

# **MICRO DECISION**

## **User's Guide**

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**Micro Decision® User's Guide**

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WordStar® is a product of MicroPro Corporation.

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BASIC-80® is a BASIC programming language developed by Microsoft, Incorporated.

BaZic® is a NorthStar compatible BASIC programming language developed by Micro Mike's, Incorporated.

PERSONAL PEARL® is a product of Relational Systems, International.

Micro Decision®, Correct-It® and Micro Menus® are products of Morrow Designs, Incorporated.

CP/M® 2.2 and 86 are operating systems developed by Digital Research, Incorporated.

## Foreword

This manual is designed to get you started in your use of the Micro Decision® computer. Although it will familiarize you with the supplied software, it is not a substitute for the manuals that accompany the software and the operating system.

We urge you to read the manual completely, performing the simple operations it outlines. Before long, you and your new Micro Decision®, (to use a little computer jargon) will be "up and running."

This version of the manual is subject to revisions. As you use it, please take a few minutes to note the sections that are confusing or particularly helpful. If you write your comments in the margins, feel free to send us your corrections and we'll return the favor with a free revised manual.

**Warning:** This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case, the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

MICRO DECISION  
USER'S GUIDE

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# CHAPTER 1

## INTRODUCTION

The Morrow Designs Micro Decision® is an economical computer system, as advanced and sophisticated as those costing several times the price. With the optional Morrow Designs terminal, and a printer, you have all the hardware and software you need for word processing, proof reading, financial modeling and programming.

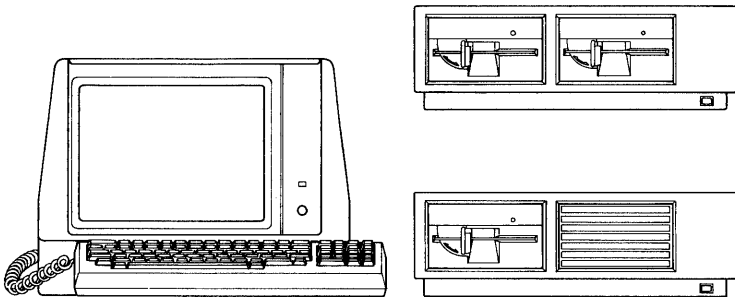


Fig. 1-1: The Micro Decision® Systems

Because your system comes with the CP/M® operating system (Control Program for Microcomputers), you are able to choose from the world's largest library of professionally written business application programs. Your Micro Decision® includes the BASIC®, BaZic® and Morrow Designs' PILOT programming languages, Morrow Designs' exclusive Micro Menus® and many specialized programs for such tasks as diskette copying, program editing, and other "utility functions."

## 1.1. System Hardware

- Z80A (8-bit) Central Processing Unit (CPU)
- 64K bytes of internal Random Access Memory (RAM)
- 2 RS-232 serial ports - one for your terminal and the other for a printer or MODEM
- Disk drive controller for up to four 5 1/4 inch floppy drives - 2 internal and 2 external
- 1 or 2 single sided drives standard, or 2 double sided drives.

## 1.2. System Software

- CP/M 2.2® Operating System
- WordStar® Word processing program
- Correct-It® Checks and corrects spelling
- LogiCalc® Financial modeling ("electronic spreadsheet") program
- PERSONAL PEARL® A versatile data base management package that allows design and production of forms and reports. Shipped with double sided drive systems only.
- BASIC-80® Microsoft BASIC programming language
- BaZic® NorthStar compatible BASIC language
- PILOT Morrow Designs' version of this popular programming language.
- Micro Menus® Your road map through CP/M®. Includes a CP/M® tutorial.

### 1.3. System Requirements

Your Micro Decision® comes with all the basics (computer hardware and software) needed to get started, but to complete your system, you will need the following:

#### 1.3.1. Terminal

A computer terminal is required for communicating with your computer. Although the Micro Decision® works with most computer terminals, the Morrow Designs terminals are recommended for those wishing to take full advantage of the software included with the Micro Decision®.

#### 1.3.2. Diskettes

The drives in the Micro Decision use 5.25 inch soft sectored floppy diskettes. For best results, use only premium quality diskettes that are certified for use in your type of system; for example, if you have an MD3, be sure to ask for diskettes that are suitable for double sided, double density use. These diskettes are available from most computer and office supply dealers. You need at least seven diskettes to get started. We recommend that you have a box of ten diskettes on hand.

**CAUTION:** Diskettes are vulnerable to accidental erasure or damage. Before you begin using them, please read Chapter 2 for important information on their care and handling.

### 1.4. Optional Hardware Equipment

There are two RS-232 serial port connectors on the back panel of the Micro Decision®. One is marked "TERMINAL" and the other "PRINTER/MODEM." These are industry standard interfaces which support a wide variety of printers, MODEMS and other serial communications de-

vices. One RS-232 port must be used for your terminal. The other can be used for a printer, a MODEM, or any other serial device that is compatible with your system. See Appendix D for information on how to set up these ports.

#### 1.4.1. Printer

The Micro Decision® works with most letter quality and dot matrix printers. The printer plugs into the back panel RS-232 port labeled "PRINTER/MODEM." In some cases, the set up of the printer serial port may need to be changed (for a different baud rate, for example). This procedure is described in Appendix D.

#### 1.4.2. MODEM

A MODEM (short for MODulator-DEModulator) connects your Micro Decision® to a telephone line and allows you to exchange programs and data with other microcomputers, or with larger computers. You can also access computerized information services such as The Source and CompuServe with a MODEM.

The MODEM connects to the RS-232 interface on the back of the system unit labeled "PRINTER/MODEM." Your dealer can provide you with information about MODEMs that can be used with your Micro Decision®. Again, see Appendix D for information on connecting these devices. (Note: Connecting your Micro Decision® to a MODEM requires special communications software not supplied with your system.)

#### 1.4.3. Additional Disk Drives

Your Micro Decision® comes from the factory with one or two disk drives. Because the CP/M® system supplied with the Micro Decision® is specially enhanced with a Virtual Drive

feature, (see Chapter 7), single drive users have some of the conveniences previously available only to those with two or more drives. All of the software supplied with the Micro Decision® will work on a single drive system.

Although the Virtual Drive feature makes a single drive system functional, there are good reasons to consider additional drives. Single drive systems can access a maximum of 200k (200,000 characters) of programs and data at any one time. Users with dual drive systems will have at least twice the "on-line" storage space, and are not required to exchange diskettes when copying files, programs or entire diskettes. See Chapter 2 for a full discussion of disk drives and allocation of diskette space.

Your Micro Decision® can accommodate up to four disk drives. Single drive systems can be upgraded by adding another internal drive. Dual drive systems can be upgraded by adding one or two external drives. A four drive system supplies 800k of storage. With double sided drives, storage capacity increases to 1.6 Mbytes. Contact Morrow Designs or an authorized dealer for information about additional internal or external disk drives.

## 1.5. Additional Software

The Micro Decision® was shipped with several useful and popular application programs. In addition, your Micro Decision is capable of using most of the many programs that run using CP/M®. This opens the door for communications programs, accounting programs, games and much more. Some of the CP/M® users groups distribute free software. See your dealer for information on available software.

You also need to know that there are several CP/M® diskette formats. By format, we

mean the pattern on a diskette that the operating system expects before it can read or write information on it. The Micro Decision® uses standard 5 1/4" soft sector diskettes, but in order for it to read a program or data diskette, the diskette must use a format that the Micro Decision® knows about. A format program is included on your system diskette to prepare diskettes for use with your system.

In addition to diskettes specially formatted for the Micro Decision®, your system can run program diskettes, and read and write data diskettes that have been formatted for the Osborne I® and the Xerox 820® computers. Additionally, it can read and write to CP/M®-86 data diskettes formatted by an IBM Personal Computer®.

Software publishers and distributors are generally able to provide CP/M® programs in one of the formats available on the Micro Decision®. If your dealer or any software publishers are not able to help you, have them contact our customer service department.

## 1.6. Introducing: The Micro Menu®

The CP/M® operating system has many powerful commands. Although they can be learned with a little practice, they tend to be somewhat intimidating for the novice user. To make your Micro Decision® easier to use, we have implemented the Micro Menu® - a series of "menus" which allow you to enter CP/M® and program commands. Using the menus reduces many complex commands to a single keystroke - a feature that even experienced computer users will appreciate.

All of the commands executed from your Micro Menu® can also be executed directly from CP/M®. If you study the screen as you use the menus, you will see what the operating system is actually doing. It's as if you have a CP/M® expert standing over your shoulder pressing the keys as you watch.

## CHAPTER 2

### ABOUT YOUR SYSTEM

There are two essential elements to any computer system - hardware and software. If you think of your computer as a stereo system, your hardware is like the turntable, amplifier, radio and tape deck. The software is like your music collection, whether it is on records, tapes, or even FM radio signals. Music brings out the value and power of a fine stereo system. Software brings out the value and power of your Micro Decision®.

#### 2.1. Types of Software

There are several types of software including operating systems, languages, programs, and data.

The operating system is the interpreter which allows the hardware to "talk to" and "listen to" the software. It is an essential element to any system. Your Micro Decision® comes with the CP/M® operating system. It was selected not only because it is powerful and versatile, but because it supports a large number of business and personal software packages.

A language is the set of rules and terms that a programmer uses to write programs. The language, working through the operating system, tells the machine what the programmer wants it to do. There are many languages compatible with the Micro Decision® computer, ranging from the highly complex, like machine language to the simple, like PILOT or BASIC.

A program is a set of instructions that makes your system do what you want it to do. If you want to use your Micro Decision® as a word



processor, you must use a word processing program, such as WordStar®. Additional programs may be purchased, and you can write some yourself using one of the languages provided with your Micro Decision®.

Data is the information being processed. If you use WordStar® to create your great novel, the actual words of the novel are your data.

As an illustration, let's trace a letter created with WordStar®. The letter is data created by the WordStar® program. WordStar® is written in assembly language and runs under the CP/M® operating system.

**Files:** Your data is stored on the diskette in files. Think, for a moment, of a diskette as a drawer in a filing cabinet. It can contain lots of different files. You can place any information in the drawers of the cabinet, but only certain information goes into each file. Your letter to Ms. Smith, for example, would be in the drawer used for correspondence. If you were using WordStar® to create that letter, you could file it on a special diskette for correspondence with a file on that diskette called "SMITH." Your letter to Mr. Jones could be on the same diskette, but it would be in a different file, perhaps called "JONES."

You might have another drawer for your financial records, just as you might have a diskette for the files you create with LogiCalc®. Your income tax information might be in one file and your accounts payable records in another.

Programs are also stored in files, though they differ from data files. The operating system can tell the difference between a program file and a data file. Program files are executed (run) and data files are read, written to, or otherwise manipulated by programs.

## 2.2. Computer Hardware

The hardware on your Micro Decision® consists of a cabinet, a power supply, a central processing unit, memory chips, a disk drive controller, one or two disk drives, and an assortment of chips, resistors, plugs, and wires.

The "brains" behind the system is the Z80A central processing unit (CPU). That sounds (and is) impressive, but it's actually only one chip, about 3/8 inches square.

Another essential element is the Random Access Memory (RAM). Your system is equipped with 64k of memory. Each "k" (short for kilobyte) consists of 1024 bytes or characters. This translates to 65,536 bytes - each byte being the equivalent of one single number or letter.

The Random Access Memory determines how much information your computer can manipulate at any one time. Information stored in RAM can be instantaneously accessed by the computer. RAM acts as a temporary storage area. Any information in RAM disappears when a new program is run, when the computer is turned off, or when the electric company decides to interrupt your power. Fortunately, you have a more permanent means to store information - diskettes. These are also known as floppy diskettes, disks, discs or, affectionately, "floppies." We call them "diskettes."

## 2.3. Diskettes and Disk Drives

Information (data and programs) is transferred between the floppy diskettes and RAM via the disk controller and disk drives. Disk drives are a little like tape recorders. They read and write magnetically encoded information on the diskettes. Diskettes are similar in substance and function to magnetic tape. The disk drive can add information to a diskette (as long as there is room) or it can record new information over old, erasing the information that was there before.

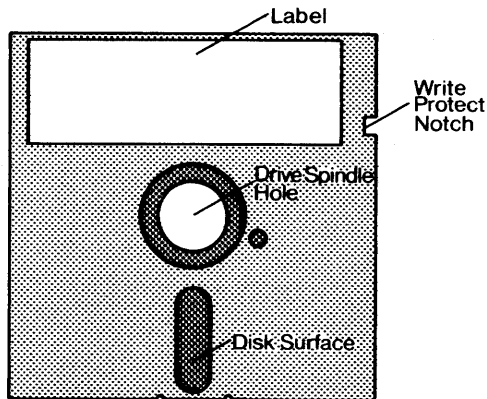


Fig. 2-1: Floppy Diskette Features

### 2.3.1. Allocation of Disk Space

The single sided floppy diskettes that work with the standard Micro Decision® can store up to 200k or 204,800 bytes (characters) of information (this increases to 400k or 409,600 characters per double sided diskette).

About 14k on each diskette is reserved for the CP/M® operating system, leaving about 186k (384k on double sided diskettes) for programs or data.

Therefore, the amount of data that can be accessed by the computer at any one time is 186k (or 384k) times the number of drives. Users with two drives are able to access about 370k (or 770k) of programs and data without swapping diskettes.

Unlike most CP/M® systems, the Micro Decision's® Virtual Drive feature makes it possible for single drive users to have their programs and data on separate diskettes. This means it is possible to create and access larger data files with a single drive Micro Decision system than is possible with other single drive systems. Whenever another diskette is needed, the Virtual Drive feature tells the user to exchange diskettes. Chapter 7 explains this feature in more detail.

## 2.4. Care of Diskettes

Diskettes are very important to your system. Information written on a diskette is "permanent" until you erase it or write over it - just like a cassette tape. Unfortunately, there are other ways to remove information from diskettes, like placing them near magnets, exposing them to extreme heat or touching their magnetic surfaces with your fingers.

### 2.4.1. Rules for Handling Diskettes

1. Never touch the plastic recording surfaces of the diskette. Handle them only by the protective plastic shield.
2. Always store diskettes in the envelopes provided.
3. Never write on a label already on the diskette using a pencil or ball point pen. If you must write on a label after it is affixed, do so lightly with a felt tip pen.
4. Keep diskettes away from extreme heat, humidity, dust, or magnetic fields. Telephones, stereo speakers and color T.V. sets can create magnetic fields.
5. Do not lay heavy objects on diskettes. Keep from bending if stored vertically.

## 2.5. Drive Names For Single Sided Drive System

The drive on the left side of the standard Micro Decision® is referred to as drive A. If you have two drives, the one on the right is referred to as drive B. If you have external drives, they are referred to as drives C and D.

Drive A is the drive where your CP/M® system diskette is placed. Drive B is used for data diskettes.

Because of the Virtual Drive feature included with the Micro Decision®, users with a single drive system will still have a "B drive."

Whenever drive B is referenced, the Virtual Drive feature automatically reassigns drive A as this drive. On-screen instructions tell the user when drive A is being reassigned and when to exchange diskettes in that drive.

## 2.6. Drive Names For Double Sided Drive Systems

The bottom drive on your Micro Decision® is referred to as drive A. The one on the top is referred to as drive B. If you have external drives, they are referred to as drives C and D.

Drive A is the drive where your CP/M® system diskette is placed. Drive B is used for data diskettes.

The following section describes the procedure for inserting the diskette into the drive.

## 2.7. Procedure for Inserting Diskettes

1. Open the door of the disk drive. This is done by turning the latch on the front of the drive up and towards the left.
2. Touching only the plastic shield, insert the diskette all the way into the drive with the label facing up and the notch (if any) to the left. The exposed oblong shaped area is inserted first. Think of that oblong as an arrow, pointing the direction in which the diskette is inserted.

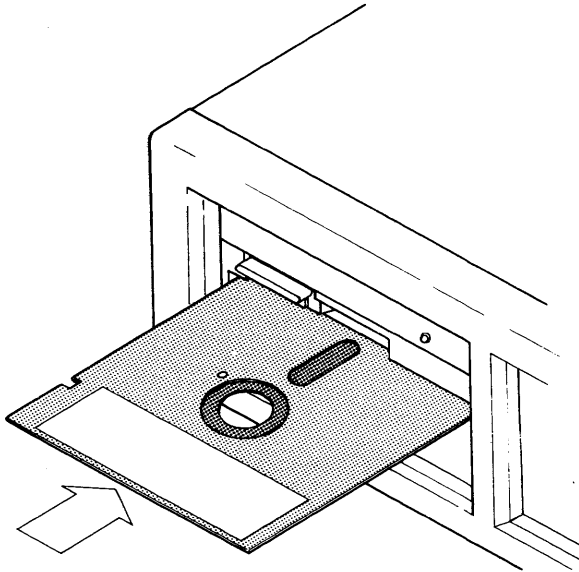


Fig. 2-2: Inserting the Diskette

3. Close the disk drive door by turning the latch down and to the right.

## 2.8. Write Protecting Diskettes

Most diskettes have a write protect notch on their right side. With the notch exposed, it is possible to write to, or erase the information on the diskette. Covering that notch with a write protect tab (a gummed label or piece of tape) prevents you from accidentally erasing material on a diskette. It is a good idea to write protect your back up copies of the diskettes that contain valuable data or programs. Write protect tabs are usually included with the diskettes when purchased.

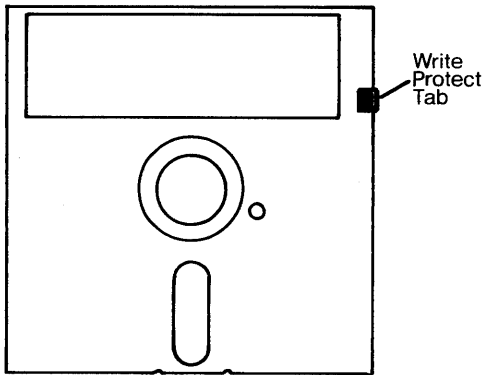


Fig. 2-3: Write Protecting the Diskette

Some program distribution diskettes do not have a write protect notch. They were shipped without the notch to discourage users from accidentally erasing or damaging them. In most cases, these programs can (and should) be copied to another diskette which is not write protected.

## 2.9. Backing Up Your Diskettes

Even if you follow our suggestions, there is still a chance that a diskette can be accidentally damaged or lost. Therefore, it is very important that you "back up" (copy) the diskettes

that contain your important programs and data. Backing up a diskette is easy and cheap insurance against a potential catastrophe. Back up procedures are discussed in Chapters 5 and 6.

**2.10. The Terminal Keyboard**

The keyboard on the Morrow Designs Terminal (and most other terminals) is similar in many respects to a standard typewriter keyboard. However, there are additional keys that are used to send special instructions to the computer. How the keys work depends on the software. Nevertheless, there are some keys that are commonly used by many programs and these are described below.



**Fig. 2-4: Typical Keyboard**

**2.10.1. ESC Key**

The use of the ESC (short for ESCAPE) key depends on the application program. In Word-Star®, for example, you are asked to press the ESCape key after executing certain commands. ESC is also used in the Micro Decision® Micro Menu® programs to return to (or "escape to") the previous menu.



### 2.10.2. CAP LOCK Key

The CAP LOCK key (also called ALPHA LOCK or ALL CAPS key) is like the shift lock key on a typewriter. It causes all letters typed to be in upper case. It has no affect on the number keys.

### 2.10.3. SHIFT Key

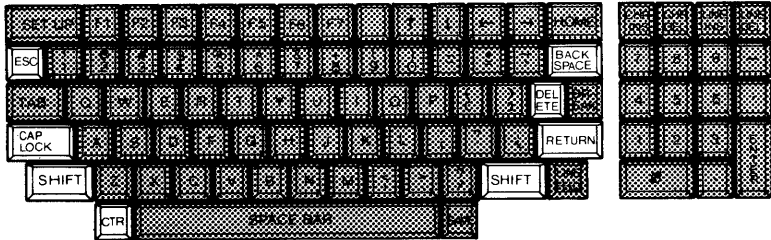
The SHIFT key works like the shift key on a standard typewriter. To type an upper case letter (or a symbol above a number key), hold down the SHIFT key and type the letter or number.

### 2.10.4. CTRL Key

The CTRL key (short for CONTROL) is always used in conjunction with another key to send a special command to your computer. Your keyboard has 26 letter keys (A through Z). The CTRL key can be used with these to add an additional 26 "keys" to your system. It can also be used with some of the symbols, for a total of 32 "keys".

The CTRL key is used just like the shift key. When you are asked to enter CTRL A, hold down the CTRL key and press the A key. The CTRL key is sometimes referred to by the "^" symbol. If a manual or help menu tells you to press ^A, it is asking you to press CTRL A.

You will find the CTRL key especially important when you begin using WordStar®. To delete a word, for example, the WordStar® manual instructs you to type ^T. In this case, you hold down the CTRL key and, without releasing it, press T. Although this may sound cumbersome, it is very easy to get used to.



**Fig. 2-5: Function Keys**

#### **2.10.5. BACK SPACE Key**

The BACK SPACE key is used to both back over characters and to erase characters. Both these functions depend on the program you are running at the time. In WordStar®, for example, pressing the BACK SPACE key will back the cursor over the characters, but will not erase them. Under CP/M®, however, BACK SPACE is the recommended key to use to erase characters.

#### **2.10.6. DELETE Key**

The DELETE key (sometimes called the RUB OUT key) is used in most application programs to back over and erase characters, but if entered under CP/M®, will "echo out" or retype the characters entered before erasing them. If all this seems confusing now, note that most programs include descriptions of how these keys are used and it won't be long before you are familiar with them.

#### **2.10.7. RETURN Key**

The RETURN key (sometimes called the ENTER key) is somewhat like a carriage return on a typewriter, but has additional uses. When doing word processing, for example, it is used to end a paragraph. In most cases, the RETURN key must be pressed to execute your

command; in fact, many programs do not recognize commands until the RETURN key is pressed. That's why it is sometimes called the "ENTER" key - it is used to enter commands.

### 2.10.8. Numeric Key Pad

The Morrow Designs terminal has a numeric key pad which is similar to an adding machine or calculator key pad. This pad is handy when using programs that require a substantial amount of numeric entries. The keys on the numeric key pad can be used interchangeably with the number keys above the letters on the keyboard.

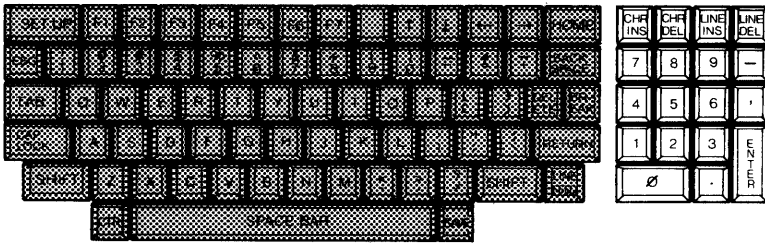


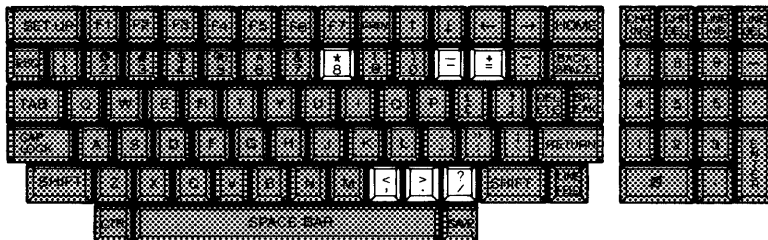
Fig. 2-6: Numeric Key Pad

### 2.10.9. Special Symbol Keys

There are several special symbol keys on your Morrow Designs terminal (and most other terminals) that do not appear on standard typewriters, and there are common symbols which serve double duty on a computer. These symbols are used in languages and programs for arithmetic functions. These are covered in the manuals that accompany BASIC, LogiCalc® and other languages and programs that use such symbols. Although their use can vary, the following table illustrates some common symbols and their definitions:

**Table 2-1: Special Keyboard Symbols**

SYMBOL	RESULT
<	Less than
>	Greater than
+	Addition
-	Subtraction
*	Multiplication
/	Division
=	Equals



**Fig. 2-7: Special Symbol Keys**

#### 2.10.10. Keyboard Idiosyncrasies

There are a couple of things you should know about the keys that have not yet been covered, namely, the character/line insert and delete keys above the numeric keypad ("edit keys"), and the up, down, left and right control arrows at the top of the alpha keypad ("cursor control keys"). Refer to the entry for your particular terminal model and serial number.

**MDT50:** Your cursor control and edit keys will have odd effects when running WordStar. You should instead use the standard Control key edit and cursor movement commands as described in the WordStar manual.

**MDT20 with serial numbers below 25110000:** The cursor control and edit keys will appear to work on the screen; however, WordStar will not know that you have used the keys, with unpredictable and generally undesirable results. Therefore do **not use these keys with WordStar.** Instead, use the standard cursor and edit commands as described in the WordStar manual.

**MDT20 with serial numbers between 25110000 and 25220000:** Your terminal will operate as described in the previous paragraph, but you have the option of upgrading it to operate as described in the next paragraph. Consult your dealer.

**MDT20 with serial numbers above 25220000:** Your cursor control keys will have odd effects when running WordStar. Therefore you should stick to the standard WordStar cursor commands. On the other hand, the edit keys will perform their intended functions. See section 3.3.6 of your MDT20 Terminal Reference Manual for definitions of their functions.

#### Notes

## INSTALLATION

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## CHAPTER 3

### SETTING UP YOUR SYSTEM

The instructions in this section will help you set up your new computer.

#### 3.1. Unpacking the System

Carefully lift the Micro Decision® from its box and check it for damage. If any damage is apparent, report it to your dealer immediately.

Be sure to remove the cardboard shipping protectors from the disk drives. These were placed there to protect the drives during shipping.

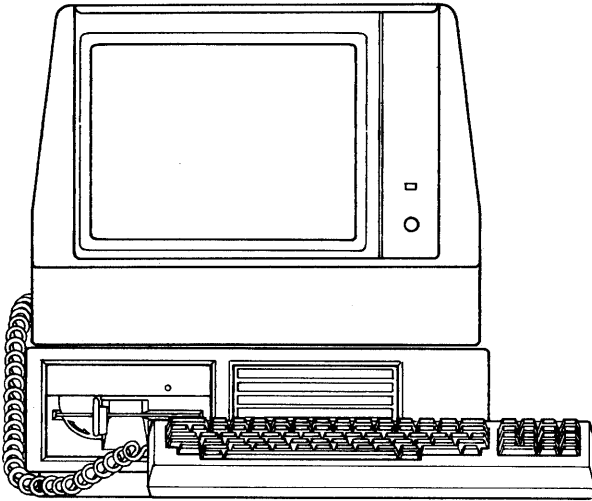
**IMPORTANT NOTE:** Save all packing material. To qualify for warranty service, your system must be returned in the original packing material. Instructions for returning systems to Morrow Designs are included in the warranty information sheets accompanying your system.

#### 3.2. Where to Place Your New System

Your Micro Decision® can be placed on any desk or table, but there are some considerations that will make your use of the computer more comfortable and help you avoid potential eye and back strain.

Most desk and table tops are about 31 inches from the floor. This is usually too high, placing unnecessary strain on your arms and back. Although the "ideal" keyboard height depends on the person, the chair, and other considerations, a rule of thumb is to place the keyboard so that the "home" row of keys (the row with ASDF) is about 28 inches from the floor. It is also wise to place the display screen in a position that avoids reflected glare and to avoid sitting with your back to a window or a strong light.

The keyboards on the Morrow Designs terminals detach from the display screen, allowing you to place them in any comfortable position.



**Fig. 3-1: Typical System Setup**

### 3.3. Cables and Plugs

The following cabling instructions apply to the Morrow Designs and most other terminals. For more information, see the manual that accompanies your terminal.

Be sure that the power to both the terminal and Micro Decision® computer is off. Looking at the Micro Decision® system from the rear, notice the connectors. The plug furthest to the right is the RS-232 port designated for your terminal. The plug immediately to its left is



another RS-232 serial port that allows you to plug in a printer, MODEM, or other serial device. The plug furthest to the left is used only if you are connecting external disk drives.

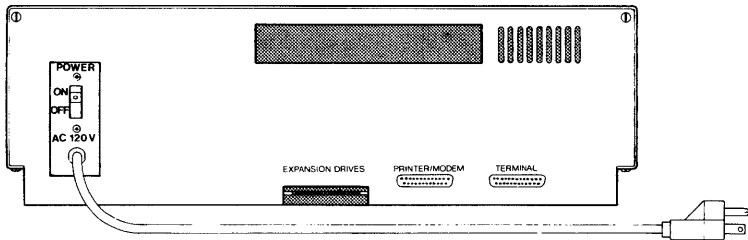


Fig. 3-2: Micro Decision® Rear Panel

The Micro Decision® and the terminal are connected with a cable that has identical RS-232 plugs at each end. Plug one end of the cable into the Micro Decision's® back panel connector labeled TERMINAL and the other end into the terminal. It doesn't matter which end of the cable goes into which unit, but there is only one way you can insert the plugs. If you encounter resistance, the plug is probably upside down.

Many terminals, including the Morrow Designs, have two connectors. On the Morrow Designs terminal, use the connector on the left labeled RS-232 or MAIN. Other terminals may be labeled MODEM or EIA.

Once your terminal is connected to the computer, plug both the terminal and the computer power cords into a three-pronged wall outlet.

**CAUTION:** Plug both the terminal and Micro Decision® power cords into a grounded wall outlet. The use of a 2 hole outlet and an ungrounded "cheater plug" is not recommended.

### 3.4. System Power Switch

The power switch, located on the rear panel, must be on when the system is in use.

**CAUTION:** If the switch is turned off while a program is running (or if power is otherwise interrupted), any data in the computer's memory (RAM) is erased.

### 3.5. System RESET Button

The illuminated RESET button, located at the lower right corner of the front panel, is used to "boot" or start up your system. It is also used to reload the operating system. See the next chapter for a brief and simple explanation about "booting" your system.

Although not likely with any of the software provided by Morrow Designs, it is possible to encounter a program that "locks up", "crashes" or otherwise fails to perform. In these cases, you need to terminate the program. Generally, programs have a prescribed method for termination, but if that fails you can always resort to pressing the RESET button.

Pressing this button terminates the program and removes any data from the computer's memory. It does not affect data that has already been transferred to a diskette.

### 3.6. Terminal Power Switch

Your terminal has a separate power switch. The power switch on the Morrow Designs Terminal is either a small black button located on the front, above the round brightness knob, or a red rocker switch located on the back panel.

### 3.7. Terminal Brightness Control

Most terminals also have some means of decreasing or increasing the brightness of the characters on the screen. The Morrow Designs Terminals have brightness control knobs on either the front panel below the power switch, or under the lower right corner of display screen case. To increase brightness, turn the knob clockwise.

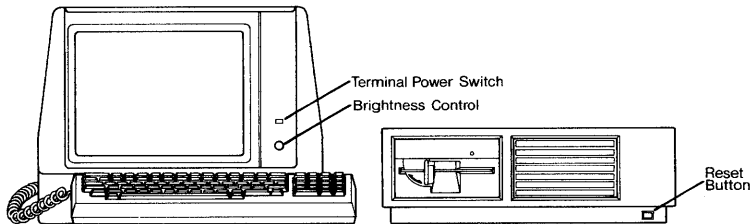


Fig. 3-3: Front Panel Orientation

### 3.8. Terminal Set Up

At this point you need to set up your terminal so it will display the characters and cursor correctly. This is different than configuring your system software for the terminal (which is described in the next chapter). Instructions for setting up the Morrow Designs terminals are on colored sheets packed with the terminal.

#### BEFORE YOU TURN THE PAGE:

1. Make sure the terminal and computer are plugged into grounded outlets.
2. Make sure the RS-232 cable is plugged into the "TERMINAL" plug on the system unit and the appropriate plug on the terminal.
3. Make sure your terminal is set up correctly.

## Notes

## CHAPTER 4

### GETTING STARTED - THE FIRST TIME

This chapter describes the procedures for a first time system installation. The instructions in this section will describe how to turn on your computer and install the software programs for it. Once you have completed these tasks, follow the instructions in the next chapter to use your new system.

#### 4.1. Diagnostic Test

The Micro Decision® automatically performs a diagnostic test each time the power is turned on. If it detects a defect, it will display a message describing the problem.

#### 4.2. Instructions For Turning On the Micro Decision®

1. Turn on the terminal and wait until it warms up. The Morrow Designs terminals are ready when a beep is heard, and the cursor (a green rectangle) appears in the upper left corner of the screen. If nothing appears on the screen after a few seconds, try turning the brightness knob clockwise.
2. Turn on the Micro Decision®. If everything is properly connected, the following message will appear on your screen:

```
MORROW DESIGNS MICRO DECISION Rev 1.n
Testing Memory -- Please Stand By:
```

About 15 seconds later, the following appears after the first message:

```
MORROW DESIGNS MICRO DECISION Rev 1.n
Testing Memory -- Please Stand By: Memory O.K.

INSERT SYSTEM DISKETTE IN DRIVE A AND PRESS [RETURN]
```

**Fig. 4-1: System Memory Test**

If these messages do not appear, turn off both the Micro Decision® and the terminal and check that your cables are properly connected. If there are any other messages, refer to the troubleshooting chart in Appendix B.

If everything checks out, you are ready to load your CP/M DISTRIBUTION DISKETTE into the computer and make a working copy of this diskette.

**NOTE:** The cursor (the small rectangle that appears on your screen) marks the spot where characters are entered into the computer; it may also be preceded by the CP/M® system prompt (A>). If you press a number, letter, or symbol key, the cursor moves to the right and the character you press takes its place.

### 4.3. Creating Working Diskettes

The software that comes with your Micro Decision® is supplied on special distribution diskettes. They contain the CP/M® operating system, the Micro Menus® and the application programs, as well as many other useful programs. These diskettes should not be used to run your system and programs. The information on them must be copied onto what we call a "working" diskette. This protects you against damaging your distribution diskettes and losing the valuable programs. The "working" diskette that contains CP/M® is called your SYSTEM diskette. Once the information has been copied, the distribution diskettes can be put in a safe place, to be used only if you need additional copies of the programs.

To make your SYSTEM diskette, follow these instructions:

Check to see that your computer and terminal are on. Press the RESET button. When asked to insert the CP/M system diskette, insert the diskette labeled CP/M DISTRIBUTION DISKETTE and press the RETURN key. The red indicator light on drive A will light up and there will be a series of messages describing the procedure for creating the SYSTEM diskette. Read these messages carefully!

This program will ask you for the number of drives in your Micro Decision® system. After you have answered, it will tell you that it's preparing to format the DESTINATION diskette and asks you to insert that diskette in a drive.

At this point, you will need to have a 5 1/4" single (or a double) sided soft sector diskette ready for use as a DESTINATION diskette. This diskette will automatically be formatted, then the operating system will be copied onto it. Any information on the diskette is erased during formatting. We recommend you use a blank diskette, or one that you don't mind erasing, as the DESTINATION diskette.

**Note to Single Drive Users:** The Micro Decision's® Virtual Drive feature will automatically help you through this program by reassigning drive A (your only drive) as drive B. You will be required to change diskettes at various times during this process. On-screen messages will tell you when your drive is being reassigned. At this time, remove the diskette currently in the drive and insert the diskette requested. Carefully read all messages and follow the instructions given.

When the formatting is done, it will copy the CP/M® operating system onto the DESTINATION diskette in Drive B.

Once this is complete, the Terminal Selection Menu is automatically displayed:

A	Morrow 20	I	Televideo 910	Q	VT100
B	Morrow 50 (Freedom)	J	Televideo 912C/920	R	Wyse
C	ADM 3A or 5	K	Televideo 925/950	S	Teleray
D	ADM 22	L	ADDS Viewpoint	T	IBM 3101
E	ADM 31	M	ADDS Viewpoint 3A+	U	Hazeltine 1420/1500
F	Heath H19	N	ACT 5A	V	Hazeltine Esprit
G	Visual 200	O	Gume 102	W	None of the above
H	Soroc 120	P	VT52		

Select your terminal:

**Fig. 4-2: Terminal Selection Menu**

Please note that this list of terminals is subject to change, as new terminals are tested for use with the Micro Decision.



Choose the letter from the menu that corresponds to your terminal. The program will configure your diskette for the terminal you select, thus enabling you to run the software programs included with your system.

If your terminal is not listed, ask your dealer if one of the terminals on the list resembles yours (you may have one which emulates a terminal on the list). If not, select the "None of the above" option. It will then be necessary to individually install each of your application programs (WordStar®, LogiCalc®, PERSONAL PEARL®, etc.) for the terminal you are using. Refer to the manuals for these programs for further details.

When the customization program is finished, the DESTINATION diskette that is in Drive B will be your fully configured SYSTEM diskette. Remove the CP/M DISTRIBUTION DISKETTE from drive A and put it away in a safe place. You probably won't need it again, but it is important to keep it as a back up.

Make a label that says CP/M SYSTEM DISKETTE and affix it to the newly configured diskette that was in Drive B. From now on, this diskette will be used to boot your system.

As mentioned above, before you can use any of the applications programs supplied with your Micro Decision®, you must create "working" diskettes of the programs you intend to use. This is required for two reasons.

1. Until you create a working diskette, your Micro Decision® will not know what codes to use to control your terminal. With many micro computers, you must run an "install" program to do this, but with the Micro Decision®, this is not necessary. Simply select the "Create working diskettes" option from the Micro Menu®, and follow the instructions on the screen.

2. The most important reasons for making a working diskette is that it will protect you from destroying the original distributed copies of your programs if you make a mistake. Once you are done creating the working diskettes, you can place the original copies away in a safe place. Then, if something does happen to one of your working diskettes, you can recreate it from the original.

It may not be necessary for you to make working diskettes of all the programs supplied with your Micro Decision®, depending on your applications.

If you are planning on using your Micro Decision® for word processing and nothing else, you will only need to make working diskettes of WordStar® and Correct-It®.

If you will be doing financial forecasting or analysis, you will need to make a working diskette of the LogiCalc® program.

Micro Decision® users with double sided disk drives also get the PERSONAL PEARL® data base management program. If you are planning on doing electronic filing, you must make working copies of this program.

Unless you will be using the BASIC-80® or BaZic® programming languages, there is no need to make working diskettes of them.

## OPERATION

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## CHAPTER 5

### GETTING STARTED FOREVER AFTER

The previous chapter described the procedures for a first time system installation. This chapter describes the operation of your computer once you are all set up and ready to go.

#### 5.1. "Booting" (or Starting Up) the Micro Decision®

If your computer and terminal are on, turn them off so you can practice starting up, or "booting" your system from a "cold start."

1. Turn on your terminal.
2. Turn on your Micro Decision® computer. The system will run its diagnostic test.
3. When asked to do so, insert the CP/M SYSTEM DISKETTE in drive A and press the RETURN key. After a few seconds, the Micro Menu® appears on your screen:

This menu is your road map through the CP/M operating system. To perform these functions, just enter the appropriate number after the prompt below, then follow the instructions given.

1	WordStar	Word Processing
2	LogiCalc	Financial Analysis
3	Correct-It	Spelling Checker
4	Personal Pearl	Data Base Manager
5	MBASIC-80	Microsoft BASIC
6	BaZic	North Star Compatible BASIC
7	CP/M Tutorial menu	CP/M Learning Tool
8	Create working diskettes	
9	Utility menu	

Enter your selection:

Fig. 5-1: The Micro Menu® Main Menu

From now on, this menu appears automatically whenever you start up using your CP/M SYSTEM DISKETTE.

**A Note to the Advanced User:** If at anytime you decide that you want your system to boot directly into CP/M® without using the Micro Menu®, simply select the "Execute a CP/M command" from the Utility Menu, and type "AUTO [RETURN]". From then on, your Micro Decision® will not run the Micro Menu® system when you start up. To cause the Micro Decision® to come up into the Micro Menu® again, select the same option, but type "AUTO PILOT CPMENU". For an explanation about this action, see the section on the AUTO command.

## 5.2. The Micro Menu®

The main Micro Menu® lists the various programs that can be run, along with a few other options. To run any of the programs shown on the main menu, simply enter the number corresponding to the program. Your Micro Decision® will tell you to put the working diskette for the program you selected into drive A and press [RETURN]. You will then be taken directly to the program you selected.

From the main menu, you may also choose to use the CP/M® tutorial for an introduction to CP/M® commands, or the "Create working diskettes" selection to create your working diskettes.

**NOTE:** We put the "Create working diskettes" option on the main menu because we want to encourage you to do this right away. This option helps you make working copies of the programs included with your system.

If the operation you wish to perform is not on the main menu, select the "Other options" choice. This will bring you to the Utility Menu, from which you can perform most common operations.

### 5.3. About the Create Working Diskettes Menu Choice

This menu choice allows you to make working copies of all of your application programs, guiding you through the procedure one step at a time. A PILOT program copies programs from your distribution diskettes to your working diskettes. It does this by automatically implementing the appropriate CP/M® commands.

#### 5.3.1. Creating a Working Diskette

Begin by making a working WordStar® diskette by following the instructions on the screen. The WordStar® program is included on one of your distribution diskettes.

Any time you are asked to insert a diskette, you must, of course, first remove any diskette that is currently in that drive. The CP/M SYSTEM DISKETTE does not necessarily have to be in drive A once the copy program starts.

Once you have copied the WordStar® program, you are returned to the "Create a working diskette" menu choice.

The procedure described for WordStar® applies to all your programs. Just enter the number that corresponds to the program and insert the appropriate distribution diskette when asked to do so. Go through the menu, one program at a time, until you have made working diskettes for all the programs on the menu that you expect to be using.

**NOTE:** After you have made your working diskettes from your distribution diskettes, place the distribution diskettes in a safe place. You probably won't need them again, but it's important to have them as back ups.

When you are finished making working copies of all your programs, exit to the Main Menu by pressing "E" for (E)xit.

This menu allows you to perform a number of everyday utility functions. The function to be performed is selected by entering the number corresponding to the function desired. In order for some of the options to work, the current drive must be set to the drive that is to be used.

- 1 Create a working diskette
- 2 Display a diskette directory
- 3 View or Print a file
- 4 Copy a file or files
- 5 Format a diskette
- 6 Make a backup diskette
- .7 Check diskette and file size
- 8 Execute a CP/M command
- 9 Other options
- E Return to Main Menu

Enter your selection:

Fig. 5-2: Utility Menu

### 5.3.2. Display a Diskette Directory

This option performs the CP/M® directory command "DIR." It gives you a list of all files on a diskette in whichever drive you specify.

### 5.3.3. View or Print a File

This option is recommended when you want to take a quick look at the contents of a data file. The contents of the file move continuously up your screen. This is known as "scrolling." You can pause the scrolling by pressing CTRL S (press any other key to resume scrolling). To cancel scrolling and return to the menu, press CTRL C.

#### 5.3.4. Copy a File

This option performs the CP/M® "PIP" (Peripheral Interchange Program) command. PIP has many functions. The one invoked by this menu option copies a file from one diskette to another. It can be used to copy program or data files or the contents of an entire diskette to another diskette. Just follow the instructions on the screen.

#### 5.3.5. Format a Diskette

Before you can write anything on a diskette, the diskette must be formatted by the CP/M® operating system. This process writes special codes on the diskette so that CP/M® can read or write to the diskette.

If you wish to create a diskette for data (WordStar® or LogiCalc® files, for example), it must be formatted before you can write to it. This is done from this menu choice.

**CAUTION:** When you FORMAT a diskette, you erase any information previously on that diskette.

#### 5.3.6. Make a Backup Diskette

This option invokes two CP/M® programs. It uses the FORMAT.COM program to format a DESTINATION diskette (blank diskette that will receive data) and copies the entire SOURCE diskette (diskette containing the data to be copied) to the DESTINATION diskette using the BACKUP.COM program.

This procedure should be used to make back up copies of your important data and program diskettes.



### 5.3.7. Check Diskette and File Size

This options performs the CP/M® "STAT" command. STAT can check the size of each of your files, and the remaining available diskette space. You should perform this command when you are about to enter WordStar® or any other program that creates diskette files. STAT has additional features which are described in the CP/M® manual and appear in the "Other options" menu choice.

### 5.3.8. Other Options

This takes you to another menu which lists all the other options that can be executed through the menus.

### 5.3.9. Execute a CP/M Command

This menu choice is helpful for learning the CP/M® commands. It asks you to type in the CP/M® command you wish to execute, and if entered correctly, executes it for you, then returns you to the main menu. Its a "fool-proof" way to learn CP/M®.

### 5.3.10. Exit to CP/M

To exit to the CP/M® operating system from the main menu, press the ESCape key. Pressing the ESCape key from any other menu returns you to the main menu.

## 5.4. Reentering the Menu Program

To reenter the menu program after exiting to CP/M® (or after being "dumped" from the program by trying to execute an illegal command), type in the following after the CP/M® prompt (A>):

A>PILOT CPMENU

and press the RETURN key.

### **5.5. Shutting Down the Micro Decision®**

Follow the procedures described below to shut down (turn off) your Micro Decision® computer system:

1. Make sure all your work has been "saved" (copied onto) on the diskette.
2. Make a back up copy of all your files. Also be sure your diskettes have a label describing their contents.
3. Remove all diskettes from the drives and place in their protective jackets.
4. Turn off power to the computer and terminal, as well as to any other devices that may be connected to your computer.

### **5.6. Special Notes on Running BaZic**

When you first select BaZic from the main menu, you will receive the prompt "BAZIC?", which may leave you at a loss as to what to do next. The following discussion should clear this up for you.

When you create you BaZic working diskette, four versions of BaZic (BAZIC08, BAZIC10, BAZIC12, & BAZIC14) are copied to it. The difference among these versions is the level of precision that you can obtain when performing

mathematical functions. The number at the end of each program name represents the number of digits (base 10) that each version can handle. The larger the number, the greater the precision. However, greater precision consumes more memory and executes somewhat less quickly.

Now then, when you are faced with that "BAZIC?" prompt, you should respond BAZIC##, where ## is the version you wish to use. Control is then transferred to that interpreter. If you find that one version suits your needs in general, there is a way of going directly into that interpreter from the main menu, thus bypassing the above prompt. Here's how:

1. Insert your CP/M system diskette into drive A and your BaZic working diskette into drive B. When the main menu is displayed, select item 9 (the Utility menu).

2. From the Utility menu, again select item 9 (Rename or erase a file). Respond R to the "erase or rename?" prompt.

3. To the next prompt, respond with one of the following file names:

BAZIC08.COM  
BAZIC10.COM  
BAZIC12.COM  
BAZIC14.COM and press Return.

4. You are then asked for the new name of the file. Enter BAZIC.COM and Return. When the renaming process is complete, the Utility menu reappears. Press ESCape to return to the main menu.

From this point on, when you select BaZic from the main menu, the Micro Decision will take you directly into your chosen version. Also note that if you want to restore the ability to select different versions through the "BAZIC?" prompt, just perform another rename, changing BAZIC.COM back to BAZIC##.COM.

## CHAPTER 6

### ABOUT THE PROGRAMS ON YOUR CP/M SYSTEM DISKETTE

Your CP/M SYSTEM DISKETTE contains a number of programs, some of which are a part of CP/M®, and some of which are extra goodies. If you use the Micro Menu® option to "Display a diskette directory," you will see a list of all the files included with CP/M®, as well as the extra programs. This chapter is to help you understand what's what on your CP/M SYSTEM DISKETTE.

As mentioned in Section 2.1 of this manual, CP/M® is an operating system. Its function is to provide a "standard operating environment" for applications programs. When you get behind the wheel of a car that you've never been in before, you know what to expect. The gas pedal is on the right and the brake is always just to the left of it. This was done to provide you with a "standard operating environment." If the arrangement of the pedals varied from one car to the next, chaos would reign (especially around car rental agencies).

This is the philosophy of an **operating system**. Application programs that use CP/M® know which "pedal" to push to cause an action (i.e. to send a character to the screen).

When you view a diskette directory, you will not see any file named "CP/M". This is because it is given special treatment. CP/M® is not stored as a file on a diskette, but is stored on a part of the diskette which is reserved exclusively for storing CP/M®.

Your Micro Decision® has a program stored in permanent memory which is executed every time you press the RESET button or turn the machine on. The purpose of this program is to test the memory and then to read CP/M® from the diskette into memory. It knows how to do this because it knows that CP/M® is always in exactly the same place on

a diskette. If it tries to read CP/M® and cannot find it, it will print a message saying that the diskette was "Not a system diskette", meaning that it could not find the CP/M® system on the diskette where it should have been.

For a description on how to put a copy of CP/M® in its reserved place on the system diskette, see the discussion below about the SYSGEN program.

### 6.1. CP/M® Transient Programs

CP/M® consists of more than the operating system. Also included is a group of programs generally considered to be part of the CP/M® system. They are referred to as utility programs or "transient commands" and are used to perform simple, common chores within the system. This group of programs and their most common applications are described briefly below.

PIP.COM	Moves or copies files
STAT.COM	Checks file size and reports other statistics on your diskettes
SYSGEN.COM	Places the CP/M® operating system on a diskette
MOVCPM.COM	Creates a version of CP/M® for a different memory size
ASM.COM	Assembles machine language programs
LOAD.COM	Changes the output of ASM.COM into a "COM" program
DUMP.COM	Outputs a file in hexadecimal format
ED.COM	Used as a text editor when none other is available
DDT.COM	Used to "patch" programs

SUBMIT.COM "Submits" a series of commands to CP/M® without operator intervention

XSUB.COM Used in conjunction with SUBMIT.COM

All of these transient programs are described in the CP/M® manual supplied with your Micro Decision®. In addition, many of the books in the Recommended Reading list at the end of this manual will help you learn more about CP/M®.

## 6.2. Additional Files On Your CP/M SYSTEM DISKETTE

In addition to the transient programs mentioned above, there are a number of other useful programs included on the CP/M SYSTEM DISKETTE. These programs are provided to improve the performance of your Micro Decision®, and to make it easier for you, as an end user, to use the Micro Decision®. The extra programs, and their functions are:

FORMAT.COM Formats a diskette for use with the Micro Decision®

BACKUP.COM Makes an exact copy of a diskette as a back up or spare

SETBAUD.COM Changes the communication (baud) rate of the PRINTER/MODEM port on the Micro Decision®

OSB.COM Used to access diskettes in the Osborne I® single density disk format

XER.COM Used to access diskettes in the Xerox 820® single sided, single density format

IBM.COM Used to access diskettes in the IBM PC®, CP/M®-86 single sided format

MORROW.COM       Resets a disk drive to the Micro Decision® format once it has been set to use another format

AUTO.COM        Creates a diskette which automatically executes a command or program when the Micro Decision® is first booted

PILOT.COM        Executes a program written in the PILOT programming language.

You will also notice a number of files on the diskette whose names end with ".PIL" (CPMENU.PIL, MDCREATE.PIL, etc.). These files make up the Micro Menu program. They are written in the PILOT programming language, and allow you to easily perform functions with your Micro Decision®, even if you don't know how to use CP/M®.

If you are interested in what a PILOT program looks like, you may look at these files using the "View or print a file" option from the Micro Menu® display.

### 6.3. Extras, Extras! Read All About 'Em!

The additional programs supplied on your Micro Decision's® CP/M SYSTEM DISKETTE can be very useful to you. Some of the programs are directly accessible from the Micro Menus®, and others must be entered from the "Execute a CP/M command" option of the Micro Menus®. The following descriptions indicate how to use the programs, and most importantly, how to access them. Of course, as you become more familiar with CP/M®, you may find that you bypass the Micro Menus®. You can then execute all the programs directly from the CP/M® prompt.

### 6.3.1. FORMAT

Before any information can be written on a diskette, the diskette must be formatted. Formatting is analogous to putting empty file folders in a filing cabinet prior to placing any information in them. It is accessed from the "Format a diskette" option of the Micro Menu®.

On Micro Decisions® equipped with double sided disk drives, you will be given the option of whether to format the diskette for single or double sided use. In most cases, you should choose double sided. You should choose single sided if you are going to be moving some files from your double sided Micro Decision® to a single sided Micro Decision®.

### 6.3.2. BACKUP

The BACKUP program is used to make a spare copy of a diskette. It is a good idea to make spare or back up copies of any diskettes which have valuable programs or data stored on them. By frequently backing up your work, you will be less likely to suffer any real catastrophe if you or your Micro Decision® malfunction. To access this function, simply pick the Micro Menu® option to "Format and backup" a diskette.

The BACKUP program expects the diskette to be copied from (the SOURCE diskette) in Drive A, and will use Drive B for the DESTINATION. For users with just one disk drive, the Virtual Drive feature will take control and ask you to exchange diskettes periodically. Be sure that you follow the instructions given carefully.

**NOTE:** If at any time while attempting to back up a diskette you are presented with the cryptic message, "Error, drive



characteristics must be identical, can't copy", don't fret.

This is a complicated way of saying " You are trying to copy from a single sided diskette to a double sided diskette", (or the other way around). Just be sure that when making back up copies, both diskettes are formatted the same way, (either both single sided or both double sided).

### 6.3.3. SETBAUD

This program allows you to select one of two baud rates for your Micro Decision's® PRINTER/MODEM port to run at. It can be very convenient if you sometimes require 300 baud for a MODEM, and at other times, require 1200 baud for a printer. Without opening up your Micro Decision® and changing the switch settings for the port, you can easily change between the two. It is accessed by typing "SETBAUD" at the "Execute a CP/M command" prompt.

### 6.3.4. OSB, XER and IBM

As we explained in a previous chapter, programs that run under the CP/M® operating system do not necessarily come on diskettes that can be read by all CP/M® systems. That is because different CP/M® systems use different methods for formatting diskettes. There are some standards among systems using 8" diskettes, but no standards for the increasingly popular 5 1/4" diskettes.

To help overcome the lack of standards, the Micro Decision® is equipped to emulate the diskette formats used by the Osborne I® (single density), Xerox 820® (single sided), and the IBM Personal Computer® (CP/M®-86, single sided). We refer to these compatible diskettes from other computers as "foreign diskettes."

You can read and write data files and run most programs written for the Xerox 820® and the Osborne I® on your Micro Decision®, but because the Osborne I® uses a nonstandard screen format (52 columns instead of 80), some Osborne programs may be incompatible.

The Micro Decision® can also read and write CP/M®-86 data files created by an IBM PC®, but it cannot run CP/M®-86 software. Because the IBM PC® uses a 16-bit microprocessor, it is incompatible with the Micro Decisions®' 8-bit microprocessor. Additionally, the Micro Decision® cannot read or write to IBM's PC-DOS® diskettes.

There are two ways that you can use foreign diskettes. You can redefine one or more of your diskette drives to emulate the foreign format, or you can copy the information on the foreign diskette to a diskette formatted for the Micro Decision®. Once the files have been copied to a diskette formatted by the Micro Decision®, you can forget they were once "foreign" and treat them like all your other Micro Decision® files.

The OSB, XER and IBM programs are used to select a particular format to read from or write to a diskette. These programs greatly expand the amount of available software that your Micro Decision® can run. Because your Micro Decision® can read or write diskettes using these "foreign" formats, it is very easy to move data, or programs from one machine to another. In addition, if your dealer does not have an application program you need in the Micro Decision® format, but does have it in one of the compatible formats, you are not out of luck.

All of these programs can be run from either the "Execute a CP/M command" option or from CP/M® directly.

The command to define a foreign format is:

NAME <drive>

Where NAME is OSB, XER, or IBM depending on your needs, and <drive> is B, C, D, or E.

For example, to redefine drive C to use the Osborne I® format, the command is:

```
A>OSB C:[RETURN]
```

The Micro Decision® will then type:

```
A>OSB C:[RETURN]
Drive C is now an OSBORNE drive
```

From this point on, anytime you access drive C, your Micro Decision® will be expecting a diskette formatted for an Osborne I®.

This capability to use foreign formats is not restricted to physical drives. If you define a nonexistent drive to use a foreign format, then when the Virtual Drive feature is in effect, it will access the drive using the correct format.

Note that the ability to read from and write to diskettes using foreign formats does NOT allow formatting a diskette for that format. Anytime you format a diskette it will be done using the Micro Decision's® format, regardless of whether or not the drive has been defined to use a foreign format.

If at anytime you get the message "Too many foreign drives", you must reboot your system. This message is telling you that the memory set aside for handling foreign formats has been used up. In normal operation, you will not run across this message, but if you do, don't panic, just reboot your system by pressing the RESET button.

#### 6.3.5. MORROW

This program is used in the same way as OSB, XER, and IBM. Its purpose is to reset a drive that has been defined to use a foreign format back to the Micro Decisions® regular format. It is executed from the "Execute a CP/M command" (or from the CP/M® system) prompt as:

```
MORROW <drive>
```

Where <drive> is one of the valid drive names B, C, D, or E.

#### 6.3.6. AUTO

This program is used to create a diskette which will automatically execute a command or run a program when your system is booted

(every time you press RESET, or turn on your Micro Decision®). For an explanation of how it is used, see Chapter 8.

**NOTE:** In order for this procedure to work, you must have put CP/M® in it's reserved area on the diskette using SYSGEN.

### 6.3.7. PILOT

PILOT is the "interpreter" for text files which translates PILOT commands into actions. Writing a program using the PILOT programming language consists of two steps:

1. Using WordStar®, or any other editor, create a text file consisting of PILOT commands. The text file name should be saved with the extension ".PIL" (i.e. FILE.PIL).
2. Execute the commands by typing "PILOT FILE", where "FILE.PIL" is the name given to your text file from step 1.

### 6.4. A Note About SYSGEN

SYSGEN is the command used to put CP/M® in it's reserved area on a diskette. It can be executed directly from the "Execute a CP/M command" option of the Micro Menu by typing "SYSGEN" and pressing the RETURN key.

To move a copy of CP/M® to the diskette in drive B, perform the following (your input is given in boldface:

#### CP/M COMMAND PROCESSOR

This menu allows you to enter CP/M commands directly. It can be used by the curious to experiment with and learn about CP/M. It can also be used by experienced CP/M users to perform a command directly.

To use this menu, just type a valid CP/M command, followed by RETURN.

Press ESC to return to main menu.

COMMAND:SYSGEN[RETURN]

After a few seconds, you should see the following:

```
SYSGEN VER 2.0 MDx.x
SOURCE DRIVE NAME (OR RETURN TO SKIP)A
SOURCE ON A, THEN TYPE RETURN[RETURN]
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)B
DESTINATION ON B, THEN TYPE RETURN[RETURN]
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO WARM BOOT)[RETURN]
```

After doing this, the diskette that was in drive B can be placed in drive A to boot your Micro Decision®.

For a more complete description of SYSGEN, see your CP/M® 2.2. Operating System Manual.

## Notes

## SPECIAL FEATURES

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## CHAPTER 7

### THE MICRO DECISION® VIRTUAL DRIVE FEATURE

No matter how many disk drives you have, there are times when it is handy to have one more. With the Micro Decision's® Virtual Drive feature, you "virtually" have that extra drive. That's because the system is able to temporarily re-assign drive A as another drive. Even though the drive does not physically exist, it can be accessed with the Virtual Drive feature. Valid drive names on your Micro Decision® are A, B, C, D and E.

#### 7.1. Example of the Virtual Drive Feature

Here's a simple example of how the Virtual Drive feature works. We're going to check the available space on the diskette in drive E. Of course, drive E doesn't really exist. Or does it?

1. From the Micro Menu, select the option to "Check diskette and file size".
2. When the next menu appears, select the option to "Check space remaining on a diskette"
3. When asked for the drive to check, enter "E".

The Micro Menu® will then check the space remaining on drive E. Since drive E does not really exist, the Micro Decision® will automatically go into the Virtual Drive mode, and reassign drive A to be drive E. At this point, you will see the message:

Your left hand drive is being re-assigned as drive E.  
Exchange diskettes and press [RETURN].

Note: If your system has double sided drives,  
the lower drive will be reassigned.

Now, take any diskette, and place it in  
your left hand (or lower drive), and press the  
RETURN key.

Your Micro Decision® will then tell you  
the amount of space remaining on the diskette you  
just put in the drive. Next, you will get the  
message:

Your left hand drive is being re-assigned as drive A.  
Exchange diskettes and press [RETURN].

At this point, place your CP/M SYSTEM  
DISKETTE back in the drive, and press the RETURN  
key. After a few seconds, you should find yourself  
back in the Micro Menus.

This demonstration doesn't show you the full power behind the Virtual Drive feature, but it does introduce you to the messages, and the procedure used when the Virtual Drive is in effect.

As a more meaningful example, let's show how the Virtual Drive feature can save you from what can be a great deal of diskette juggling.

Imagine that you want to copy a file from one diskette to another. With other systems, you will have to do it in several time consuming steps. But with the Micro Decision®, it is no problem at all.

Three diskettes are involved in this example. The first is your CP/M SYSTEM DISKETTE. The second is your diskette with the file you want copied, and the third, the diskette you want to copy the file to. Got it? Good, off we go.

1. From the Micro Menu, select the "Copy a file" option. This will bring you to another menu from which you should select the option to "Copy a single file".
2. When asked for the current file, enter the name of the file to be copied.
3. When asked for the drive to be copied from, enter E. This will cause the Virtual Drive to be invoked when the copy is actually being done.
4. Insert the DESTINATION diskette for the copy in drive B.
5. When asked for the drive to be copied to, enter B.

Your Micro Decision® will now go off to perform the copy. Since the copy is from drive E, it will automatically invoke the Virtual Drive feature and ask you to exchange diskettes. By exchanging the CP/M SYSTEM DISKETTE and the SOURCE diskettes as requested, the copy will be completed, and you will end up back in the Copy Menu.

You may still be confused about all of this, but as time goes on, you will find many uses for the "extra" drives provided by the Virtual Drive feature.

## CHAPTER 8

### THE AUTO PROGRAM

You may have wondered why some of the diskettes provided with the Micro Decision® automatically execute programs when they are booted. This was done by using the AUTO program that is supplied with your Micro Decision®. This chapter shows how you can create, change, or cancel the programs or commands that are automatically executed upon start up.

It is possible for you to configure any of your diskettes so that they automatically execute a command or program each time they are booted. This is known as creating a "turnkey" system. Such a system is ready to run at the "turn of a key" (or by just turning on the machine).

Two requirements must be met before you can create a turnkey diskette:

1. The diskette must have the CP/M® operating system placed on it using the SYSGEN program. Some diskettes already have CP/M® on them. To determine if your diskette has CP/M® on it, put the diskette in drive A and press the RESET button. If you get a message saying "Not a system diskette", then you must use SYSGEN to put the "system" on the diskette. See Section 6.4, A Note About SYSGEN, for the procedure to do this.
2. The AUTO program must be on the diskette as well. To do this, use the "Copy a file" option or PIP to move a copy of the file named AUTO.COM to the diskette that is to become the turnkey diskette.

## 8.1. Creating an AUTO Diskette

Normally, to get a directory of the diskette in drive A, you would enter the command "DIR[RETURN]" (assuming you are currently using drive A), from the keyboard. You can just as easily have this done automatically every time you start up your system by using the AUTO program to create a diskette with "DIR A:" as the AUTO command. To do this, take, or make a diskette that has the CP/M® operating system "SYSGENed" to it, and also has the file AUTO.COM on it. Next, place this diskette in drive A, and press the RESET button. When told to do so, press [RETURN] on the keyboard. After a few seconds, you should see the CP/M® prompt "A>", and the system will be waiting for a command. At this stage, type:

```
AUTO DIR A:[RETURN]
```

That's all there is to it. From now on, anytime you boot your system using this diskette, you will be treated to a directory of the diskette automatically. To see the result of this operation, reboot your system using the RESET button. This time, before you get the CP/M® prompt, you should see a directory of the files on the diskette. If not, try going through the procedure once again. If you still encounter difficulty, consult your dealer for help.

## 8.2. Automatically Running a Program

At this point, you may not realize how powerful the AUTO command can be. Besides executing simple commands when started up, the AUTO command can be used to cause a program to run instead. With this feature, you can create a diskette that when booted, comes up automatically running WordStar®, or any other program of your choice. The procedure is identical to the one above. To see this in action, you must first use SYSGEN to put a copy of CP/M® on your WordStar® diskette, and then put a copy of AUTO.COM on it as well. You can do this using the Micro Menu®, or

directly from CP/M®. It is possible that your WordStar® diskette already has CP/M® on it. To see if it does, try to start up your system using your WordStar® diskette in drive A. If you get the "Not a system diskette" message, then you must use SYSGEN.

After you have CP/M® and AUTO.COM on your diskette, press the RESET button on your Micro Decision®, and insert your WordStar® diskette in drive A. Next, press the RETURN key and wait for the CP/M® prompt "A>". At this point, type:

AUTO WS

After a few seconds, you should see the CP/M® prompt again. Now, press the RESET button again and watch what happens. This time, when your system boots, it should go straight into WordStar® and show you the "NO - FILE MENU" of WordStar®. You are now "up and running" - automatically!

### 8.3. Changing or Canceling the AUTO Command

It is possible to change or cancel an AUTO command. To change an AUTO command, go through the same process used to create the AUTO command, entering a new command after AUTO on the command line.

Canceling an AUTO command involves pretty much the same process as changing the command, only no command is entered after AUTO on the command line.

For example, the Micro Menus® are executed from the CP/M SYSTEM DISKETTE by the AUTO.COM program. To cancel this feature, place the CP/M SYSTEM DISKETTE into drive A and enter

A)AUTO [RETURN]

The Micro Menu<sup>®</sup> will no longer automatically appear after the system is booted. To reinstate this feature, type

A)AUTO PILOT CPMENU[RETURN]

The AUTO.COM program is just one of the many special features included with your system and we're betting that you will find lots of uses for it.



## CHAPTER 9

### ERROR MESSAGES

Computers rarely break down, but moving parts can wear out and electronic parts on rare occasions, fail to perform. And, although there is a great deal of excellent commercially available software, most users eventually happen upon a program with "bugs," or one that won't work properly. Most errors, however, can be traced to humans. The solution isn't to place blame, but to quickly identify the source of an error and get it resolved.

The unmodified version of CP/M® issues special messages when it encounters software, hardware or operator errors. However, the messages tend to be difficult to understand and the errors difficult to rectify. Some errors can cause programs to fail and data to be lost.

The operating systems supplied with your Micro Decision® has an enhanced version of CP/M® with a special error detection feature that informs you of an error in plain English and "traps" the error so that you can correct it before it causes any serious problems.

#### 9.1. Backing Up - An Ounce of Prevention

There are no guarantees against errors, but there is a way to reduce the possibility of a catastrophic consequence by always backing up copies of your important program and data diskettes. Then, if something goes wrong, you at least have a copy of your work to go back to.

#### 9.2. Error Message Categories

We have divided the errors into two categories: recoverable and nonrecoverable.

### 9.3. Recoverable Errors

These errors occur during the actual disk operation. If you encounter one of these errors, an error message will be displayed in the form:

```
Disk error on drive X: YYYYYYYYYYYY  
Type R to try again, A to abort, or I to ignore:
```

Where X is the drive where the error occurred, and YYYYYYYYYYYY is the specific error that occurred.

Possible errors are:

#### 9.3.1. Drive Not Ready

The disk drive is not ready. This can be caused by a number of things including no diskette in the drive, drive door open, or a problem with the drive, cable or disk controller. In some cases, the problem can be solved by simply opening, then closing the drive door. If you cannot get the system to work, consult your dealer or service department.

#### 9.3.2. Write Protected

You have attempted to write to a diskette that is write protected. That means that the write protect notch is covered. If you want to write to that disk, you must remove the write protect tab and try again.

Some diskettes do not have a notch and are therefore permanently write protected. These are generally software distribution diskettes that were protected by the manufacturer to avoid accidental erasure or damage. In most situations, the files on these diskettes can, and should, be copied to one of your own diskettes.

### 9.3.3. Not Found

The disk controller is unable to locate information on the diskette. This can be caused by trying to access a diskette that is either damaged, unformatted, or formatted for a computer other than the Micro Decision®. If you are sure that your diskette is properly formatted, it may have been damaged. If you suspect that this is the problem, use the "Copy a file" option on the Micro Menu® to copy as much of the information as possible to a freshly formatted diskette.

### 9.3.4. Data Error

Whenever information is written on a diskette, additional error control codes are also written. When the information is read back, these codes allow the disk controller to determine if the information has been read correctly. This error is usually caused by a damaged or incorrectly formatted diskette, or by a hardware failure in the drive or controller. Whether or not you recover from the error, try copying the contents of this diskette to a new, freshly formatted diskette.

### 9.3.5. Lost Data

Data is transferred to and from the diskette at a precise rate. Your Micro Decision® must be synchronized to this rate. This error can occur if your Micro Decision® is not synchronized correctly, or by a problem with the diskette. Sometimes you can recover from this error by trying again. It is possible that the diskette is slightly damaged. Try copying the contents of this diskette to a freshly formatted diskette.

### 9.3.6. Wrong Track

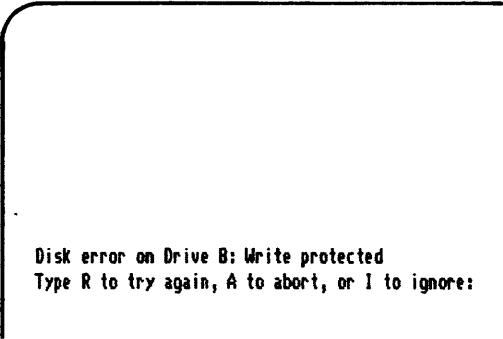
The disk drive was not able to find the correct track on the diskette. This can be caused by a diskette which is improperly inserted in the drive, or incorrectly formatted. This can also be caused by a hardware failure in the disk drive.

## 9.4. Error Message Responses

After displaying the error message, your Micro Decision® waits for a response from you. Only an R, A, or I will be accepted. These keys produce the following results:

### 9.4.1. R - to Try Again

Enter an R to try the disk operation again. This is obviously helpful if the error was due to an open drive door, a write protected diskette, or something else that you can easily correct. Sometimes, too, other errors can be cleared by trying again. For example:



```
Disk error on Drive B: Write protected
Type R to try again, A to abort, or I to ignore:
```

Remove the write protect tab from the diskette in drive B, then enter:

R (Do not press RETURN)

#### 9.4.2. A - to Abort

Enter an A to abort (terminate) the disk operation. This causes a system "warm boot", re-loading CP/M®. Any information which was in memory is lost.

#### 9.4.3. I - to Ignore

Enter an I to ignore the error and continue as if nothing had happened. This should be used with extreme caution, especially when writing data to a diskette. Using this response can lull you into a false sense of security, since disk operations appear to proceed normally, despite the possibility of a faulty diskette or other problem.

### 9.5. Nonrecoverable Errors

These errors occur before the disk operation actually begins. They cause a "warm boot", which reloads CP/M® and erases any information that was in memory. If you encounter one of these errors, an error message will be displayed in the form:

CP/M error on drive X: YYYYYYYYYYYY

Where X is the drive where the error occurred, and YYYYYYYYYYYY is the specific error that occurred.

Possible errors are:

#### 9.5.1. Select Error

An invalid drive name was entered. Valid names are drives A: through E:.

### 9.5.2. Diskette Read Only

An attempt was made to write to a drive which CP/M® has set to "read only". CP/M® automatically does this whenever a diskette is changed in a drive without a "warm boot". This is done to prevent CP/M® from inadvertently writing to the wrong diskette. Programs can also explicitly set a drive to "read only", but this is rarely used.

### 9.5.3. File Read Only

An attempt was made to write to a file which has been set to "read only". The STAT command can be used to set a file to "read only". This is one way to protect your files from accidental erasure or modifications. Refer to the CP/M® 2.2 Operating System Manual for more information on the STAT command.

## Conclusion

We wish we could end this manual with some self-congratulatory message such as "You now know all there is to learn about the Micro Decision®." That would be like learning to drive a boat and claiming you know everything about the seven seas and the lands they connect. The Micro Decision®, like a boat, is only a vessel. Where it takes you and how you use it depends more on the bounds of your curiosity and imagination than on the limits of the hardware and supplied software. Learning to use a computer is a never ending process. Just when you feel you have mastered something, another challenge awaits you.

This manual was written to get you started. It was not designed to be inclusive. Fortunately, others have continued where we left off. There are a number of books, magazines, users groups, retailers and others dedicated to helping you learn more about computers. We have included references to some guides about CP/M® and computers in general, but this too is limited.

For further assistance, and a native guide for your journey through the land of computers, we strongly recommend your local Morrow Designs' dealer.

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## A. SYSTEM SPECIFICATIONS

### ENCLOSURE:

Dimensions: 16.9" wide x 11.3" long x 5.3" high  
(43 cm wide x 29 cm long x 13.5 cm high)

Net Weight: 18 lbs. (8.1 kgs.)

Composition: RFI (Radio Frequency Inhibiting) metal

### POWER:

115 VAC (+/- 10%), 50/60 Hz (domestic)  
230 VAC (+/- 10%), 50/60 Hz (export)

### TEMPERATURES:

Operating: 50° F to 104° F  
(10° C to 40° C)

Nonoperating: -40° F to 125° F  
(-40° C to 52° C)

### PROCESSOR:

CPU: Z80A, operating speed: 4MHz

### MEMORY:

RAM: 64K bytes  
EPROM: 2-4K bytes

### DISK DRIVES:

Internal: 1 or 2 5 1/4" floppy diskette  
drives, single or double sided

External: 2 additional 5 1/4 inch drives may be  
connected.

**A. SYSTEM SPECIFICATIONS, CONT.**

Diskettes: Standard 5 1/4" soft sectored,  
1024 bytes/sector, 5 soft sectors/track,  
40 tracks/side, 1 or 2 side(s)/diskette

Formatted Capacity: 200K bytes per diskette, single  
sided; 400K bytes double sided

**INPUT/OUTPUT:**

Serial I/O: 2 RS-232C serial ports

Baud Rate: Asynchronous: 150 - 19.2 Kilobaud

## B. TROUBLESHOOTING CHART

The following table has been designed to aid you in the event your Micro Decision® does not operate correctly:

PROBLEM	PROBABLE CAUSE	REMEDY
SYSTEM MEMORY TEST FAILS:	Bad ROM or RAM.	Contact your dealer.
RESET INDICATOR LIGHT NOT LIT:	Power cord not plugged in.	Plug in cord.
	Wall outlet not live.	Check outlet and circuit breaker.
	Indicator light burned out.	Contact dealer
	Internal connection loose.	Contact dealer.
DISK DRIVE INDICATOR LIGHT DOES NOT BLINK	System was not reset.	Press RESET.
	Indicator light burned out.	Contact dealer.
	Internal connection loose.	Contact dealer.
DISK DRIVE INDICATOR LIGHT IS ON AND ERROR MESSAGE IS DISPLAYED ON SCREEN	System cannot read diskette.	Refer to Section 9.3.3.
	Diskette inserted incorrectly.	Refer to Section 2.7.

B. TROUBLESHOOTING CHART, CONT.

PROBLEM	PROBABLE CAUSE	REMEDY
NOTHING APPEARS ON TERMINAL SCREEN	Floppy diskette inserted incorrectly.	Insert SYSTEM DISKETTE with label facing up and away from slot.
	Incorrect diskette inserted.	Insert SYSTEM DISKETTE.
	Cables and plugs incorrectly connected.	Refer to Section 3.3.
	Terminal is off.	Turn it on.
SYSTEM LOADS WITH GARBLED MESSAGE:	Terminal not configured correctly.	Refer to Section 3.8. and terminal reference manual.
	Baud rate or word setting incorrect.	Refer to Appendix D.
	SYSTEM DISKETTE is ruined.	Make or use another SYSTEM DISKETTE.

## C. THE CP/M® COMMANDS

The Micro Menu® program can perform many CP/M® commands for you, but it's also a good idea to understand something about the CP/M® commands. As you progress in using and learning about your Micro Decision®, you may find situations where it is better not to use the Micro Menu®. The menus and the PILOT language needed to run them take up diskette space that can be used for other files.

This discussion is not a substitute for the CP/M® manual. This chapter is only an overview of the CP/M® commands and cursor control keys most commonly used and is deliberately more simple than the discussions in the CP/M® 2.2 Operating System Manual included with your system. You are encouraged to read this manual as well as some of those listed in Appendix F.

### C.1. Control Key Functions

Many functions in CP/M® are controlled or initiated by the control (CTRL) key and a letter key. We've included a description of a few of the more common control key functions below:

#### C.1.1. CTRL C

Generally used to "warm boot" (reload) the operating system. If you press CTRL C while your computer is under the control of the CP/M® operating system, CP/M® interrupts what it is doing and reloads the operating system.

A CTRL C can also be used to abort a command. For example, if you press CTRL C while running most BASIC programs, the program stops and you are returned to BASIC, with the program remaining in memory. (CTRL C does not return you to CP/M®, however. That is done from BASIC by typing SYSTEM).

A CTRL C should also be pressed anytime you change diskettes, (unless you are exiting from the Virtual Drive feature) to reset the drives.

#### C.1.2. CTRL P

Routes information to the printer as well as the screen. After you press CTRL P, anything that appears on the screen is also sent to the printer. This remains in affect until you press CTRL P again or perform a "warm boot" by pressing CTRL C.

#### C.1.3. CTRL S

Used by the operating system to pause while you are scrolling text (using the TYPE command) or are listing a program. Press CTRL S to pause, and any other key to resume scrolling.

#### C.1.4. CTRL X

This function is helpful when you've entered an incorrect command line and don't wish to use the BACK SPACE key to erase it. The CTRL X sequence cancels the line currently typed on the screen and jumps the cursor to the next line so you may reenter the command correctly. The first line entered will be ignored.

### C.2. CP/M® Commands

CP/M® commands are instructions that tell the operating system to perform a particular function. These commands are divided into two groups: built-in and transient. Built-in commands are always present in memory (RAM) with the operating system. They may be executed from any drive in the system.

Transient commands are stored on files on the system diskette. In order to execute transient commands, you must be working in drive A (drive with the CP/M SYSTEM DISKETTE), or you must address drive A and the command you want to execute. The transient commands included with the Micro Decision® are described in Section 6.1.

### C.3. CP/M® Built-In Commands

The following sections briefly describe the CP/M® built-in commands. For a more complete discussion of these commands, refer to the CP/M® 2.2. Operating System Manual.

#### C.3.1. d: - Changing the Logged Drive

Each time the system is booted, it comes up ready to work using drive A:, as indicated by the "A>" prompt seen on the screen. If you want to work on another drive, you must indicate this to CP/M® by typing in the name of the drive you wish to change to (A, B, C, D and E are valid), followed by a colon and carriage return ([RETURN]), after the CP/M® prompt.

As an example:

```
A>B:[RETURN]
```

changes the drive selected from A to B.



To return to drive A: enter

```
B>A:[RETURN]
```

If you select a nonexistent drive, the Virtual Drive feature will intervene and assign drive A or your left hand drive as this drive. Refer to Section 6.3.5. for instructions on exiting the Virtual Drive feature.

### C.3.2. DIR

Displays a list of all files on your diskette. Type DIR followed by a carriage return. For a printed copy of your directory, precede DIR with a CTRL P.

#### EXAMPLE:

To get a catalog (list) of all files on the currently logged drive:

```
A>DIR[RETURN]
```

To get a catalog of all files on drive B, if drive A is the currently logged drive:

```
A>DIR B:[RETURN]
```

### C.3.3. ERA

This command allows you to erase files on your diskette.

**CAUTION:** Once erased, files cannot be restored unless they are backed up on another diskette.

#### EXAMPLE:

To erase a file called "FILE1.TXT" on drive A:

```
A>ERA FILE1.TXT[RETURN]
```

To erase a file on drive B: if drive A:

is the currently logged drive:

```
A)ERA B:FILE1.TXT[RETURN]
```

#### C.3.4. REN

Allows user to RENAME a file on the diskette. It is assumed that the file to be renamed is on the currently logged drive.

To change the name of a file, enter the new name desired followed by the current name.

#### EXAMPLE:

To change file called OLDNAME.TXT to one called NEWNAME.TXT, enter

```
A)REN NEWNAME.TXT = OLDNAME.TXT[RETURN]
```

The new file name goes to the left of the equal sign and the old one goes to the right of it.

### C.3.5. TYPE

Displays the contents of a file. Enter TYPE followed by file name, press RETURN and the contents are scrolled on your screen. If you precede a TYPE command with a CTRL P, the contents of the file is also routed to the printer.

#### EXAMPLE:

If you had a file called "EXAMPLE.TXT" and wanted to display that file from the CP/M® operating system, you would enter:

```
A)TYPE EXAMPLE.TXT[RETURN]
```

## Appendix D

### CONNECTING DEVICES TO THE MICRO DECISION

Figure D-1 shows the connectors on the rear of the Micro Decision. Each connector is designed to have a certain type of device attached to it. This appendix tells you what connects where, and details the options that are available to make the Micro Decision compatible with a healthy variety of devices.

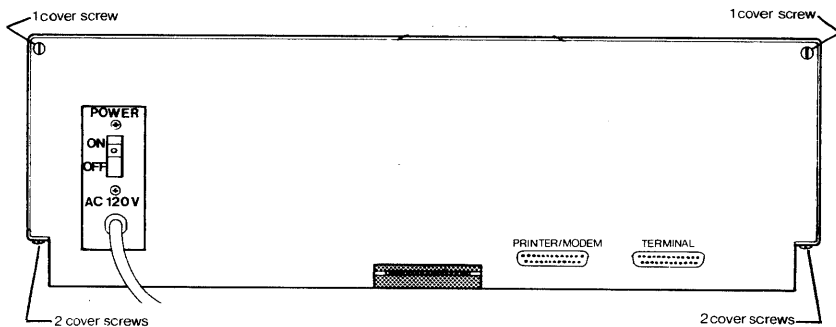


Figure D-1 Micro Decision peripheral connectors

The topics that will be discussed herein are:

- o Serial versus Parallel transmission
- o RS-232 standard connections
- o Centronics-style printer connections
- o Baud rates and communication protocols
- o Using two printers
- o The SETUP program, which controls baud rates, protocols, and printer selection
- o Using jumpers to configure the Micro Decision for modem hookups
- o Technical data on the serial ports and CP/M device definitions

#### Types of Transmission

There is a direct relationship between the two classes of data transmission mentioned above and the two different styles of connectors on the Micro Decision.

The two "lazy D" sockets with 25 little holes in them are known as **serial ports**. The flat plate with the copper strips on it is a **parallel port**, designed to connect to a parallel printer that conforms to the standards established de facto by the Centronics Corporation.

Now then. If you don't know the difference between serial and parallel transmission of data, you may find the rest of this section enlightening. The information presented is not essential to making the proper connections, though.

**Serial transmission** means that a letter or number is sent, say, from your terminal to the Micro Decision in a burst of eleven bits, one after the other. The bits are represented by a voltage going up and down on one of the wires that connects the Micro Decision to its serial peripherals.

The first bit is the "start bit", which alerts whoever is receiving to get ready for the next ten bits. The eight bits after the start bit form a code that represents a letter, number, or special character. The last two bits are "stop bits" that say that the character is finished. (There are variations on this theme, but they go beyond our discussion since they don't apply to the Micro Decision.)

The Micro Decision normally talks to its terminal at 9600 baud, which translates to 9600 bits per second. At 11 bits per character, this boils down to a transmission rate of about 870 characters per second. This speed can be changed to meet the needs of certain terminals, as will be covered when we get to the **SETUP** program.

Terminals and modems always converse with the Micro Decision over serial links; printers, however, may employ serial or parallel schemes.

**Parallel transmission** takes place when a whole character is sent to and from the computer as a unit, instead of one bit at a time. Of course, you need at least eight wires to carry the individual bits that make up a character, so you'll find that parallel cables are generally more bulky than serial cables. This also explains why the connectors themselves have to be different.

A printer may come with a serial interface, a parallel interface, or both. Printers that are strictly parallel may be cheaper than their serial counterparts because fewer components are involved in processing parallel signals.

Serial transmission does have some definite advantages, however, such as the relative simplicity of the cables. Another is the greater distances that serial communication can reliably

cover. But the biggest difference is the fact that the RS-232 serial interface was designed to accomodate two-way communication while the centronics parallel interface is limited to one-way. Hence the latter's employment for printers only.

### The RS-232 Connectors

RS-232 is a standard adopted by the Electronic Industries Association that defines, among other things, which of the pins in the 25-pin serial connector carries what signal. These signals are identified later in this appendix under **Jumper Options**.

When you face the rear of the Micro Decision, the rightmost serial connector is where you attach your terminal. The other is available for serial printers, modems, plotters, or networking to other computers. This connector comes configured from the factory for use with printers. There are jumpers inside the Micro Decision that enable it to work with other devices, which we will get to momentarily.

### The Centronics Connector

The 34-pin edge connector is a unidirectional parallel port designed for use with centronics style printers. You will need an adapter cable that connects the edge connector to the standard 36-pin centronics port on the printer. This cable is available from Morrow or at Radio Shack.

Unlike with the serial connectors, it is possible to connect the adapter cable to the edge connector upside down. While no harm results, no good does either. You can be sure that it's right when the ribbon of wires is flowing **downward** out of its connector (see Figure D-2).

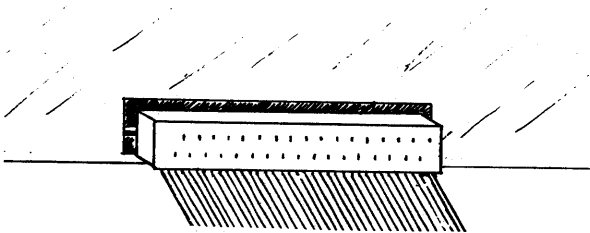


Figure D-2 Connecting the 34-pin plug

## Crash Course in Baud Rates and Protocol

**Baud Rate** is the speed at which data flows across a serial communications link. **Protocol**, also known as "handshaking", is the system by which the computer and peripheral let each other know if they're ready for data or whether they're too busy at the moment.

There are two basic types of protocol, **hardware handshaking** and **X-ON/X-OFF** (software handshaking). X-ON/X-OFF applies **only** to serial printers. Parallel printers always use hardware handshaking.

The only judgment you have to make in this regard is whether your **serial printer** is capable of using X-ON/X-OFF handshaking. This should be clear from the dealer or from the printer's documentation. If it does have this capability, great. If not, this is no problem, but you must make sure that your printer cable has a wire in it connecting pin 20 at the Micro Decision end to the Busy/Ready pin at the printer end.

The pin number at the printer end varies among brands of printers, so you'll have to check its manual. Typically it is either pin 4, 11, 19, or 20. If a cable is not available off the shelf to meet your needs, you can make one from parts available at Radio Shack or have your dealer make one. Keep in mind that if your printer can use X-ON/X-OFF handshaking, none of this cable business applies.

The main thing you need to know about the details of baud rate and protocol is that they must be set up **symmetrically** in the computer and its peripherals. Which brings us handily to the **SETUP** program.

### The SETUP Program

This is a CP/M program that modifies the operating system to reflect these factors:

- A) **The baud rate for your terminal** - If you have a terminal that operates at something other than 9600 baud, or if you are connecting a modem to this port (unusual), you can select 110, 300, 600, 1200, 2400, or 4800 baud, and later return to 9600.



- B) **Printer Selection** - More will be said about this below, but for now this means you have a fairly convenient way of sending output from an application program to the serial printer one time and to the parallel printer the next.
- C) **The serial printer baud rate** - This comes preset at 1200, but you can change it to any of the values listed in "A)" above.
- D) **Serial printer protocol** - This is where you specify hardware or X-ON/X-OFF handshaking. The Micro Decision assumes you are using hardware handshaking unless you use **SETUP** to tell it otherwise.

You have the option of making these changes take effect immediately, in which case they stay in effect only until you reboot. The alternative is to make the changes permanent on the CP/M disk so that they are in effect from your next boot until you run **SETUP** again.

Micro-Decision **SETUP** program Rev. 1.0  
Morrow, Inc.

Copyright 1983  
San Leandro, CA

This program allows you to change the operating characteristics of your Micro-Decision. The changes can be made temporarily or permanently.

- |                                       |   |
|---------------------------------------|---|
| A) Terminal speed<br>9600 baud        | C) Printer speed<br>1200 baud                                       |
| B) Printer selection<br>RS-232 SERIAL | D) RS-232 SERIAL Printer protocol<br>HARDWARE HANDSHAKING ON PIN 20 |

- E) Make temporary changes effective immediately.
- F) Save changes on CP/M diskette for use after next boot.
- ESC) Quit without making any further changes.

Selection:

Figure D-3 The **SETUP** menu

## Using SETUP

To get SETUP running:

1. Insert the CP/M system diskette, press RESET and then RETURN to bring up the main menu. Select item 9, the Utility Menu.
2. From there, select item 8, **Execute a CP/M command**. At the ensuing "COMMAND:" prompt, enter **SETUP** <return>. The screen in Figure D-3 follows.

To make changes via SETUP:

Study the screen and locate the change(s) you want to make. Pressing the letter key associated with a function will "toggle" the value of that function. For example, if you press **A** repeatedly, the displayed terminal baud rate switches from 9600 to 110 to 300 and so on, continuing the cycle each time you press the key.

Each of the functions A-D operates in this way, with its own options as noted previously. After you have made all of the changes necessary, press **E** to put the changes into memory (the immediate and temporary route), press **F** to write the changes on the CP/M diskette (the deferred but permanent route), and then press **ESCape** to return to the main menu.

**Example:** You got a new serial printer that uses X-ON/X-OFF handshaking and runs at 2400 baud. This is your first run of SETUP.

1. Get into SETUP as described above.
2. Press **C** once to toggle it from 1200 to 2400 baud. If you accidentally go past 2400, keep typing **C**; it will be back.
3. Press **D** to go from **HARDWARE HANDSHAKING ON PIN 20** to **X-ON/X-OFF**.
4. Press **F** to make the changes permanent on the CP/M diskette. "Permanent" is relative, of course, because you could rerun SETUP five minutes later and change it again.
5. Press **RESET** to put the changes into effect.

## Special Notes:

If you have only a terminal that simply can't operate at 9600 baud, you will have to get your dealer to run SETUP for you, using your CP/M distribution diskette to create a system diskette for you first.

When you do this, don't be surprised when "garbage" appears on your screen each time you press the reset button. This is a garbled version of the message that normally tells you to insert your CP/M diskette and press Return. It is sent out at 9600 baud, so your terminal misinterprets it. After you press Return, however, the new baud rate takes over and everything proceeds normally from there.

## Using Two Printers

It is conceivable that you may have both a serial and a parallel printer, with one doing high speed matrix output and the other handling slower letter-quality jobs.

Perhaps you want to send the output of a word processing program to the matrix printer, for example, until you reach the final version. Then you want to print it on the daisy-wheel.

If both of your printers are serial (or parallel) and both operate with the same baud rate and protocol, all you would have to do to switch printers is to unplug one and plug the other one in. Even when these unlikely conditions exist, this technique is still tedious and hard on your cable.

In the more probable case of two printers that are not so compatible, and without the benefits of the SETUP program, you would have to get involved in resetting switches inside the computer and possibly having to swap cables.

SETUP function B (Printer select) allows you to switch from serial to parallel printer and back effortlessly. Those of you familiar with CP/M should note that this function establishes the setting of the "LST:" device, while the printer not selected automatically becomes the "PUN:" device.

SETUP function C (Printer baud rate) is useful not only if you have a single serial printer that won't work at 1200 baud, but also if you have two serial printers operating at different baud rates. Then you can switch plugs, run SETUP, and toggle the baud rate (and protocol, if necessary).

### Jumper Options

The following operations involve removing the cover of the Micro Decision and thus should be performed by qualified technical personnel only.

Most peripheral options can be handled with the SETUP program. If you want to use a modem on either of your serial ports, however, it is necessary to reconfigure the pinouts of that port with jumpers contained on the Micro Decision circuit board.

As mentioned previously, the serial connectors on the Micro Decision conform to RS-232 standards. Figure D-4 shows the layout of the connector and Table D-1 identifies the signal associated with each of the pins.

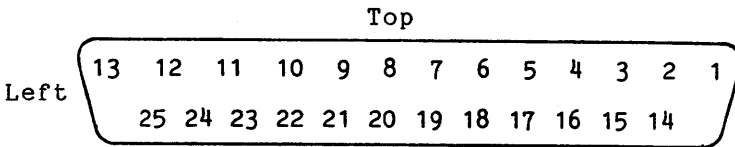


Figure D-4 Serial Port Pin Arrangement - Rear View

Pin #	Signal
1	Frame Ground
2	Receive Data Input
3	Transmit Data Output
4	Request To Send Input
5	Clear To Send Output
6	Data Set Ready Output
7	Signal Ground
8	Carrier Detect Output
9 *	+12V Output
10 *	-12V Output
11 *	Alternate Handshake Line
14 *	+5V Output
17 *	Receiver Clock Output
20	Data Terminal Ready Input
24 *	Transmitter Clock Input

\* These signals are available on the printer/modem connector only.

Table D-1 RS-232 Signal Descriptions

On the circuit board in front of each serial connector is a set of jumper headers labelled JPA and JPB. JPA has eight pairs of jumpers for defining the terminal port; JPB has 13 pairs that define the printer/modem port. Slip-on connectors are used to make the RS-232 pin assignments. By changing the positions of some connectors, the ports can be configured for use with modems. (For those of you familiar with telecommunications jargon, the jumpers select whether the serial connector is set up to talk to DCE or DTE equipment.)

### Accessing the Jumpers

Before you begin, TURN OFF THE MICRO DECISION POWER SWITCH and UNPLUG THE POWER CORD.

Remove the four screws securing the cover to the chassis, then remove the two screws holding the cover to the back panel (see Figure D-1).

Carefully slide the cover towards the front (it is not necessary to remove it completely). Each jumper block is located in front of the serial port that it relates to.

## JPA Factory Settings

The terminal port would be configured for a modem if you want to call up the Micro Decision from a remote terminal or computer.

The signal present on each jumper pin in JPA is shown in table D-2, along with the factory setting for the feeding of the signals to the RS-232 connector. The reason the pin numbers appear as 1 (1A) is that the board may be silkscreened in either of these two ways.

JPA Pin#	Signal	RS-232 Pin#
1 (1A)	RxD to UART	2
2 (2A)	RD to terminal	3
3 (3A)	DSR to terminal	6
4 (4A)	DSR/ to UART	4
5 (5A)	DTR from terminal	N/C
6 (6A)	DTR/ from UART	5
7 (7A)	+12V	8
8 (8A)	+12V	8
9 (8B)	CTS/ to UART	8
10 (7B)	CD from terminal	8
11 (6B)	CTS to terminal	5
12 (5B)	CTS/ to UART	8
13 (4B)	RTS from terminal	4
14 (3B)	RTS/ from UART	6
15 (2B)	TxD from UART	3
16 (1B)	TD from terminal	2

Table D-2 JPA Pinouts (Terminal Setup)

This signal configuration is accomplished through circuit board wiring and the factory jumper settings, as shown in Figure D-5.

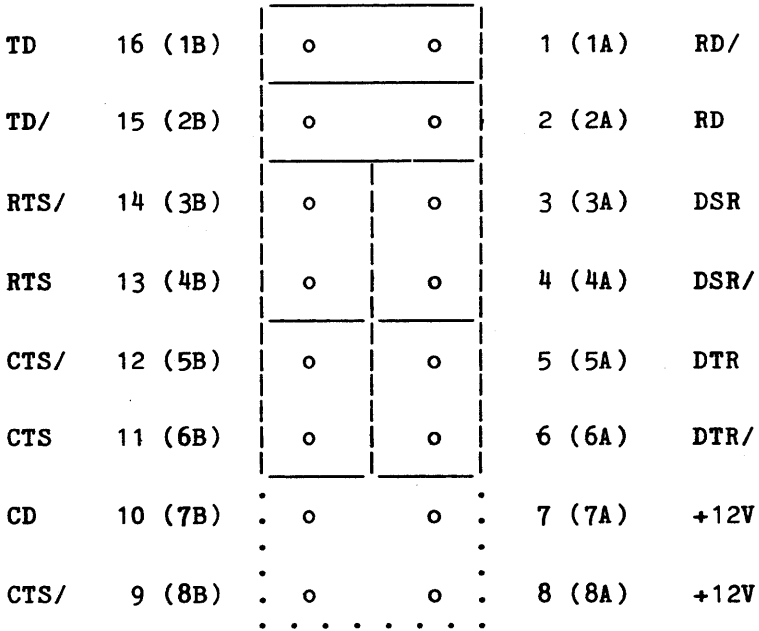
TD	16 (1B)	o	o	1 (1A)	RD/
TD/	15 (2B)	o	o	2 (2A)	RD
RTS/	14 (3B)	o	o	3 (3A)	DSR
RTS	13 (4B)	o	o	4 (4A)	DSR/
CTS/	12 (5B)	o	o	5 (5A)	DTR
CTS	11 (6B)	o	o	6 (6A)	DTR/
CD	10 (7B)	o	o	7 (7A)	+12V
CTS/	9 (8B)	o	o	8 (8A)	+12V

Figure D-5 Factory Jumper Settings for JPA

When setting up JPA for use with a modem on the terminal port, the jumper modifications depend on whether your modem cable has pin 2 at one end tied to pin 3 at the other, and vice versa. This crisscrossing is frequently, but not always, found in modem cables. If you're not sure which type you have, use an ohmmeter or continuity tester to find out.

## JPA Settings for Modems

For cables that crisscross pins 2 and 3, arrange the jumpers as shown below.



For cables that connect pin 2 to pin 2 and pin 3 to pin 3, set your jumpers as shown in the next diagram.



TD	16 (1B)	o	o	1 (1A)	RD/
TD/	15 (2B)	o	o	2 (2A)	RD
RTS/	14 (3B)	o	o	3 (3A)	DSR
RTS	13 (4B)	o	o	4 (4A)	DSR/
CTS/	12 (5B)	o	o	5 (5A)	DTR
CTS	11 (6B)	o	o	6 (6A)	DTR/
CD	10 (7B)	o	o	7 (7A)	+12V
CTS/	9 (8B)	o	o	8 (8A)	+12V
		.	.		
		.	.		
		.	.		
		.	.		
		.	.		
		.	.		

**Factory Settings for JPB**

The printer/modem port would be configured for a modem if you want to use the Micro Decision as a host computer contacting remote computers or data bases.

The signal present on each jumper pin in JPB is shown in table D3, along with the factory setting for the feeding of the signals to the RS-232 connector. The reason the pin numbers appear as 1 (1A) is that the board may be silkscreened in either of these two ways.

JPA Pin#	Signal	RS-232 Pin#
1 (1A)	RxD to UART	2
2 (2A)	RD to terminal	3
3 (3A)	DSR to terminal	6
4 (4A)	DSR/ to UART	20
5 (5A)	DTR from terminal	20
6 (6A)	DTR/ from UART	5
7 (7A)	TTL false (<-3V)	8
8 (8A)	TTL false	8
9 (9A)	TTL false	8
10 (10A)	Receiver Clock to modem	17
11 (11A)	RS-232 Receiver input	N/C
12 (12A)	TTL output of RS-232 rcvr	N/C
13 (13A)	N/C	
14 (13B)	Baud Clock output	N/C
15 (12B)	Baud Clock input to UART	N/C
16 (11B)	TC (External Clock)	24
17 (10B)	RS-232 level clock out	N/C
18 (9B)	DET (alternate handshake)	11
19 (8B)	CTS/ to UART	8
20 (7B)	CD from terminal	8
21 (6B)	CTS to terminal	5
22 (5B)	CTS/ to UART	8
23 (4B)	RTS from terminal	4
24 (3B)	RTS/ from UART	6
25 (2B)	TxD from UART	3
26 (1B)	TD from terminal	2

Table D-3 JPB Pinouts (Terminal Setup)

This signal configuration is accomplished through circuit board wiring and the factory jumper settings, as shown in Figure D-6.

TD	26 (1B)	o	o	1 (1A)	RD/
TD/	25 (2B)	o	o	2 (2A)	RD
RTS/	24 (3B)	o	o	3 (3A)	DSR
RTS	23 (4B)	o	o	4 (4A)	DSR/
CTS/	22 (5B)	o	o	5 (5A)	DTR
CTS	21 (6B)	o	o	6 (6A)	DTR/
CD	20 (7B)	o	o	7 (7A)	<-3V
CTS/	19 (8B)	o	o	8 (8A)	<-3V
DET	18 (9B)	o	o	9 (9A)	<-3V
	17 (10B)	o	o	10 (10A)	
	16 (11B)	o	o	11 (11A)	
RxCB	15 (12B)	o	o	12 (12A)	
U2CLK	14 (13B)	o	o	13 (13A)	

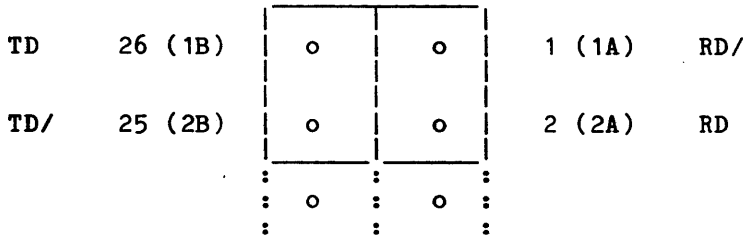
Figure D-6 Factory jumper settings for JPB

## JPB Settings for Modems

As was mentioned above for JPA, the jumper settings for JPB depend on the type of modem cable you have. For cables that crisscross pins 2 and 3, arrange the jumpers as shown in the next figure.

TD	26 (1B)	o	o	1 (1A)	RD/
TD/	25 (2B)	o	o	2 (2A)	RD
RTS/	24 (3B)	o	o	3 (3A)	DSR
RTS	23 (4B)	o	o	4 (4A)	DSR/
CTS/	22 (5B)	o	o	5 (5A)	DTR
CTS	21 (6B)	o	o	6 (6A)	DTR/
CD	20 (7B)	o	o	7 (7A)	<-3V
CTS/	19 (8B)	o	o	8 (8A)	<-3V
DET	18 (9B)	o	o	9 (9A)	<-3V
	17 (10B)	o	o	10 (10A)	
	16 (11B)	o	o	11 (11A)	
RxCB	15 (12B)	o	o	12 (12A)	
U2CLK	14 (13B)	o	o	13 (13A)	

When using a modem cable that connects pin 2 to pin 2 and 3 to 3, use the jumper setup is the same as above except for positions 1 (1A), 2 (2A), 25 (2B), and 26 (1B). See the difference below.



### About the Serial Ports

Both serial ports on the Micro Decision use the Intel 8251A UART (Universal Asynchronous Receiver/Transmitter) chip. For information on how to program the UART, refer to an Intel or NEC data book:

The UARTs are I/O mapped and may be accessed at the following locations:

OFCH	Terminal UART DATA port
OFDH	Terminal UART COMMAND/STATUS port
OFEH	Printer UART DATA port
OFFH	Printer COMMAND/STATUS port

### CP/M Device Definitions

The Micro Decision has all four logical devices implemented as follows:

CON:	Terminal
LST:	PRINTER/MODEM port (supports XON/XOFF handshaking) or CENTRONICS port
RDR:	PRINTER/MODEM port (input)
PUN:	PRINTER/MODEM port (output, supports XON/XOFF) or CENTRONICS port

The thing that determines the assignment of the LST: and PUN: devices is SETUP.COM. The printer (port) selected through this program becomes the LST: device while the other becomes PUN:. Factory settings are LST: = PRINTER/MODEM and PUN: = CENTRONICS.

## The Expansion Connector

While you had the cover off of the Micro Decision, you may have noticed J5, a 40-pin connector at position A6 on the circuit board. This is intended for future use as a connector to circuit boards that provide enhancement functions. Documentation for its pinouts will be available when it becomes operational.

## E. GLOSSARY

**ALLOCATE** - Assignment of space or function for a specific task.

**APPLICATION PROGRAM** - Usually a commercially available program that tells the computer how to do a specific job, such as word processing or payroll accounting.

**BACK UP COPY** - A copy of files (programs or data) kept as a spare in case the original file is destroyed.

**BAUD RATE** - Rate of character transmission speeds over asynchronous communication devices such as printers, terminals and MODEMs. Named for Emil Baudot, a pioneer in printing telegraphy.

**BIT** - A contraction of "binary digit;" the basic unit of information used by the computer. Eight bits equals one byte (see BYTE).

**BOOT** - Short for "bootstrap." A bootstrap program contains instructions that allow the computer to be placed in a desired state by means of its own actions. Microcomputers are readied for use by a bootstrap program (see COLD START).

**BYTE** - The representation of a single character. A sequence of eight bits treated as a single unit; also the smallest addressable unit within the system.

**CAPACITY** - Amount of data that can be stored on a magnetic storage device (diskette, for example); usually described in terms of k bytes, where one k = 1024 bytes.

**CHARACTER** - Synonymous with byte. One character is made up of 8 bits.

## E. GLOSSARY

**CHIPS** - Small (about 3/8 inch square) pieces of silicon that contain computer logic and circuitry for processing, memory and input/output functions. Chips are soldered together on a printed circuit board to form the microcomputer.

**COLD START** - Procedure to start up a computer that is currently off or has undergone a serious failure. The Micro Decision® uses a bootstrap program to bring itself up (see BOOT).

**COMMAND** - Instruction entered by the user at the terminal keyboard to direct the actions of the computer.

**COMPATIBILITY** - The ability of one computer to accept and process data by another computer without modifying the data or the media upon which it is being transferred.

**COMPUTER PROGRAM** - A set of instructions written for a computer that enable it to achieve a desired result.

**CONFIGURATION** - A group of devices (such as terminals, printers, disk drives, etc.) connected to a computer that has been programmed to operate them as a single system.

**CONTROL KEYS** - Key or a sequence of keys entered at the keyboard to initiate a particular function within a program.

**CPU** - Central Processing Unit. The "brains" of the computer where instructions and data are interpreted and executed.

**CURSOR** - Indicates position on the terminal screen; may be a small rectangle, line or triangle.

**DATA** - The facts, numbers, letters, symbols, etc. processed or produced by the computer.



## E. GLOSSARY

**DISKETTE STORAGE** - Storing of data on magnetic disk. Data is arranged on concentric tracks much like a phonograph record.

**ERASE** - Complete removal (obliteration) of data from a diskette or other data storage device.

**EXECUTE** - The process of entering a command that the computer can successfully perform or carry out.

**FILE** - A single named collection of data, such as a manuscript or a list of addresses, that can be recalled by the computer.

**FIRMWARE** - Specific software instructions permanently placed into the computer's internal memory chips.

**FLOPPY DISKETTE** - Small, flexible disks that store magnetically encoded data used on the microcomputer.

**FORMAT** - Structure of a diskette that the operating system expects before it writes files or programs onto the diskette.

**HARDWARE** - Contrasts to software; the physical computer equipment and components, such as the magnetic, electronic and mechanical devices.

**INPUT** - Data entered into the computer to be processed from the keyboard, or the transfer of data from external storage to internal storage devices.

**I/O** - Input/Output; refers to acceptance and transfer of data to and from a computer.

**I/O DEVICES** - Devices used to communicate with the computer and transfer data to and from it.

**INSTRUCTION** - Statement in a computer program specifying a particular function or task to be performed.

## E. GLOSSARY

**k** - Taken from Greek word "kilo" meaning 1000; equivalent to 1024, or 2 raised to the 10th power (see BYTE).

**LANGUAGE** - A means of conveying information to the computer that is governed by a set of defined rules and conventions.

**MASS STORAGE** - On-line secondary data storage devices, such as floppy disk subsystems, that are readily accessible by the CPU.

**MODEM** - Contraction of MODulator-DEModulator; communication device that transmits information between computers via telephone lines.

**OPERATING SYSTEM** - An operating system has many important functions in a computer system. It is a collection of instructions and software programs that link the user to the computer, allowing him to work efficiently with it. It also controls the operation of the system, taking care of command and program execution, displaying error messages at the appropriate times, directing data to the proper places, etc. The Micro Decision® operates with the CP/M® operating system.

**PRINTER** - An output device that produces a "print-out" or "hard copy" of computer data. Output is measured in the amount of words printed per second, with dot matrix printers being faster than letter quality printers.

**RAM** - Random Access Memory; high speed memory locations within the computer circuitry itself.

**RS-232** - A specification established by the Electronic Industries Association governing the interface requirements between MODEMS and terminals or computers.

**SOFTWARE** - The programs that govern the operation of the computer and make the hardware run.

## E. GLOSSARY

**TERMINAL** - A typewriter-like keyboard and CRT (cathode ray tube) display screen connected to the computer for input/output of data.

**USER** - Person who uses a computer.

**WARM START** - Restarting or resetting a computer after a temporary failure or interrupt of normal activity; temporary failure has not disturbed back up storage.

## F. RECOMMENDED READING

- An Introduction to Microcomputers, Vols. 0-3,  
(Berkeley: Osborne/McGraw-Hill, 1980)
- CP/M® Primer, by Stephen M. Murtha and Mitchell  
Waite, (San Francisco: Howard W. Sams & Co.,  
Inc., 1980)
- Using CP/M® - A Self-Teaching Guide, by Judi N.  
Fernandez and Ruth Ashley (New York: John  
Wiley & Sons, Inc., 1980)
- The CP/M® Handbook with MP/M, by Rodnay Zaks  
(Berkeley: Sybex, 1980)
- Osborne CP/M® User Guide, Second Edition, By Tom  
Hogan (Berkeley: Osborne/McGraw-Hill, 1982)
- Mastering CP/M®, by Alan R. Miller (Berkeley:  
Sybex, 1982)
- Wordstar® Made Easy, by Walter A. Ettlin  
(Berkeley: Osborne/McGraw-Hill, 1981)
- Introduction to WordStar®, by Arthur Naiman  
(Berkeley: Sybex, 1982)
- Introduction to Word Processing, by Hal Glatzer  
(Berkeley: Sybex, 1981)
- DON'T (Or How to Care For Your Computer), by  
Rodnay Zaks (Berkeley: Sybex, 1981)
- Your First Computer, A Guide to Business and Per-  
sonal Computing, by Rodnay Zaks (Berkeley: Sybex,  
1981)
- BASIC for Business, by Douglas Hergert (Berkeley:  
Sybex, 1982)

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