply by typing the filename). You may use whatever filetype you wish when naming a file, or omit it entirely.

Example of valid filenames:

```
ABC.ASM
DEF      (It is not necessary to have a filetype)
TEST.TRY
```

The symbols \*.\* can be used to describe all files on a particular disk while \*.ASM refers to all files having the secondary name ASM, and TEST.\* refers to all files having the primary name TEST. Be careful using the \*.\* which refers to all files, especially using this with the erase (ERA) command.

The user can specify the disk drive on which a file is to be found by typing the drive name, followed by a colon (:) followed by the filename. Example: D:ABC.COM refers to a file called ABC.COM on disk drive D.

A file reference which identifies a single particular file is said to be an unambiguous filename (UFN) and a file name which identifies a group of files is said to be an ambiguous filename (AFN). In an ambiguous file name, the character "?" can be used to match any character in that position of a filename.

Example:

Filename ABC.?SM can refer to the following group of files:

```
ABC.ASM      ABC.YSM
ABC.XSM      ABC.ZSM
```

So the file reference ABC.??? is equivalent to ABC.\*  
 ???.\*ASM is equivalent to \*.\*ASM

### 5.1.3 CONTROL CHARACTERS FOR OUTPUT AND LINE EDITING

KEYS	ACTION
rubout/delete	Delete the last character typed at the console
control - U (^U)	Remove current line after new line
control - X (^X)	Backspace to beginning of current line
control - C (^C)	CP/M system reboot - loads CP/M system again (warm start)
control - R (^R)	Retype current command lines; types a "clean line" following character deletion
control - E (^E)	Physical end of line: carriage is returned but line is not sent until carriage return key is used
control - P (^P)	Copy all subsequent console output to the currently assigned list device. Output is sent to both the console and the list device until the next control - P is typed
control - S (^S)	Stops the console output temporarily; output continues when the next character is typed at the console (e.g., another control - S). This can be used to slow down output on high-speed consoles (e.g. CRT's) to enable the user to examine a segment of output before continuing.
control - Z (^Z)	Ends input from the console
control - H (^H)	Backspace one character position
control - J (^J)	(line feed) terminates current input
control - M (^M)	(carriage return) terminates input

These functions are achieved by pressing both the control key and the applicable character key at the same time.

NOTE: These editing functions apply only when the CP/M system is in control. If you are using a software

## SOFTWARE DESCRIPTION AND DOCUMENTATION

applications program, these control characters will have different functions while you are running that program.

### 5.1.4 BUILT-IN COMMANDS

The operator issues commands to the operating system via the console keyboard. There are two classes of commands: built-in and transient.

The built-in commands are handled from within the operating system itself (always in memory ready to execute) and consist of the following commands:

#### 5.1.4.1 USER n (n is an integer value in the range 0 to 15)

The USER command allows the maintenance of separate files in the same directory. Files are separated according to the user number. Upon initial start-up, the operator is automatically logged into user area number 0 (zero). The user area can be changed by typing USER followed by a number e.g. USER 2. When requesting a listing of all files (using DIR command, see below), the listing will only include the files stored on the currently logged user number.

NOTE: In the standard ORION V system with floppy disk drives, this CP/M feature is generally not used. In this case, ignore references to user number in the following command descriptions; where user numbers appear in examples, in the ORION V system these will be omitted. Most often, the user areas and user numbers are employed with hard disk drives.

#### 5.1.4.2 ERA filename <CR>

The ERA (erase command) removes files from the currently logged disk drive. The erase command can be used to

- a) erase a single file e.g. ERA ABC.XYX <CR>
- b) erase a group of files e.g. ERA \*.ASM <CR> which would erase all files with the secondary name ASM, listed under the current user number
- c) erase all files in the currently logged user number e.g. ERA \*.\* <CR>

#### 5.1.4.3 DIR filename <CR>

The DIR (directory) command causes a list of names of all the files specified by the "filename" (under the currently logged user number) to be displayed on the console device. The DIR command can be used



## SOFTWARE DESCRIPTION AND DOCUMENTATION

- a) to list all files on currently logged disk and current user number e.g. DIR <CR>
- b) to list a group of files on currently logged disk and current user number e.g. DIR \*.COM <CR> which would list all files with the secondary name COM.
- c) to list files on a disk drive other than the currently logged disk e.g. DIR B: OR DIR B:ABC, \*

### 5.1.4.4 REN filename 1 = filename 2 <CR>

The REN (rename) command is used to change the names of files on disk. The file specified by filename 2 is changed to (renamed) filename 1. If no drive name is specified, the currently logged drive is assumed; e.g. REN ABC.XYZ = ABC.UVW <CR>. If a drive other than the currently logged drive is specified for either filename 1 or filename 2, then both filename 1 and filename 2 must be on the same drive. Both filename 1 and filename 2 must be unambiguous i.e., refer to a single file. The Rename command is in the form: REN newname = oldname.

e.g. REN A:X.Y = W.Z  
REN X.Y = A:W.Z  
REN A:X.Y = A:W.Z

These command are equivalent

File W.Z on drive A is renamed  
X.Y (also on A)

### 5.1.4.5 SAVE n filename <CR>

The SAVE command stores n pages (256-byte blocks) on disk from the Transient Program Area and names the file "filename". In the CP/M system the TPA starts at 100H (hexadecimal) which is the second page of memory.

SAVE 3 ABC.XYZ

Copies 100H through to 3FFFH  
to ABC.XYZ

For more detailed explanation, refer to the accompanying information on CP/M.

### 5.1.4.6 TYPE filename <CR>

The type command displays the contents of the file named filename on the currently logged disk drive and user number at the console device.

TYPE ABC.XYZ

The file ABC.XYZ on the currently logged drive, is displayed on the console.

TYPE B:WWW.XXX

The file WWW.XXX on drive B is displayed on the console.

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The file must consist of printable characters to be seen on the display. Do not attempt to type .COM files, .OBJ files; meaningless garbage will appear on the console. The command TYPE will work with filetypes .BAS, .ASM, .BAK, .DAT, .HEX, .DOC or any other file which contains ASCII text or data.

### 5.1.5 TRANSIENT COMMANDS

The transient commands are included in support programs as part of the CP/M operating system: these are automatically loaded from the currently logged disk whenever the appropriate commands are typed in by the user. These commands are present on the system disk in the form of .COM files (files with the filetype COM). Transient commands are specified in the same manner as built-in commands, but they must be present as a .COM file in the directory (built-in commands do not). If you encounter a problem using a transient command, for example STAT? is displayed on your screen after attempting to use the STAT command, check to see that the file STAT.COM is present on your disk.

#### 5.1.5.1 STAT <CR>

The STAT command provides statistical information concerning disk file storage.

<u>STAT &lt;CR&gt;</u>	Calculates the storage space remaining on all active drives.
<u>STAT A: &lt;CR&gt;</u>	Calculates the number of bytes remaining on drive A.
<u>STAT filename &lt;CR&gt;</u>	Statistics on all files specified by filename are displayed.
<u>STAT A:=R/O &lt;CR&gt;</u>	Sets the drive A to read/only. If there is an attempt to write on drive A, the message BDOS ERR ON A: READ ONLY will appear. If any key is depressed, the disk becomes R/W (read/write), CP/M reboots.
<u>STAT VAL: &lt;CR&gt;</u>	Produces a summary of the available status (STAT) commands.
<u>STAT D:filename \$S &lt;CR&gt;</u>	Lists statistics on the file or group of files specified by the filename on Drive D. Information includes the number

of records, the actual number of bytes allocated, the number of logical 16k extents, and the R/O or R/W access mode. The \$S parameter causes the size field to be displayed also (the virtual file size in records). If \$S is omitted the size is not displayed.

STAT D:filename \$R/O  
STAT D:filename \$R/W  
STAT D:filename \$SYS  
STAT D:filename \$DIR

The commands are used to set or reset various permanent file indicators. The R/O indicator places the file (or group of files) in a read/only status until changed by a subsequent STAT command; this status remains with the file throughout cold start operations. The R/W indicator places the file in permanent R/W status. The SYS indicator attaches the system file indicator to the file; using the DIR (in the STAT command) removes the system indicator from a file

STAT D:DSK <CR>

List drive characteristics of disk drive D.

STAT DSK: <CR>

Lists drive characteristics table of all currently active drives.

STAT USR: <CR>

Lists user numbers which have files on currently addressed disks.

#### 5.1.5.2 ASM filename <CR>

The ASM command loads and executes the CP/M 8080/8085 assembler which takes an assembly language program (specified by filename, with the secondary name assumed to be ASM) and produces a file in machine language which can be subsequently loaded and executed. (See the LOAD command below.)

ASM ABC <CR>

Takes file ABC.ASM (assembly language) and produces ABC.HEX which can later be loaded and executed.

#### 5.1.5.3 LOAD filename <CR>

The LOAD command reads a file in special format (machine language in "hex" format) produced by ASM from disk into memory.

The LOAD command creates a file X.COM which means it contains machine executable code where X is the filename specified in the LOAD command. The program is executed when the filename is typed immediately after the console prompt ">".

e.g. AB.ASM is a assembly language program

A>ASM AB	Assembles the program, produces AB.HEX
A>LOAD AB	Reads AB.HEX, produces AB.COM
A> AB	Executes the program

The program can be executed any number of times simply by typing the filename immediately following the console prompt ">".

Using the LOAD command, the user can create his own "transient" commands (which are stored as .COM files).

#### 5.1.5.4 DUMP filename <CR>

The DUMP command types the contents of a disk file, specified by filename, at the console in hexadecimal form. Long typeouts can be stopped by pressing the rubout key.

#### 5.1.5.5 DDT filename <CR>

The DDT program allows dynamic interactive testing and debugging of 8080/8085 programs.

For details on the DDT program commands see CP/M User's Guide.

#### 5.1.5.6 ED filename <CR>

The ED program is a context editor which allows the creation and alteration of text files (ASCII coded).

e.g. ED ABC.ASM <CR>

The ED program creates the specified source file ABC.ASM if it does not already exist and opens the file; an intermediate work file ABC.\$\$\$ is created to hold the edited data during the ED run. After the ED run, ABC.ASM (the unedited, initial file) is renamed ABC.BAK and the edited file (ABC.\$\$\$) is renamed ABC.ASM.

Upon entering the ED program, the prompt '\*' indicates that the program is ready to accept text transfer commands. ED performs operations on the source file (the filename given in the ED command) by first moving all or part of the text contained in the file into a memory buffer (by means of an Append command) where

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it can be examined and altered by means of various ED commands. After the text has been edited, the contents of the memory buffer are copied into the temporary work file (filename.\$\$\$) using a Write command. After the editing is finished, the End command is issued and the temporary work file is automatically copied to the source file.

### TEXT TRANSFER COMMANDS

- nA <CR>      Copy the next n unprocessed source lines from the source file and add these to what is already in the memory buffer.
- nW <CR>      Write the first n lines of the memory buffer into the temporary file, appending them to what is already in the temporary file.
- E <CR>        End the edit; copy the memory buffer to the temporary file and rename the files as described above.
- H <CR>        This automatically performs the same as the E command, but also moves to the start of the new edited file, ready to perform a second edit (same filename).
- O <CR>        Return to the start of the original file; the memory buffer and temporary file are emptied. This effectively cancels all previous editing commands on the file (abandons the edit).
- Q <CR>        Quit edit, with no changes to the original source file; same effect as O command but also exits from ED program, returns to CP/M.

In these commands, n is an integer from 0 to 65535. If n is omitted, the value 1 (one) is assumed. If the character "#" is given for n, the value 65535 (the maximum) is assumed. The command #A reads the entire source file (if it is of a reasonable size) into the memory buffer for editing and #W writes the entire memory buffer to the temporary file (.\$\$\$).

The memory buffer can be thought of as a sequence of source lines brought in by the Append command from the source file. The memory buffer has an imaginary character pointer (CP) which moves throughout the buffer and can be manipulated by the user. The CP is positioned either (1) before the first character of the first line (beginning of memory), (2) after the last character of the last line or (3) between two characters.

Upon entering into the ED program, the memory buffer is empty. The user may append lines (A command) from the source file or enter the text directly from the console (if creating a file)

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with the Insert command.

### I <CR>

Each line of input should be followed by <CR>. When the input is completed, type ^Z (CNTRL-Z) after the \* prompt.

Various commands allow the user to move the character pointer (CP) or display text in the vicinity of the CP. The following commands may be used, where n is an integer with default value 1 (one) and the default sign is +. These commands all act only on the text lines in the memory buffer (they do not affect the original file).

- |                 |  |
|-----------------|--|
| <u>+B</u> <CR>  | Move CP to the beginning of memory buffer if + and to the end if -.  |
| <u>+nC</u> <CR> | Move CP by n characters, ahead if +, behind if -.  |
| <u>+nD</u> <CR> | Delete n characters ahead of CP if + and behind CP if -.   |
| <u>+nK</u> <CR> | Remove ("kill") <u>+ n</u> lines of source text starting at the current position of CP; if +, the lines after CP are removed; if -, the lines before CP are removed.   |
| <u>+nL</u> <CR> | If n=0, move CP to the beginning of the current line; if n $\neq$ 0, move the CP to the beginning of the current line, then move it n lines down if + and n lines up if -.   |
| <u>+nT</u> <CR> | If n=0, type the contents of the current line up to the CP. If n=1, type the contents of the current line from CP to the end of the line. For n>1, type n lines (including current line) ahead if + and behind if -. |
| <u>+n</u> <CR>  | Equivalent to <u>+nLT</u> ; moves n lines ahead if + or behind if - and types a single line.   |

Any number of commands can be typed one after the other, on a single line and are processed in order after the <CR> is typed. E.g., B2T <CR>.

Other commands are available to insert, find and replace strings, and group ED commands. For more details see the accompanying information on CP/M.

### 5.1.5.7 SUBMIT filename parm#1....parm#n <CR> XSUB SSUB

These are batch processing programs which enable automatic processing of a series of CP/M commands. SUBMIT and XSUB are programs included with the CP/M operating system and SSUB is an additional program included by dy-4 with extra features for more flexibility and ease of operation.

### SUBMIT filename parameter #1....parameter#n <CR>

The filename given in the command must specify a file which exists on the currently logged disk, with the file type assumed to be "SUB". This ".SUB" file contains CP/M commands with possible parameter substitution. The commands in the ".SUB" file may contain parameters in the form \$1, \$2, ..., \$n, with the number n corresponding to the number of actual parameters that will be included when the SUBMIT command is given. Upon submission command, all occurrences in the .SUB file of the character \$1 are replaced by parameter 1 specified in the SUBMIT command, character \$2 is replaced by parameter 2 etc. and the commands are executed in sequence by the Command Control Processor.

#### EXAMPLE:

Suppose TEST.SUB is on disk and consists of the following commands:

```
ASM $1
PIP $2 = $1
LOAD $1
$1
```

Then the command SUBMIT TEST AB WZ would substitute AB for every occurrence of \$1 and substitute WZ for every occurrence of \$2 and thus would create a file containing the following commands:

```
ASM AB
PIP WZ = AB
LOAD AB
AB
```

Which would be executed by CCP.

### XSUB

This is an additional utility program, which allows line input to programs as well as the Console Command Processor. The XSUB command must be the first line of your submit file. All subsequent submit command lines are processed by XSUB; programs which read console input receive their input directly from the submit file.

## SOFTWARE DESCRIPTION AND DOCUMENTATION

Only the first command file submitted need have XSUB in the first line. XSUB remains in memory until a cold start occurs.

### SSUB <CR>

SSUB command can be used in the same manner as standard SUBMIT, but also has some additional features - has a HELP message, has an interactive mode, and can be used to enter a number of commands, separated by semi-colons.

To get the HELP message type:

SSUB <CR> after system prompt

### 5.1.5.8 MOVCPM

The MOVCPM program allows the user to reconfigure the CP/M system for any particular memory size. The MOVCPM program relocates a memory image of CP/M and places this image in memory, ready for a system generation operation (SYSGEN). Also used in modification to CBIOS (Basic Input/Output System). See UPDATE, Section 4.

MOVCPM <CR>

Relocate and execute CP/M for current memory configuration; the new system is executed but not recorded on disk.

MOVCPM nn <CR>

Creates CP/M system for nn kilobyte system and system is executed.

MOVCPM \* \* <CR>

Creates a relocated memory image for current memory configuration but leaves image in memory ready for SYSGEN operation.

MOVCPM nn\* <CR>

Construct a relocated memory image for an nn kilobyte memory system, and leaves memory image ready for a SYSGEN operation.

where nn is a two-digit integer decimal number of the kilobytes of memory that you want CP/M to recognize.



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### 5.1.5.9 SYSGEN

The SYSGEN command allows generation of an initialized diskette containing the CP/M operating system. The SYSGEN program is interactive; it prompts the console for commands.

<u>SYSGEN</u> <CR>	Initiates SYSGEN program
sysgen version n.n	Sign-on message generated by SYSGEN
from drive size (8/5)	Type in size of source disk ( <u>8</u> )
source drive name (or RETURN to skip)	Type in drive name (A,B,C or D) of the disk drive containing a CP/M system, usually A. If MOVCPM command has been used, type only <u>&lt;CR&gt;</u> . If a drive name X is typed, the response will be:  source on X then type RETURN Place a disk containing the CP/M operating system on drive X (A,B,C or D). Then <u>&lt;CR&gt;</u>
done system transfer	CP/M system is copied to memory. SYSGEN answers:
to drive size (8/5)	Type in size of destination disk ( <u>8</u> )
destination drive name (or RETURN to reboot)	If a disk is being initialized, place new disk into a drive and type in the drive name. Otherwise type a <u>&lt;CR&gt;</u> and the system will reboot from drive A. If drive name Y is typed SYSGEN will responds with:  destination on Y then type RETURN Make sure new disk is in drive Y then type <u>&lt;CR&gt;</u> .
done system transfer	New disk has been initalized in drive Y.

SYSGEN will respond with the "to disk size (8/5)" prompt until CNTRL-C is typed; in this way more than one disk can be initialized without starting SYSGEN over again.

The disk being initialized now contains CP/M operating system, with only the built-in commands. In order to obtain the transient commands on the new disk, the user must copy the files from

## SOFTWARE DESCRIPTION AND DOCUMENTATION

the existing CP/M disk, using the PIP command as shown below.

SYSGEN only constructs a new operating system on a disk: it does not destroy files already existing on a disk. If the disk is not going to be used on drive A (for booting) only used on B,C, or D drives then it need **not** be initialized using SYSGEN.

### 5.1.5.10 PIP <CR>

PIP is the Peripheral Interchange Program which is a media conversion program used to load, print, copy and combine disk files.

The command can be in one of the following forms:

1. PIP <CR>
2. PIP "command line" <CR>

In either case, the PIP program is loaded from disk into memory and executed. Using form (1) the PIP reads command lines from the console, prompting with a "\*", until an empty command line is entered (just <CR>). This is used if a number of different media conversions are to be accomplished. Using form (2), the single command line is executed immediately with no prompting afterwards.

The "command line" takes the following form:

destination = Source #1, Source #2, ..., Source #N

Where destination is the file or peripheral device to receive the data and Source #1, Source #2, ..., Source #N represent the files or devices which are copied, in order, from left to right (concatenated).

The destination and source elements represent a file or group of files, with or without a preceding disk drive name (followed by a colon) which names the disk drive on which the file may be found. If the destination file already exists, it is removed if the command line is properly formed (it is not removed if an error condition arises).

Examples:

\*X = Y

Copy file Y into file X; Y remains unchanged.

\*X = Y,Z

Concatenate files Y and Z and copy the result to file X; Y and Z remain unchanged.

\*ABC.DEF = B:UVW.XYZ

Move a copy of file UVW.XYZ from drive B into file ABC.DEF on

## SOFTWARE DESCRIPTION AND DOCUMENTATION

currently logged drive.

\*B:U.V = B:U.W , A:X.Y , W.Z

Contatenate file U.W on drive B with file X.Y on drive A and file W.Z on logged drive; move this to file U.V on drive B.

PIP allows abbreviated commands for transferring files between disk drives. These forms are:

- (1) PIP X: = filename <CR> This copies the file or group of files specified by "filename" from the currently logged drive to the same filenames on drive X.

e.g. PIP B: = \*.ASM This copies all files of type "ASM" from the currently logged drive to the same filenames on drive B.

- (2) PIP X: = Y:filename <CR> This copies the file or group of files specified by filename from drive Y to drive X.

e.g. PIP A: = B:TRY.\* <CR> This copies all files on drive B with the primary name TRY to the same filenames on drive A.

- (3) PIP filename = Y: <CR> This copies the file specified by filename from drive Y to the currently logged drive.

e.g. PIP TRY.NEW = A: <CR> Copies the file TRY.NEW from Drive A to the same name on currently logged drive.

- (4) PIP X:filename = Y: <CR> This copies the file specified by filename from drive Y to drive X.

e.g. PIP NEW.ONE = B: This copies the file NEW.ONE from drive B to drive A.

NOTE: In all of these cases the source and destination disks must be different.

## SOFTWARE DESCRIPTION AND DOCUMENTATION

Another form of the PIP command allows the use of input/output devices. The command takes the following forms:

```
PIP dev: = x:filename.typ
PIP x:filename.typ = dev:
```

where dev is the input/output device e.g. LST is the list device (printer) and CON is the console (CRT).

- e.g. PIP LST: = B:ABC.XYZ      This copies the file ABC.XYZ on drive B to the list device (printer). The contents of the file are printed out.
- e.g. PIP A:FILE.TXT = CON:      This copies input from the console device to a file FILE.TXT on Drive A. Control-Z terminates the transfer and signifies the end of the file.

Each form of the PIP command can be followed by a number of parameters, enclosed in square brackets. These parameters are optional and are described briefly below.

1. [B] - specifies block mode transfer of information.
2. [Dn] - deletes all characters after the nth column: this is primarily used to send wide-lined output to a device which handles only narrow lines (e.g. CRT terminal). For file to file transfers this is rarely used.
3. [E] - echoes the copying to the console as it is being performed; the contents of the file being transferred will be displayed on the console.
4. [F] - removes form feed characters from the copy of the file; the destination receives no form feed characters.
5. [Gn] - directs PIP to get the source file from a user area (n) other than the currently logged user area; this allows the transfer of files from another user number into the current user number. For reasons of security, it is not possible to transfer into another user number, only from another user number.
6. [H] - checks for proper Intel Hex Format.
7. [I] - ignores any null records in Intel Hex Format transfers.
8. [L] - converts upper-case letters to lower-case letters.
9. [N] - adds line numbers to each line transferred during the copying process.

## SOFTWARE DESCRIPTION AND DOCUMENTATION

10. [O] - for transferring object files or other non-ASCII files; this is necessary since CP/M uses different methods for marking and detecting the end-of-file for ASCII and non-ASCII files.
11. [Pn] - issues form feed after the nth line; this is used when the list device (i.e. printer) does not understand the form feed character or does not insert top and bottom margins.
12. [Qstring^Z] - copies a portion of a file by specifying the final characters to be copied; the source file is copied up to and including the characters in the specified string.
13. [R] - directs PIP to copy a system file (a file with the attribute SYS). A SYS file will not be copied unless this parameter is specified.
14. [Sstring^Z] - copies a portion of a file by specifying the initial characters to be copied; the copy is started when the specified characters in 'string' are encountered.
15. [Tn] - sets the tab stops at every nth column.
16. [V] - verifies that the copy is correct by comparing the original source file with the newly created file.
17. [W] - tells PIP to copy into a R/O (read-only) file without query.
18. [Z] - zeroes the parity bit on each ASCII character received from the source; each ASCII character uses 7 of 8 bits for recognition and processing - the eighth bit is called the parity bit.

For more information on the various uses of the PIP command, refer to the accompanying information on CP/M.

#### 5.1.5.11 FORMAT <CR>

The FORMAT program is an interactive program for formatting disks: either all of the tracks or only certain tracks. To use the program, simply type in

A> FORMAT

The program will prompt the user with questions concerning the disk formatting (default answers will be shown by CR=default value; this means that if the user simply presses carriage return, then the default value will be taken):

1. Size of disk: 5 inch or 8 inch
2. Density: single (S), double (D), extended (X)
3. Single sided (S) or double-sided (D)
4. Single (S) or double track (D) - answer D (double) only if your disk drives are specified double track (check the specifications of your particular system)
5. What drive is the disk to be formatted on (A,B,C or D)
6. Standard format (Yes or No)
  - if Yes - all of the disk is formatted (destroys all of the data on the disk)
  - if No - then the user may specify only certain tracks to be formatted, in which case the rest of the disk remains as it was

The disks to be used in particular drives should be formatted to match the characteristics of that disk drive, but more importantly, they must also be formatted according to the characteristics of the particular disk being used: specifically whether the disk is single-sided or double-sided (this information is on the label). User should check the specifications of his system since the type of disk drive varies on different ORION models.

The FORMAT program will print a row of asterisks ("\*") across the screen, each one representing a track successfully formatted. If an R is printed instead of an "\*", this means that a retry (a second attempt to format a track) has been attempted. If two retries in a row are attempted, the FORMAT program will ask if you wish to try again; if not, the program will abort. Even new diskettes can have bad sectors.

If there are no successful formatting operations performed, most likely the disk is write protected - this problem can be solved by covering the notch on the lower edge of the disk with a tab (see Section 3.7).

Check your diskette to see whether it is single-sided or double-sided. It should be specified on the upper left hand label. It is not possible to take a single-sided disk and format it double-sided. Check your disk before attempting a format operation.

## SOFTWARE DESCRIPTION AND DOCUMENTATION

### 5.1.5.12 CRCK filename <CR>

CRCK is a cyclic-redundancy check program which produces a 4 character (hexadecimal) check-sum for the file given in the command. This can be used to verify that a particular file or program has not been changed (i.e. data lost or changed by mistake).

The check-sum produced when CRCK is executed on a particular file should always be the same; if it is not, then the file has been changed.

In the UPDATE file included on the ORION V system, the check-sums for all the support programs included with the system are listed. To verify that the support programs on the user's system diskette are identical the user may execute the CRCK program on his files and verify that the check-sum produced matches the check-sum given in the UPDATE file.

This is particularly helpful if you are having trouble with executing certain transient commands.

e.g. SYSGEN command doesn't work

type in CRCK SYSGEN <CR>

When the check-sum is given, make sure it matches the one given for SYSGEN in the UPDATE file.

**Caution:** Any program that the user modifies will be given a different check-sum. User should execute CRCK after modification and note the check-sum for future reference.

## SOFTWARE DESCRIPTION AND DOCUMENTATION

### 5.2 BDOS ERROR MESSAGES

There are three error situations which the BDOS (Basic Disk Operating System) intercepts during file processing. When such an error situation occurs, the following is printed:

BDOS ERR ON X: error message

Where X is the drive name. The three error messages are:

1. BAD SECTOR      An error condition has been encountered in reading or writing the diskette; usually means a badly worn diskette or a problem with the diskette controller. Also, this condition may occur when reading disk files generated by another system (different manufacturer). To recover from this condition type a control - C to reboot (safest way) or return (which may destroy data).
2. SELECT          Error caused by attempting to address a drive other than A,B,C, D. The system reboots after any key is pressed.
3. READ ONLY       Error caused by trying to write to a disk which has been designated as read-only. To recover from this condition, the user should reboot using warm start (control - C) or by performing warm start whenever diskettes are changed.

### 5.3 DEBUG MONITOR

The dy-4 Debug Monitor is contained in firmware located on the DSTD-102 CPU board. The Monitor is a program that gains control of the ORION V if there is no disk inserted in Drive A on power-up or when the reset button (RST button on the ORION V Industrial model, right button on the front of the ORION V Desk-top model) is pressed. When the Debug monitor program is entered the console prompts with a period (.). For commands, see Appendix C.



## SECTION 6

### HARDWARE

#### 6.1 HARDWARE DESCRIPTION

The ORION V system is based on the DSTD family of microcomputer modules. The two modules used in the standard system are described below.

1. **DSTD-102** This circuit board contains the 280A CPU, 4 channel Counter/Timer (CTC) and 2 serial input/output channels. Also included are two 2K x 8 (4K bytes altogether) EPROM devices which contain the system firmware (Debug and Disk Control Monitor). When a diskette is present in drive A during power-up or reset, the first sector of the diskette in drive A is read into memory and executed: this sector usually contains a "bootstrap" program to read an operating system off the disk into memory. If no diskette is present in drive A then the Debug Monitor is executed.
2. **DSTD-711** This circuit board contains 64k bytes of dynamic memory and the LSI diskette controller which interfaces directly to the two 8 inch disk drives.

## HARDWARE

### 6.2 SYSTEM PORTS

The following port addresses are used in the ORION V System:

Board Type	Port No. (Hex)	Description
DSTD-102	7A	Baud Rate Generator
	7B	Disable memory
	7C	CTC Channel 0
	7D	CTC Channel 1
	7E	CTC Channel 2
	7F	CTC Channel 3
	BC	Serial Port A Data (Console)
	BD	Serial Port A Control (Console)
	BE	Serial Port B Data (List)
	BF	Serial Port B Control (List)
DSTD-711	A0-A3	Floppy Disk Controller
	A4	DMA Address
	A5	Drive Select
	A6	Drive Density Mode Select
	A7	Memory Control Port

## SECTION 7

### MAINTENANCE

#### 7.1 PRINTED CIRCUIT MODULES

The DSTD-102 and DSTD-711 circuit boards require no preventive maintenance.

#### 7.2 POWER SUPPLY

The power supply assembly requires no periodic maintenance. If it is noticed that DC voltages have drifted from nominal values, adjustment facilities are available on the main regulator card. However, this determination should be made only with a high impedance voltmeter at normal operating ambient temperature.

#### 7.3 DISK DRIVE

##### 7.3.1 MAINTENANCE

The disk drives require preventive maintenance every 12 months under normal usage. See paragraph 7.4.3 for complete details. Cleanliness is very important to successful operation of the ORION V. Do not lubricate the disk drive unit; oil will allow dust and dirt to accumulate. The read/write heads on the disk unit should be cleaned when signs of oxide build-up are present. Oxide build up will cause premature failure of diskette material.

Occasional inspection of the read/write heads and diskette will monitor this condition. Head Cleaning Diskettes can be purchased for this purpose.

##### 7.3.2 DISK DRIVE REMOVAL

Preventive maintenance or inspection of the drive unit requires removal from the ORION V. The following procedure describes drive removal for the ORION V Industrial Model only. For the ORION V Desk-top Model, removal of the disk drives should be performed by qualified service personnel.

1. Remove all power from the ORION V.

**CAUTION:** HIGH AC VOLTAGES ARE PRESENT WITHIN THE SYSTEM EVEN WITH THE AC SWITCH OFF. REMOVE THE LINE CORD FROM THE WALL OUTLET.

2. Remove top cover.
3. Remove the flat cable (Signal), AC Power, and DC Power connectors from back of the drive to be removed. The AC and DC connectors are removed by depressing the tabs

## Maintenance

extending from the side of the connectors.

4. Carefully remove the front panel from the ORION V chassis by pulling forward.
5. Remove the front and rear screws (2) holding the drive to the baseplate.
6. Remove the disk unit out the front of the enclosure.
7. To replace the drive, use the reverse procedure.

### 7.3.3 DISK DRIVE PREVENTIVE MAINTENANCE

#### 7.3.3.1 INTRODUCTION

The prime objective of any preventive maintenance activity is to provide maximum machine availability to the user. Every preventive maintenance operation should assist in realizing this objective. Unless a preventive maintenance operation cuts machine downtime, it is unnecessary.

Visual inspection is the first step in every scheduled maintenance operation. Always look for corrosion, dirt, wear and loose connections. Noticing these items during PM may save downtime later.

Remember, do not do more than recommended preventive maintenance on equipment that is operating satisfactorily.

#### 7.3.3.2 PREVENTIVE MAINTENANCE PROCEDURES

Details of preventive maintenance operations are listed in Table 7 - 1. During the normal preventive maintenance, perform only those operations listed on the chart for that preventive maintenance period. Observe all safety procedures.

TABLE 7 - 1

## PREVENTIVE MAINTENANCE SCHEDULE

UNIT	FREQUENCY (MONTHS)	OBSERVE	ACTION
Read/Write Head	12	Oxide build up	Clean Read/Write Head ONLY IF NECESSARY
Stepper Motor and Lead Screw	12	Inspect for nicks and burrs	Clean off all oil, dust and dirt
Belt	12	Frayed or weakened areas	Replace
Base	12	Inspect for loose screws, connectors and switches	Clean base
Read/Write Head	12	Check for proper alignment	

## SECTION 8

### TROUBLESHOOTING

#### 8.1 INTRODUCTION

This section contains a troubleshooting guide for some specific problems which might occur with the ORION V system.

SYMPTOMS	THINGS TO CHECK
1. POWER ON indicator does not illuminate.	1. Power to line cord? 2. Fuse good? 3. Lamp defective?
2. POWER ON indicator illuminates, fan runs, drive spindle does not turn.	1. Drive belt broken or off pulley? 2. AC wiring to Disk Drive
3. POWER ON indicator illuminates. No diskette in Drive A. Monitor prompt '.' does not appear on console screen.	1. Check terminal communication cables, terminal and that cards are seated in connectors. Check Baud rate setting.
4. BDOS ERROR ON X: error message	1. See Section 5.2
5. Transient commands do not work --> System returns with PIP? or STAT?	1. Is the logged disk drive A (with the CP/M system diskette)? If not, change to A by typing <u>A:</u> 2. Check to see that file is there e.g. <u>DIR</u> PIP.*
6. Transient commands seem to be executed but do not perform the proper functions. e.g. SYSGEN	1. Execute CRCK program. e.g. CRCK SYSGEN and verify that the checksum given is the same as the check sum in the UPDATE file. If it is not, then the program has somehow become changed.

## Troubleshooting

### 7. System will not boot

1. Is the CP/M system diskette in drive A?
2. Is the CP/M diskette inserted in the proper manner? Check Section 3.3.

### 8. WRITE Error

1. Are you attempting to "write" (i.e. create, edit, copy, or erase a file) to a disk that is write-protected? Is the notch on the lower edge uncovered? If so, then the disk is write-protected and you must cover the notch with a tab in order to continue.

**APPENDIX A**  
**GLOSSARY OF TERMS**



## APPENDIX A

### GLOSSARY OF TERMS

CP/M	Control program for microcomputers; provides a general environment for program construction, storage and editing, file management, etc., by managing the various components in a system (memory, disk drives, CRT, printer); a standard operating system for which there are many application packages available.
CPU	Central processing unit which controls the sequencing of the operation of the entire system and performs arithmetic and logical functions (add, subtract, etc.).
I/O	Input/Output
K	Represents 1024
RAM	Random access memory, can be read from or written to; in this case, RAM is the memory inside the ORION V used to hold the the operating system, and programs and data while they are being processed.
PROM	Programmable read only memory, can only be read from, not written to (i.e. program) ; it can be programmed directly by using a special PROM programmer.
EPROM	Erasable PROM, can be erased and reprogrammed a number of times by means of a PROM programming unit.
HARDWARE	Refers to the actual physical components of a system, the "machinery".
SOFTWARE	Refers to the programs which cause the hardware to perform certain functions; the software "runs" the hardware.
FIRMWARE	Combination of hardware and software (i.e. programmed hardware); programs that are actually physically wired in the system.
CRT	Cathode ray tube; television-like tube, commonly used output device.
BYTE	Amount of memory needed to store a single character.
BAUD RATE	Speed of data transmission; a baud is a bit-per-second.
DISKETTE (Floppy Disk)	

A flexible disk enclosed in a plastic jacket used to store programs and data.

## GLOSSARY OF TERMS

### WINCHESTER DISK

A hard disk in a sealed, self-contained unit; has a much higher memory capacity than diskettes.

**LSI** Stands for Large Scale Integration and refers to the advanced technology by which several thousand transistors can be implemented on a single integrated circuit.

### WARM START

Using Control-C keys to reboot the system.

### BOOT THE SYSTEM

Loads the CP/M operating system from the disk into memory.

### COLD START

Initial loading of CP/M into memory; performed by pushing the reset button, referred to as "booting" the system.

**FILE** Any distinct unit of information stored on disk, with a unique filename; a file may contain, for example, a program, a form letter, a mailing list, or a series of numbers etc.

**ASCII** Character recognition and storage method in which each letter and character has a unique representation which can be used and saved by the computer.

## **APPENDIX B**

PRACTICE SESSION FOR FIRST TIME USERS

## APPENDIX B

### PRACTICE SESSION FOR FIRST TIME USERS

So far we have covered the basic features of the hardware and software of the ORION V, and the procedures involved in powering-up the computer and loading the CP/M operating system.

Having backed-up your master system diskette, the following section outlines a practice session to familiarize the first-time user with some of the more commonly used CP/M commands.

First, create a file called PRACTICE.DOC using the ED (editor) program as follows:

A>ED PRACTICE.DOC <CR> This command invokes ED, the text editor program and the file PRACTICE.DOC is searched for in the directory of disk drive A. Since we are creating a new file, ED will operate on an empty file.

If you see the message "WRITE" on the screen and then the CP/M prompt after you attempt to create a file, most likely your disk is write-protected (i.e. the notch on the lower edge of the disk is exposed). The system is trying to create a file, which involves writing on the disk. You must place a tab over the notch in order to continue.

New File

The editor program did not find an existing file, so it opens a new file.

\*

ED is ready to accept commands.

\*I <CR>

After the asterisk prompt, type the command I which instructs the editor that you wish to insert information.

:

The edit program returns with the ":" prompt to show that it is ready to accept the insertion. You may now type in any information that you wish to enter into your new file. Type 3 or 4 lines of text, following each line with a carriage return.

## PRACTICE SESSION FOR FIRST TIME USERS

1: ...text.....<CR>  
2: .....text..<CR>  
3: .text.....<CR>

You may enter any sort of text or data.

4: ^Z

When you have finished, type ^Z (the control key pressed at the same time as Z)

\*E <CR>

This command ends the edit and places the text you entered, into the file PRACTICE.DOC and exits from the editor program and returns control to CP/M.

A>

A>DIR <CR>

Now the DIR (directory) command may be used to list the files on disk drive A. You will notice that your file has been added to the list.

Now, place a blank, formatted disk in drive b.

A>B: <CR>

This changes the currently logged disk drive from A to B.

B>

The prompt changes to show that the system is now looking at drive B.

B> DIR <CR>

This produces a directory listing of all files on disk in drive B. Since this is a new, blank disk, there will be no files.

NO FILE

B>

Shows that no files are currently on drive B.

B>A: <CR>

Changes the currently logged drive from B to A.

A>PIP B:=A:PRACTICE.DOC <CR>

Copies the file PRACTICE.DOC on disk drive A to the same filename on disk drive B.

NOTE: In this copy command, the left side of the equal sign represents the destination for the copy and the right side represents the source

## PRACTICE SESSION FOR FIRST TIME USERS

A>>DIR B: <CR>

The directory listing for drive B can be shown on the console while still logged onto drive A.

The directory will show that the file PRACTICE.DOC was successfully copied from drive A onto drive B.

A>>B: <CR>

Log onto drive B.

B>>TYPE PRACTICE.DOC <CR> This displays the contents of the file PRACTICE.DOC on the console.

B>>TYPE A:PRACTICE.DOC <CR>

This displays the contents of the file PRACTICE.DOC on drive A. You see that the two files are identical.

B>>REN NEW.DOC = PRACTICE.DOC <CR>

This finds the file PRACTICE.DOC and renames it NEW.DOC.

NOTE: the new name is on the **left** hand side of the equal sign. (REN newname = oldname)

B>>DIR <CR>

The directory listing shows that now only the filename NEW.DOC is on drive B.

B>>A:STAT \*.\* <CR>

This will list statistics on all files on currently logged disk drive (in this case, drive B).

B>>ERA NEW.DOC <CR>

Erases the file NEW.DOC from disk drive B.

B>>DIR <CR>

A directory listing shows that there are no longer any files on drive B, since we erased NEW.DOC.

B>>A: <CR>

Log onto drive A again.

A>>STAT \*.\* <CR>

This gives statistics on all files on disk drive A.

For further practice, you may create 2 or 3 different new files and experiment with copying, renaming, listing, erasing them, etc.

## APPENDIX C

### DEBUG AND DISK CONTROL MONITOR MANUAL

Document No. 101P-0-11-1  
Document No. 102P-0-11-1  
Revision B

DEBUG MONITOR  
AND  
DISK CONTROL MONITOR



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# DEBUG MONITOR AND DISK CONTROL MONITOR

## 1.0 Debug Monitor

The Debug monitor is contained in an EPROM which is based at address E000. With this firmware, the operator via a CRT can examine and modify memory, set and clear program breakpoints, copy memory blocks, execute programs, etc. (details of all features are present in Section 1). A convenient non-destructive memory test command is also provided to enable the user to check RAM performance.

## 2.0 Disk Control Monitor

The Disk Control Monitor (DCM) is an option contained in a second EPROM which is based at address E800. This product controls diskette controller input and output and the single-step option. When a diskette is present in drive A during power-up or reset, the first sector of the diskette in drive A is read into memory and executed. This sector usually contains a "bootstrap" program to read an operating system off the disk into memory. If no diskette is present in drive A then the Debug monitor is executed.

## 3.0 Operational Notes

The delimiter ',' used between arguments in commands may be replaced by spaces.

The entry of a '.' at any point will return the user to the MONITOR.

The entry of a slash '/' during most repetitive commands will complete the command by finishing the command and returning the user to the MONITOR.

Entry of invalid characters causes the monitor to output a '?' and return for a valid command. The command is not executed.

When entering any number, only the last four digits entered will be taken for an address or the last two in the case of a port number or argument.

Entry of any character while the MONITOR is printing to the console stops printing. Entry of any character allows printing to resume.

## Introduction

User's registers are loaded to active registers with E or W command. They are stored in RAM with breakpoint re-entry, warm start, or full restart.

## Commands

### 1.1 Breakpoint Command

```
.B <CR>  
.B pppp<CR>
```

The Breakpoint command sets a software breakpoint by setting up a jump in RAM at the user specified location back to the MONITOR. The original contents of RAM are stored and replaced when the break point is cleared or executed. Since the breakpoint jump is three bytes, placing a breakpoint on a return will cause the first two bytes of the following code to be overwritten. Upon execution of a break point the user's registers are stored and displayed while the breakpoint is cleared. Setting a breakpoint will clear any previously set and not executed breakpoint.

### 1.2 Copy Command

```
.C ssss,eeee,dddd<CR>
```

Copies the contents of RAM from ssss to eeee inclusive to the corresponding bytes starting at dddd. In the event that dddd is internal to the boundaries ssss,eeee code will be duplicated.

### 1.3 Execute Command

```
.E <CR>  
.E pppp<CR>
```

The MONITOR transfers control to the user's program while restoring all of the user's registers.

### 1.4 Fill Command

```
.F ssss,eeee,nn<CR>
```

Fills memory locations ssss to eeee inclusive with nn.

## Commands

### 1.5 Memory Command

.M <CR>

Displays memory in blocks of 256 bytes from the last address displayed. Should be preceded by some sort of memory command with an address or the start address will be indeterminant.

.M nnnn/

Displays memory in blocks of 256 bytes as above from location nnnn on.

.M nnnn<CR>

Examine and update individual memory locations.

.M ssss,eeee<CR>

Display memory locations ssss to eeee inclusive.

### EXAMPLES

<u>.M 8000&lt;CR&gt;</u>	
8000 FA <u>&lt;CR&gt;</u>	Entry of a carriage return moves to next
8001 FE <u>05&lt;CR&gt;</u>	address.
8002 BD <u>^</u>	Entry of an argument and a carriage
8001 05 <u>0B^</u>	return updates the location and moves to
8001 0B <u>36.</u>	next location. Entry of a '^' with no
.	argument updates the present location
	and re-displays it. Entry of a '.'
	exits the command with no update.
<u>.M 8001&lt;CR&gt;</u>	Entry of a slash '/' and an argument
8001 0B <u>36/</u>	updates the location and returns to the
.	MONITOR.

## Commands

### 1.6 Port Update Command

.P nn<CR>

.P 78<CR>  
78 FF <CR>  
79 0A 00<CR>  
80 12 ^  
79 0F 06  
79 0A 3/  
.

.P 79  
79 BF ^  
.

Each port instruction reads the port and waits for an argument to output to the port. A termination character may be entered without an argument in which case the port number is decremented for a '^', incremented for a <CR> and the command is terminated by a slash '/' or a '.'. When an argument is entered, it is output to the port if the termination character is a '^', '/', or <CR>. The port number is incremented with a <CR>, decremented with a '^', and termination of the command occurs with a '/'. Entry of a '.' causes termination prior to output to the port.

### 1.7 Port Update Command (without read)

.Q nn<CR>

.Q 78<CR>  
78 <CR>  
80 ^  
79 06  
79 3/  
.

.Q 79  
.79 ^  
.

This command is identical to the P command except that no read of the port is done.

### 1.8 Register Examine Command

.R<CR>

PC	A	F	B	C	D	E	H	L	A'F'	B'C'	D'E'	H'L'	IX	IY	SP
0035	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000

.

Displays the contents of the user's registers as stored by re-entry into the MONITOR.

## Commands

### 1.9 Memory Test Command

.T ssss,eeee,<CR>

PP

A 'P' is displayed for each time the test makes one complete pass through the bounds in memory set by ssss and eeee. If the test fails at any point in the test, the location and the data written and read are displayed. Entry of a '.' during the test will abort the test. The test will continue until it is aborted by the user.

.T E800,E803<CR>

BAD E800 10 AA

BAD E801 10 BB

PBAD E800 11 AA

BAD E801 11 BB

PRAD E800 11 AA

BAD E801 11 BB

P

(a '.' was entered here although not echoed)

### 1.10 Verify Memory Command

```
.V ssss,eeee,dddd<CR>
```

The contents of memory from ssss to eeee are compared with the contents of memory from dddd, byte for byte. Any bytes which do not match are shown by outputting the address and contents of the byte in the block starting at dddd.

EXAMPLE:

.V 3000,3FFF,4000<CR>

407A 3D

This shows that of the two blocks 3000 to 3FFF and 4000 to 4FFF, the only locations which do not match are 307A and 407A.

## Commands

### 1.11 Single Step Command

```
.W <CR>
.W pppp<CR>
.W ,nn<CR>
.W pppp,nn<CR>
```

This command is available only with the Single Step Board option from dy-4 Systems Inc. The single steps will begin at location pppp if this argument is included. The value of nn is the number of steps to be taken in HEX. When all steps have been completed in each command variation above, the cursor will wait at the right for either a carriage return to signal it to perform another single step or another character to signal it to return to the MONITOR. Default for non-entry of pppp is the user's PC register. Default for nn is one single step.

#### EXAMPLES:

```
.W 4000,<CR>
```

```
4001 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 FF64<CR>
4003 4400 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 FF64<CR>
4006 4400 2222 0000 0000 0000 0000 0000 0000 0000 0000 0000 FF64<CR>
4009 4400 2222 4444 0000 0000 0000 0000 0000 0000 0000 0000 FF64<CR>
4012 4400 2222 4444 7777 0000 0000 0000 0000 0000 0000 0000 FF64.
```

```
.W ,2<CR>
```

```
4015 4400 2222 4444 7777 0000 0000 0000 0000 1445 0000 FF64
4016 4400 0000 0000 0000 0000 0000 2222 4444 7777 1445 0000 FF64<CR>
4017 4400 0000 0000 0000 0000 0000 2222 4444 7777 1445 0000 FF62.
```



## Entry Points

### 2.0 Entry Points

Entry Point	Address	Description
RENTY	E003	Entry into the MONITOR at this point saves all of the user's registers but does not initialize the SIO. (i.e. a Warm start)
RDCHAR	E006	A character is read from the console and returned in A register. Bit 7 of the E register must be set up, 0 for non-immediate mode or 1 for immediate mode. Immediate mode causes RDCHAR to exit immediately if a character is not available.
WRCHAR	E009	A character must be placed in the A register where it is output to the console. Immediate mode must be set up in the E register as in RDCHAR.
ECHO	E00C	A character is read from the keyboard and output to the screen as well as left in the A register.
SPACE	E00F	A space is output to the console.
CRLF	E012	A carriage return and line feed are consecutively output to the console.
PRENT	E015	The number (HEX) in the A register is output to console after being converted to ASCII.

## Entry Points

PTEXT	E018	The HL register pair must be loaded with the address of the starting point of an ASCII string which must end with a termination code of 03H. (EOT)
ASCHEX	E01B	A call to ECHO or RDCHAR must precede this call in order that the internal variable CHAR contains a valid value.
** RDWR	E030	The location FF86 contains the read/write code in order that the routine will read/write a sector.
** FLPRDY	E033	This routine scans the floppy controller until the disk drive is ready for another command and then returns.
** FRSTOR	E036	A restore is executed on the currently logged disk.
** FSEEK	E039	A seek to the track stored in location FF80 is executed on the currently logged disk.
** SDISK	E03C	The user can select the disk for the target of the next read, write, seek or restore operation. The disk is in the form 0,1,2.... (A,B,C....) stored in location FF84.
* ERROR	E01E	The message: "ERROR # nn" where nn is the contents of the A register is output.

## Entry Points

\* DELAY                   E021

Causes a delay of 1ms times  
the number in the B register.

\*     These modules are included in the Disk Control Monitor  
      PROM. Calls to these jump table locations without the DCM  
      PROM in place will cause undetermined results.

\*\*    Not included with ORION VI DCM

## User Memory

### 3.0 User Memory

The debug monitor assumes there is at least 256 bytes of RAM located from FF00 to FFFF. The user is advised not to use these locations such as to interfere with the operation of the monitor. If the user's system uses a dy-4 manufactured CPU card (eg. DSTD-101, 102), then there are 1024 bytes (FC00 - FFFF) of available RAM. The user is free to use any of the lower RAM from FC00 to FFEF.

## Error Codes

### 4.0 Error Codes

Error #	Description
1	Read error
2	Restore error
3	Restore error during seek (caused by seek error)
4	Seek error (with successful restore)
5	Reserved....
6	Reserved....
7	Read/Write code not either (wrong parameter passed)
**10	Bad boot error

## Command Summary

### 5.0 Command Summary

.B <CR>	Clears a break point if set, non-functional if none set.
.B pppp<CR>	Sets a break point at location pppp.
.C ssss,eeee,dddd<CR>	Copy contents of ssss to eeee inclusive to destination dddd.
.E <CR>	Start execution from location found in user's PC register.
.E pppp<CR>	Start execution from location pppp.
.F ssss,eeee,nn<CR>	Fill locations ssss to eeee inclusive with nn.
.M <CR>	Display 256 locations from the last display point.
.M nnnn<CR>	Display and set location nnnn.
.M nnnn/	Display 256 locations from location nnnn.
.M ssss,eeee<CR>	Display from location ssss to location eeee.
.M :	Display and set registers.
.P nn<CR>	Display contents of port nn and set
.Q nn<CR>	Set only the contents of port nn
.R	Display the contents of the registers.
.T ssss,eeee <CR>	Destructive test of memory from location ssss to eeee.
.V ssss,eeee,dddd<CR>	Verify (compare) memory locations ssss to eeee with the corresponding locations from dddd, byte for byte.

## Command Summary

.W <CR>	Single Step one step from user's PC.
.W pppp<CR>	Single Step one step from pppp.
.W ,nn<CR>	Single Step nn steps from user's PC.
.W pppp,nn<CR>	Single Step nn steps from pppp.