MicroMate User's Guide

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MICROMATE USER'S GUIDE

MODEL PMC-101

PREFACE

     Thank you for purchasing Personal Micro Computer's MicroMate computer. The MicroMate User's Guide, written for the model PMC-101, contains instructions for installing the PMC MicroMate system. The MicroMate computer system consists of a MicroMate computer, Model PMC-101 and a Qume terminal, Model QVT-102. The User's Guide consists of six sections plus Appendices. Section 1 outlines operational features of the MicroMate system operations. Section 2 leads the user step by step through the preliminary unpacking, installing, and power-on procedures necessary to run the PMC MicroMate system. Section 3 covers the installation of optional equipment. This section also mentions terminals other than the Qume. Section 4 discusses the Software Utilities supplied exclusively by PMC. Section 5 treats the differences between standard CP/M Plus and the CP/M PLUS version being used on the MicroMate. Section 6 contains technical information for the advanced user, and the Appendices offer technical assistance. PMC has also included a glossary at the end to help you with the terminology used in this Guide.

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Figure 1-1 MicroMate Computer System

1.1   PHYSICAL DESCRIPTION

The MicroMate cabinet contains a half-height 5 1/4 inch disk drive, a single board computer using a Z80-A microprocessor, and a power supply. The front panel of the cabinet incorporates a RESET button, a disk drive slot for a 5 1/4 inch diskette, a drive door handle, a power indicator light, and a disk drive activity indicator light (see Figure 2-2). The back panel features two serial connectors: one labelled "TERMINAL", the other "MODEM"; and two edge connectors, one labelled "PRINTER" for a parallel printer, the second labelled "DISKS" for add-on floppy disk drives.

1.2   SYSTEM FEATURES

     The MicroMate computer, shipped as a stand alone system, is
designed to be used with an asynchronous terminal as a high speed
independent work station. It is easy to transport the computer
from one work station to another because of its small size.

     The MicroMate computer features a Z80-A microprocessor
running at 4 Mhz, 128 Kilobytes of Dynamic bank switched RAM, a
half-height 5 1/4 inch floppy disk drive with 400 Kilobytes of
storage and a Real Time Clock, as well as the CP/M PLUS Operating
System.

     In addition to the basic configuration, the MicroMate is
compatible with a wide range of products as well, for example:

                    - asynchronous serial terminals
                    - parallel or serial printers
                    - up to four disk drives
                    - modems
                    - asynchronous serial peripherals

     An internal interface connector offers further expansion
capabilities for the MicroMate computer. This connector permits
the addition of other peripherals such as hard disk drives,
eight-inch disk drives, voice and music synthesizers, and
networks.

1.3   SOFTWARE FEATURES

     PMC includes three software diskettes with the MicroMate
computer. The diskettes are labelled:

          "CP/M 3.0 SYSTEM MASTER"
          "CP/M 3.0 SOURCE MASTER"
          "T/MAKER MASTER"

     Each diskette contains the CP/M PLUS operating system
permitting any program on the three diskettes to load and run
with a single disk drive system. PMC has implemented the banked
version of CP/M PLUS using 128K-bytes of Ram and three types of
serial protocol: XON/XOFF, CTS/RTS and DTR/DSR.

     In order to simplify the initial installation of the system,
the parameters used for booting are different on each diskette.
All Software Utilities supplied, which are menu driven for ease
of use, include extensive error trapping and messages.

The "SYSTEM MASTER" diskette contains programs and Software Utilities used in day-to-day computing.   Some of the Utilities included with this diskette are: command help, diskette formatting, high-speed full diskette copying, drive conversion (which permits reading from and writing to diskettes of other manufacturers), power-on parameter configuration, and system test.

The "SOURCE MASTER" diskette that contains the Bios source code files also has the necessary programs to assemble the source code into a working operating system.

The "T/MAKER" diskette contains all of the files relating to the T/Maker electric spreadsheet and word processing program.

1.4   SPECIFICATIONS

1.4.1   MICROMATE COMPUTER SPECIFICATIONS, Model PMC-101

Processor	Z80A, 4Mhz
RAM	128K-bytes, bank switched
ROM	4K-bytes, auto boot
Disk Capacity	One internal drive, 400K-bytes
	Three optional drives
Serial Ports	Two 50 to 19,200 baud, asynchronous
Parallel Ports	128 bidirectional available
Printer Port	Centronics parallel type
Dimensions	3 1/2 wide x 6 high x 15 inches deep
Weight	10 pounds
Power	117 VAC 50/60Hz 75 Watts

1.4.2   QUME TERMINAL SPECIFICATIONS, Model QVT-102

Screen Size	12 inch non-glare green screen
Display Format	24 x 80, 25th status/setup line
Character Size	7 x 9 matrix in a 9 x 12 cell
Attributes	Blink, blank, underline, reverse, dim
Keyboard	Low profile, detached, 85-key QWERTY type
	Numeric keypad, function & cursor control
	keys, key click and auto repeat
Character Set	96 ASCII, 32 control, 15 graphic
Interface	EIA RS-232-C, Terminal & Aux.
Protocol	DTR, Xon/Xoff or both
Baud Rates	50 to 19,200
Dimensions	Keyboard: 18 wide x 1 1/2 high x 12 inches deep
	Screen: 13 wide x 14 high x 12 inches deep
Weight	Keyboard & Screen Module: 22 pounds
Power	117VAC 50/60Hz 30 Watts

INSTALLATION

2.1   UNPACKING

Your MicroMate system is delivered in two cartons. The smaller carton contains the MicroMate computer, 3 diskettes, and the documentation for the MicroMate, CP/M PLUS, and T/Maker.

The larger carton contains the Qume QVT-102 terminal comprised of an adjustable tilting screen and an 85-key keyboard, an RS-232 cable, and the Qume manual.

Remove all components and documentation from the cartons and save the cartons and packing material in the event that the MicroMate computer needs to be returned.

If you wish to install your MicroMate system with other than a Qume QVT-102 terminal, please read Section 3 before proceeding.

2.2   CARE AND HANDLING OF DISKETTES

Your diskettes (See Figure 2-1) are extremely fragile and sensitive to magnetic fields. Keep them away from your terminal and from metallic objects, such as scissors, screw drivers, speakers etc. Never touch the exposed areas of the magnetic surface. There is a write protect notch in the diskette jacket. When this notch is covered with a Write Protect Tab, the diskette can only be read from and not written to. Master diskettes should always have a write protect tab placed over the notch before they are stored safely away. When using a Master diskette, never remove the write protect tab.

Figure 2-1   5 1/4 Inch Diskette

Power Switch

Power Light

Door Handle

Disk Drive

Slot

Reset Button

Disk Drive

Activity Light
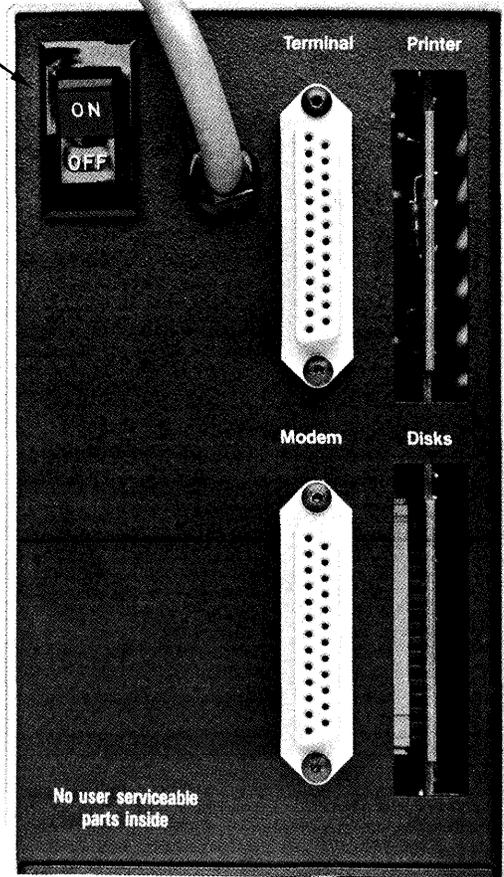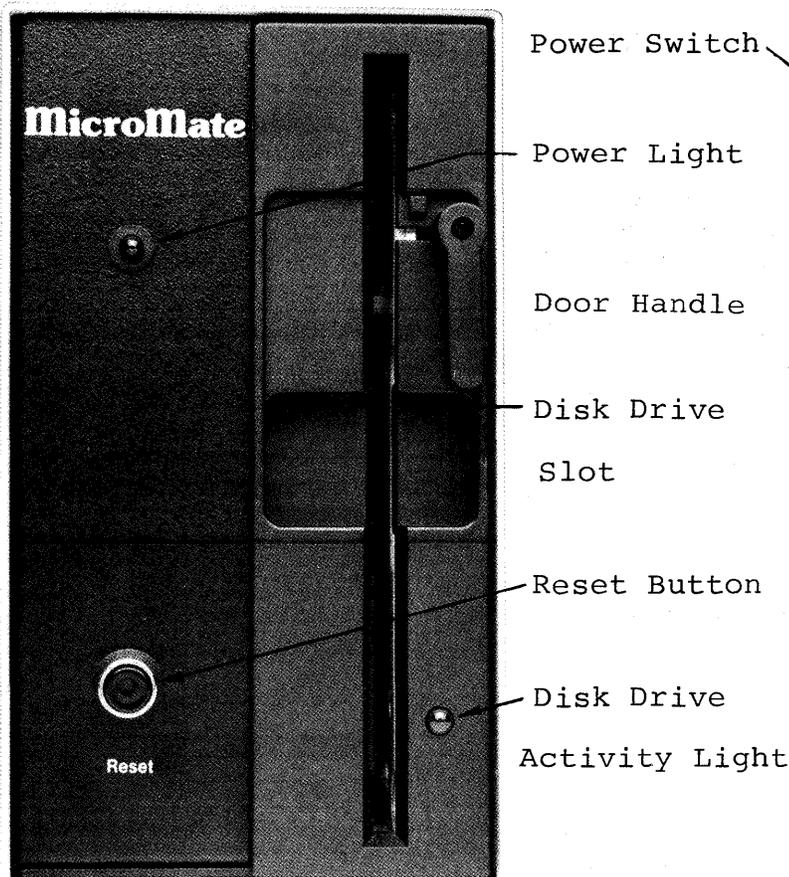
Figure 2-2 Front Panel   Figure 2-3 Rear Panel

Terminal Connector
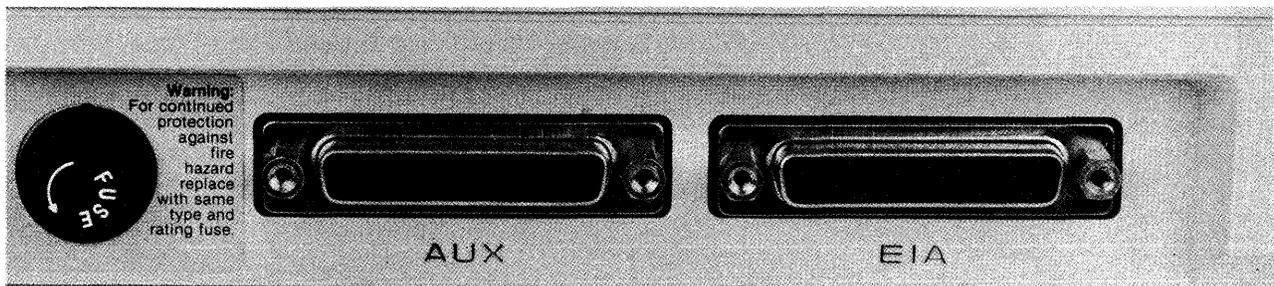
Figure 2-4 Rear Panel of Qume Terminal

2.3   INTERCONNECTING

1)   Set the QVT-102 terminal and the MicroMate computer on
      a very stable and solid work surface. The two pieces
      must always be a minimum of six (6) inches apart.

2)   Be sure the power switches on the rear of the terminal
      and the computer are in the OFF position before
      plugging the terminal and the computer power cords into
      grounded AC outlets.

      It is often convenient to have the computer and all
      peripherals plugged into an AC power strip so that
      they can be all turned on or off at the same time.

3)   Plug the loose end of the coiled keyboard cable into
      the matching connector located on the left front corner
      of the terminal base.

4)   Plug either end of the RS-232 cable (round cable) into
      the connector labelled "EIA" and found on the rear
      panel of the Qume terminal.

5)   Plug the other end of the RS-232 cable into the
      connector labelled "TERMINAL" and found on the rear
      panel of the MicroMate cabinet.

      For permanent installation it is advisable that the
      lock-down screws on each RS-232 cable connector be
      screwed into the rear panel mounting studs.

      Open the door of the built in disk drive (**A:** drive) by
      pressing down on the left side of the door handle.
      Pull the cardboard shipping diskette straight out to
      remove it. This cardboard diskette should be kept with
      the rest of the packing materials.

2.4   POWER-ON PROCEDURE

ALWAYS turn on peripheral devices such as the terminal, modem and printer before powering-on the MicroMate computer.

2.4.1   TERMINAL

6)   Move the terminal power switch, located on the rear of the base, to the ON position.

7)   After a short delay, the beeper sounds.

8)   The cursor appears in the upper left corner of the screen while the status line spreads across the bottom of the screen.

9)   If an error message appears or the cursor does not appear, consult your terminal manual.

2.4.2   COMPUTER

10)   Move the MicroMate power switch, located on the rear panel, to the ON position.

11)   The power indicator on the upper left front panel will illuminate.

12)   The drive activity indicator on the front of the A: drive will blink.

13)   Press the RESET button located on the front panel.

14)   If the A: drive activity light does not blink, move the power switch to the OFF position. Repeat from step 10.

        If all the steps above fail, consult your dealer.

2.5   BOOT PROCEDURE (Loading the Operating System)

15)   Locate the diskette labelled "CP/M 3.0 SYSTEM MASTER."   *OK for 9600 Baud*

16)   Remove the diskette from its sleeve, being careful to
       handle the diskette by the label end only.

17)   Hold the diskette so the label side is facing right and
       the silver write protect tab is up.

18)   Insert the diskette slowly into the slot in the front
       of the A: drive. The diskette must be fully inserted.

19)   Close the drive door by grasping the lower edge of the
       door lever and in a smooth motion, swing the handle
       left and up until it is in a horizontal position.

       Clicking noises emanate from the drive. After a short
       delay the terminal screen will display the information
       shown as Screen 2-1, below; after a second delay, the
       screen appears as Screen 2-2. The screen will look
       like Screen 2-3 after the system boots.

20)   The "A>_" is called the A> prompt; the "_" represents
       the cursor.   *← insert "SYS MASTER if not already in"*

```
CP/M V3.0 Loader
Copyright (C) 1982, Digital Research

 61K TPA
```

Screen 2-1 Initial Boot Display.

```
------------------------------------------------------------------
|                                                                |
|                                                                |
|CP/M V3.0 Loader                                                |
|Copyright (C) 1982, Digital Research                            |
|                                                                |
| 61K TPA                                                        |
|128K PMC-101        CP/M 3.0 with extended Bios for MicroMate -Vers 3.0- |
------------------------------------------------------------------
```

Screen 2-2 Intermediate Boot Display.

```
------------------------------------------------------------------
|                                                                |
|                                                                |
|CP/M V3.0 Loader                                                |
|Copyright (C) 1982, Digital Research                            |
|                                                                |
| 61K TPA                                                        |
|128K PMC-101        CP/M 3.0 with extended Bios for MicroMate -Vers 3.0- |
|                                                                |
|A>_                                                             |
------------------------------------------------------------------
```

Screen 2-3 Final Boot Display.

2.6   MASTER DISKETTE BACKUP PROCEDURES

Please BACKUP your three master diskettes now. It is very important to make backup copies of each original diskette at the time of your first successful installation. The SYSTEM MASTER diskette has two programs, FORMAT and BACKUP, which enable you to prepare new diskettes and BACKUP each of your master diskettes. You will need six blank Double Sided, Double Density diskettes enabling you to make two copies of each master diskette. Follow the steps below very carefully and as soon as you have finished backing up or copying your master diskettes, put the originals in a very safe, cool, dry place.

* NOTE *

The RETURN key on the Qume terminal is labelled ⤆ .
The ENTER key on the numeric keypad may also be used.

2.6.1   FORMATTING

Now that you have signed on by allowing the system to boot, you have the A> prompt on the screen; follow the instructions below for FORMATTING your blank disks:

21)   Obtain six blank Double Sided, Double Density 5 1/4 inch diskettes.

22)   If the SYSTEM MASTER diskette is not already in the A: drive, insert it into the A: drive, and close the door. Type control C (^C) by holding down the key marked **Ctrl** while simultaneously pressing the key marked **C**.

23)   After the A> prompt, type in the word **FORMAT.** Do not leave a space between the A> and FORMAT. Either upper case or lower case letters may be typed. The screen should appear as follows:

A>**format**

24)   Press the RETURN key (⤆). The FORMAT introduction screen appears.

If the introduction screen fails to appear, be sure the SYSTEM MASTER diskette is inserted correctly in the A: drive and the disk drive door is closed. Repeat from step 22.

25)   After reading the introduction screen, press the RETURN
        key to advance to the main menu screen.

26)   At the main menu screen, type an **F** for Format. Press
        the RETURN key.

27)   When the drive selection menu appears on the screen,
        type an **A.** Press the RETURN key.

28)   The next screen instructs you to insert the Double
        Sided diskette you wish to format into the A: drive.

        Remove the SYSTEM MASTER diskette, replace in sleeve,
        and insert one of the blank diskettes into the A: drive
        at this time.

        DO NOT press the RETURN key before inserting the blank
        disk.

        The screen first displays the number of each track on
        side 0, and then on side 1 of the diskette as it
        formats. The counting of the tracks changes rapidly on
        the screen as the drives make a clicking sound.

29)   After both sides are formatted, every track on both
        sides is verified for correct formatting. If the
        format of any track is incorrect, a coded error message
        appears next to the track number.

30)   Upon completion of the formatting and verification
        procedure, the screen prompts you to press RETURN.

        Before pressing RETURN, check the screen for any errors
        which appear as a code word bounded by asterisks (**)
        next to a track number.

31)   Press the RETURN key; the main menu reappears.

32)   If any errors are reported, leave the diskette in the
        A: drive. Try formatting the diskette one more time by
        repeating from step 26. If errors reappear, remove the
        diskette, discard it, and skip to step 34.

33)   Remove the diskette from the A: drive, replace in
        sleeve, and set aside.

34)   Insert another blank diskette into the A: drive.
        Repeat steps 26 through 33 until you have formatted 6
        diskettes without any errors.

35)   When the final diskette is prepared for use, remove the diskette, reinsert the SYSTEM MASTER diskette, close the drive door, and type an **E** at the main menu to exit from the Utility.

The A> prompt should now be visible on your screen.

You are now ready to make BACKUP copies of your master diskettes.

2.6.2   BACKUP

The BACKUP Utility is designed to make copies of your master diskettes. It may only be used with a previously formatted diskette.

36)   To begin the BACKUP Utility, type the word **BACKUP** at the A> prompt, and press the RETURN key (◄──┘).

The BACKUP introduction menu appears on the screen. PLEASE read the directions carefully. The following screens instruct you when to remove or insert the SYSTEM MASTER diskette (called the SOURCE diskette), and when to insert or remove the newly formatted diskette (called the DESTINATION diskette).

In case the introduction screen fails to appear, be sure the SYSTEM MASTER diskette is correctly inserted in the A: drive. Go back to step 36.

37)   To advance to the next screen, after reading the Introduction screen, press the RETURN key.

38)   The next screen asks whether or not the data is to be verified. Type a **Y**. Press the RETURN key.

39)   On the next screen, confirm using only the A: drive by typing a **Y**. Press RETURN.

40)   When prompted to load the SOURCE diskette into drive
        A:, be sure the SYSTEM MASTER diskette is in the A:
        drive.   Press RETURN.

        Ten "cylinders" are read from the SOURCE diskette into
        the computer. The number of each cylinder appears on
        the screen as it is being read from the disk. Watch
        the screen as the numbers are displayed; look for any
        lower case letters that may appear after a number. If
        any letters appear after a number, an error has
        occurred.   Note the error and proceed.

41)   When prompted to load the DESTINATION diskette into
        drive A:, remove the SYSTEM MASTER diskette, insert a
        newly formatted diskette, and close the drive door.
        Press RETURN.

        Ten cylinders are written to the DESTINATION diskette.
        The number of each cylinder written appears on the
        screen. If no letters appear after any of the numbers,
        the information has been written correctly.

42)   Repeat steps 40 and 41 three more times so that all 40
        cylinders are copied.   Insert the SYSTEM MASTER
        diskette when prompted for the SOURCE diskette, and
        insert the newly formatted diskette when prompted for
        the DESTINATION diskette.

43)   After the last cylinder has been written to the
        DESTINATION diskette, the screen asks whether or not to
        repeat the backup function.   If any errors were
        reported in step 40, type **Y**. Try the BACKUP Utility for
        this diskette one more time by repeating step 38
        through 43.

44)   DO NOT answer the prompt until you remove the diskette
        from the A: drive, and replace it in the envelope.

        Prepare a label by writing "CP/M 3.0 SYSTEM" on a self-
        adhesive label before affixing it to the first backup
        diskette.

45)   Type **Y**. Press RETURN, and repeat steps 38 through 44
        using another of the newly formatted diskettes for the
        second backup copy of the SYSTEM MASTER diskette.

46)   Replace the SYSTEM MASTER diskette in its envelope and
        set aside.

47)   Type **Y**. Press RETURN, and repeat steps 38 through 46
        using the SOURCE MASTER diskette as the SOURCE diskette
        instead of the SYSTEM MASTER diskette. Label these
        backup copies "SOURCE."

48)   Type **Y**. Press RETURN, and repeat steps 38 through 46
        using the the T/MAKER MASTER diskette instead of the
        SOURCE MASTER diskette. Label these backup copies
        "T/MAKER."

49)   Now that you have made two backup copies of all three
        master diskettes, when the screen prompts whether or
        not to repeat function, type **N**. Press RETURN.

        When the screen prompts you to "Place SYSTEM disk in
        A:", insert one of the newly created CP/M 3.0 SYSTEM
        diskettes into the A: drive, close the door and press
        RETURN. The A> prompt reappears on your screen.

50)   Place your three master diskettes in a very safe, cool,
        dry place; they will not be needed for any further
        operations. Use the backup copies just created for all
        of your day-to-day computer work. The master diskettes
        should only be used to make new backup copies.

        You are now ready to configure the power-on parameters
        on the CP/M 3.0 SOURCE and T/MAKER diskettes just
        created.

2.7   CONFIGURATION PROCEDURES

    The CONFIG Utility is used to change the power-on paramaters
on each of the newly created CP/M 3.0 SOURCE and T/MAKER
diskettes in order to match the paramaters of the CP/M 3.0 SYSTEM
diskette.

51)   To begin the CONFIG Utility insert the CP/M 3.0 SYSTEM
        diskette in the A: drive. Type the word **CONFIG** after
        the A> prompt. Press the RETURN key (◄──╵).

        The CONFIG introduction menu will appear on the screen.

        If the introduction screen fails to appear, be sure the
        CP/M 3.0 SYSTEM diskette is correctly inserted in the
        A: drive, and repeat from step 51.

insert non-9600-Baud diskette here

52)   After reading the introduction screen, press the RETURN
        key.

        The next screen is divided into two parts: the upper
        portion of the screen displays the current power-on
        settings; the lower part of the screen is the main
        menu.

53)   The Qume terminal, as shipped from the factory, is set
        at 9600 Baud. This matches the current setting
        displayed in the upper portion of your screen.

54)   Remove the diskette from the A: drive and replace it
        with one of the CP/M 3.0 SOURCE diskettes just created.

55)   Select the <W>rite option, by typing a **W** and pressing
        RETURN, to write the current 9600 baud setting to this
        diskette.

        The drive activity light illuminates for a brief period
        and the main menu reappears.

56)   Repeat steps 54 and 55 for the second CP/M 3.0 SOURCE
        diskette and both of the T/MAKER diskettes.

     You now have 6 bootable diskettes: Two CP/M SYSTEM
diskettes, two CP/M SOURCE diskettes, and two T/MAKER diskettes.
Any one of these diskettes may be used to boot the system when
you first turn it on. Please proceed to the next steps for
details on powering off your computer system.

2.8   POWER-OFF PROCEDURE

57)   Make sure that you are at the A> prompt.

58)   Open the disk drive door.

59)   Remove the diskette from the drive and <u>replace it in
        its sleeve.</u>

<u>WARNING</u>

**If you leave your diskette(s) in the drive(s) when you
power OFF, information on the diskette(s) <u>WILL be ERASED.</u>**

60)   Turn OFF all components. There is no required sequence
      for turning off the computer or peripherals.

     You are now ready to use your MicroMate system. PLEASE Read
the CP/M PLUS Documentation for details on using CP/M. Some
sections of the CP/M PLUS documentation do not apply to the
MicroMate PMC-101 system. Section 5 of this User's Guide lists
the inapplicable sections and refers you to an alternate section
in this Guide. Read the T/MAKER III REFERENCE MANUAL for details
on using T/Maker.

2.9   DAY-TO-DAY POWER-ON/OFF PROCEDURES

     Once you have created backup copies of your master diskettes
and have configured them for your system, use ONLY the backup
copies for your day-to-day computing. The following steps guide
you through a normal start up and power down.

2.9.1   POWER ON AND BOOT PROCEDURE

1)   Refer to Section 2.4.

2)   Use any boot diskette configured for your system.

3)   Hold the diskette so the label side is facing right and
     the write protect notch is up.

4)   Insert the diskette slowly into the A: drive slot.

5)   Close the drive door.

6)   The A> prompt appears after the sign-on message.

2.9.2   POWER-OFF PROCEDURE

   1)   Make sure that you are at the A> prompt.

   2)   Open the disk drive door(s).

   3)   Remove the diskette(s) from the drive(s) and replace
         it(them) in its(their) sleeve(s).

                              WARNING

**If you leave your diskette(s) in the drive(s) when you
power OFF, information on the diskette(s) WILL be ERASED.**

   4)   Turn off all power switches.

INSTALLING OPTIONAL EQUIPMENT

3.1   TERMINAL

For terminals other than the Qume QVT-102, consult your terminal manual and set the following parameters on your terminal:

> 110, 300 or 9600 baud rate
> 8 bit word length
> 1 stop bit
> No parity
> Full duplex mode
> No protocol (XON/XOFF permissible)

Other terminal parameters should not affect the initial start up procedures.

Each of the supplied master diskettes contains the CP/M 3.0 operating system and may be used to boot the system; however, each diskette will boot using a different baud rate.

If your terminal is set for 300 baud, use the CP/M 3.0 SOURCE MASTER diskette; if your terminal is set for 110 baud, use the T/MAKER MASTER; or, if your terminal is set for 9600 baud, use the CP/M 3.0 SYSTEM MASTER diskette to boot the system.

Terminal Baud Rate	Diskette Name
110	T/MAKER MASTER
300	CP/M 3.0 SOURCE MASTER
9600	CP/M 3.0 SYSTEM MASTER

Table 3-1   Diskette Selection for Boot Operation

After selecting the proper diskette, follow the procedures in Section 2.5 and make suitable adjustments for use of your own terminal and make the following specific changes:

In step 15, use your selected diskette instead of the SYSTEM MASTER.

Immediately after step 20, remove your selected diskette and insert the SYSTEM MASTER. Type Control C <^C>.

After step 51, but before step 52, insert your selected diskette.

In step 53, substitute your terminal settings.

In step 54, if your selected diskette is the SOURCE
diskette, substitute the SYSTEM diskette.

In step 56, if your selected diskette is the T/MAKER
diskette, substitute the SYSTEM diskette.

3.2   DISK DRIVES

To connect additional disk drives, use a standard 34 conductor drive expansion cable with a 34 pin edge connector on one end and one, two, or three 34 pin edge connector(s) on the other end. (See Appendix A for a wiring diagram.) Connect the computer end of the cable to the MicroMate's connector labelled "DISKS" and found on the rear panel. Usually the Pin 1 edge of the ribbon cable is marked by a different or darker color. When plugged in, Pin 1 of the connector must be down, and the cable often exits from the left side of the connector. If you are not sure about the exact location of Pin 1 on your cable, consult your dealer. If the add-on disk drives are located on the right side of the computer as viewed from the front, the other connector(s) plug into the drive(s) and should not have any twists in the cable.

IMPORTANT

a)   Every add-on drive must be properly configured prior to use. Refer to your disk drive manual for this procedure.

b)   When adding one disk drive, set the add-on drive select jumper or switch to **DS2**; when adding two disk drives, set the second add-on drive select jumper or switch to **DS3**; and when adding three disk drives, set the third add-on drive select jumper or switch to **DS4.**

c)   The user is also responsible for removing the termination resistor pack or jumpers from all add-on drives. The MicroMate's built-in drive is already terminated.

It is very important that you run the CONFIG Utility in order to change the drive quantity parameter to include the add-on disk drives. (See Section 4.3.)

NOTE: We recommend adding DS, DD disk drives. Any add-on drives must be able to step at 6 ms or faster.

3.3   PARALLEL PRINTER

To connect a Centronics type parallel printer, use a 34 conductor ribbon cable with a Centronics D-connector on one end and a 34 pin edge connector on the other (available from PMC as Part No.: Cab-85). Plug the edge connector end of the printer cable into the MicroMate's connector labelled "PRINTER" and found on the rear panel. Usually the Pin 1 edge of the ribbon cable is marked by a different or darker color. When plugged in, Pin 1 of the connector must be down, and the cable often exits from the left side of the connector. If you are not sure about the exact location of Pin 1 on your cable, consult your dealer. The printer end of the cable is a standard Centronics connector. Consult your printer manual for proper connection. (See Appendix A for a wiring diagram of a standard Centronics printer cable.)

3.4   SERIAL PRINTER

To connect a serial type printer, generally, you use a "flipped" or "Null-Modem" Asynchronous Serial RS-232 cable with male connectors on both ends. Plug one end of the cable into the connector of the MicroMate labelled "MODEM" and found on the rear panel. The other end of the cable connects to your serial printer. Consult your printer manual for instructions on the connecting and wiring of the DB-25 connector. (See Appendix A for a wiring diagram of a "flipped" RS-232 printer cable.)

Use the DEVICE Utility to set the logical LST: device to MODEM and change the baud rate temporarily. (See the CP/M User's Guide.) As shipped from the factory, the MicroMate's MODEM port is set to 300 baud. The CONFIG Utility may be used to change the power-on MODEM baud rate setting. (See Section 4.3.)

3.5   MODEM

To connect a modem, use a standard Asynchronous Serial RS-232 modem cable with male connectors on both ends. Plug one end of the cable into the lower right connector labelled "MODEM" on the rear panel of the MicroMate. The other end of the cable connects to your modem. Consult your modem manual for further installation instructions. (See Appendix A for a wiring diagram of a standard RS-232 modem cable.)

Use the DEVICE Utility to change the MODEM port baud rate temporarily. (See the CP/M User's Guide.) The MicroMate's MODEM port, as shipped from the factory, is set to 300 baud. The CONFIG Utility may be used to change the power-on MODEM baud rate setting. (See Section 4.3.)

SOFTWARE UTILITIES

        The SYSTEM MASTER diskette supplied by PMC contains five
useful Software Utilities: FORMAT, COPY, CONVERT, CONFIG, and
SYSTEST.

        Each Software Utility first displays an introductory screen
that explains the procedure. After you read the information
presented, press the RETURN key to advance to the screen
containing the main menu. The subsequent screens guide you step
by step through the Utility by using complete menus, messages,
and error trapping.

        Each Utility is designed to provide you with the capability
of being able to abort (cancel) while the Utility is running. If
you need to abort the Utility, type Control C by holding the
Ctrl key down and simultaneously pressing the **C** key.

4.1   FORMAT UTILITY

        Command Syntax: **FORMAT**

        The process called "formatting a diskette" prepares a
diskette to receive information by creating tracks and sectors.
Each computer system formats diskettes for use on that particular
system. The PMC FORMAT Utility provides a method to prepare
diskettes for use with the MicroMate system.   This Utility
allows you to format TYPE A (See Section 4.4) Double Sided,
Double Density (DSDD) and TYPE B Single Sided, Double Density
(SSDD) diskettes and verify the transferred sector map. It may
also be used to erase completely and reformat a diskette needing
correction of any hard errors that have developed.

        Before using the FORMAT Utility, however, you may need to
use the CONVERT Utility to choose the preferred diskette TYPE.
If you want to store information on both sides of a Double Sided
diskette, use the CONVERT Utility, change the selected drive to
TYPE A, and then run the FORMAT Utility; a TYPE B drive formats
Single Sided diskettes only.

4.1.1   NORMAL OPERATION

The main menu of the FORMAT Utility offers three options: <F>ORMAT a diskette, <V>ERIFY the integrity of a previously formatted diskette, or <E>XIT from the Utility to CP/M. Select FORMAT or VERIFY by typing an **F** or **V** and pressing the RETURN key.

```
------------------------------------------------------------------

            <F>ormat       (All data will be erased)
            <V>erify       (No data will be erased)
            <E>xit to CP/M

        (Do not enter the <> brackets)

Your choice:_
------------------------------------------------------------------
```

Screen 4-1   Format Utility-Main Menu

While listing the possible drive choices, the next screen prompt requests the letter of a drive. Type the letter for the chosen drive and press the RETURN key. The screen prompt will be re-displayed if an invalid drive letter is entered, so that you may correct the entry.

```
------------------------------------------------------------------

            <F>ormat       (All data will be erased)
            <V>erify       (No data will be erased)
            <E>xit to CP/M

        (Do not enter the <> brackets)

Your choice:F



    Enter drive to use: <A>, ....
------------------------------------------------------------------
```

Screen 4-2   Format Utility-Drive Selection

        After a valid drive letter is entered, the screen prompts
you to insert either a Single or Double Sided diskette into the
corresponding drive. If the drive is TYPE A, both sides of the
diskette will be formatted and/or verified; if the drive is TYPE
B, only one side of the diskette will be used; or, if the drive
TYPE is other than A or B, it cannot be formatted nor will its
letter be displayed. (See Section 4.4 on the CONVERT Utility for
further explanation of TYPEs.)

        Pressing the RETURN key starts the FORMATTING or VERIFYing
procedure. DO NOT press RETURN until the proper diskette has
been inserted into the selected drive.

```
-----------------------------------------------------------------------
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
|    Insert DOUBLE sided diskette to FORMAT into drive A and          |
|    Press <RETURN> to continue or control C <^C> to abort.           |
-----------------------------------------------------------------------
```

            Screen 4-3   Format Utility-Final Prompt

        The TRACK NUMBER and the current SIDE being formatted and/or
verified is displayed on the screen while the Utility is running.
As soon as the formatting is completed, the verify mode is
entered automatically.

```
-----------------------------------------------------------------------
|                                                                     |
|   Formatting:                                                       |
|Track     Side 0                                                     |
|  39                                                                 |
|Track     Side 1                                                     |
|  39                                                                 |
|                                                                     |
|   Verifying:                                                        |
|Track     Side 0                                                     |
|  39                                                                 |
|Track     Side 1                                                     |
|  39                                                                 |
|                                                                     |
|Press <RETURN> to continue or control C <^C> to abort.               |
-----------------------------------------------------------------------
```

            Screen 4-4   Format Utility-No Errors

Sometimes during the FORMAT procedure, a new diskette formats incorrectly. When this happens, an error message bounded by asterisks appears on the screen next to the number of the track causing the error. If, after trying to reformat the diskette one more time, the error still appears, then discard the unusable diskette. Only two possible errors can occur during formatting. They are * WRITE PROTECT * and * WRITE FAULT *. You may recover, however, from a * WRITE PROTECT * error. Wait for all drive activity to cease, remove the write protect tab from the diskette, and try again.

```
--------------------------------------------------------------------
   Formatting:
Track    Side 0
   10      **WRITE FAULT**
   39
Track    Side 1
   39


   Verifying:
Track    Side 0
   10      **RECORD NOT FOUND**
   39
Track    Side 1
   39

Press <RETURN> to continue or control C <^C> to abort.
--------------------------------------------------------------------
```

Screen 4-5   Format Utility-Typical Errors

During the verification process there are four possible error messages: * NOT READY *, * CRC *, * RECORD NOT FOUND *, and * LOST DATA * (See Appendix B for error code explanations.)

4.1.2   ADVANCED OPERATION

The advanced command form, which can be used only for formatting, requires prior selection of the drive to be used. The only prompt displayed is a prompt requesting the insertion of the proper diskette into the selected drive. If the drive specified is an invalid drive or type, then normal prompts will be displayed, and you will be requested to enter a valid drive letter.

Command syntax: **FORMAT,**drive

```
-----------------------------------------------------------------------

A>FORMAT,B

    Insert DOUBLE sided diskette to FORMAT into drive B and
    Press <RETURN> to continue or control C <^C> to abort.
-----------------------------------------------------------------------
```

Screen 4-6   Format Utility-Advanced Command

The screen prompts you to insert the diskette to be formatted into drive B.   Press RETURN to begin formatting.

4.2   BACKUP UTILITY

Command Syntax: **BACKUP**

* NOTE *

   SOURCE is the drive or diskette being copied FROM.
DESTINATION is the drive or diskette being copied TO.

   This Software Utility creates an exact copy of a MicroMate
TYPE A diskette.   By means of its own mini-operating system, the
BACKUP Utility is able to copy a diskette using only one disk
drive. One advantage of the MicroMate's 128 Kilobytes of RAM is
that ten cylinders (twenty tracks) can be read at one time from
the SOURCE diskette and can be held in this memory until the
DESTINATION diskette is ready to receive the transferred
information. This procedure need only be repeated three more
times until all the cylinders have been read and written.

   When used with multiple drives, however, this Utility copies
the diskette by a faster technique of transferring data one
cylinder at a time. One important feature of the Utility comes
into play whenever a SOURCE diskette is inserted by mistake,
instead of a DESTINATION diskette. The Utility marks the
DESTINATION diskette on single drive systems; therefore,
inserting the wrong diskette causes an error message to appear.
This BACKUP Utility may be used only with TYPE A drives (See
Section 4.4 on the CONVERT Utility for further information on
TYPEs.)

   When the BACKUP Utility first begins to run, an
informational screen appears and prompts you to press RETURN
after you finish reading the screen. If you have only one valid
drive, the Utility determines this and does not ask for the drive
letter. If you are using multiple valid drives, the screen asks
you to enter: first, the letter of the drive chosen to be your
SOURCE drive and then: the DESTINATION drive. The list of valid
drives will be displayed in the prompt on the screen. Only
drives designated as TYPE A are valid. If an invalid drive
letter is entered, you are returned to the informational screen
displayed at the beginning of the Utility.

```
---------------------------------------------------------------------
|          Enter the letter of the DRIVE to use as                  |
|                                                                   |
|                                                                   |
| SOURCE DRIVE                                                      |
|                                                                   |
|                                                                   |
|              Do not enter the <> brackets.                       |
|                                                                   |
| Your choice <A>, <B>, ....                                       |
---------------------------------------------------------------------
```

Screen 4-7 Backup Utility-Source Drive

```
---------------------------------------------------------------------
|          Enter the letter of the DRIVE to use as                  |
|                                                                   |
|                                                                   |
|                                    DESTINATION DRIVE             |
|                                                                   |
|                                                                   |
|              Do not enter the <> brackets.                       |
|                                                                   |
| Your choice <A>, <B>, ....                                       |
---------------------------------------------------------------------
```

Screen 4-8 Backup Utility-Destination Drive

The next screen asks you to decide about verification. Verification means that after the data is written to the DESTINATION diskette, it is read back from the DESTINATION diskette, and then it is compared to the original data read from the SOURCE diskette. (If they do not match, a lower case "v" error code is displayed on the screen after the cylinder number.) It is strongly suggested that you always answer the verification question with Y (yes). Although the backup takes slightly longer, verification proves the DESTINATION diskette is an exact copy of the SOURCE diskette.

```
------------------------------------------------------------------
|           Do you wish to VERIFY DATA as written?              |
|                                                              |
|                                                              |
|                                                              |
|                                                              |
|                                                              |
| <Y>es, <N>o or <^C> to exit.                                 |
------------------------------------------------------------------
```

Screen 4-9   Backup Utility-Verification Mode

Next the screen displays a prompt reaffirming the selection of the drives being used in the BACKUP function. Type a **Y** and Press the RETURN key if you are satisfied with the drive selection.

```
------------------------------------------------------------------
|           The Backup will be FROM A: TO A:                   |
|                                                              |
|           Do you wish to proceed with Backup?                |
|                                                              |
|                                                              |
|                                                              |
| <Y>es, <N>o or <^C> to exit.                                 |
------------------------------------------------------------------
```

Screen 4-10   Backup Utility-Confirmation Prompt


```
------------------------------------------------------------------
| Load SOURCE DISK into A:                                     |
|                                                              |
|                                                              |
|                                                              |
|                                                              |
| Press <RETURN> to continue or control C <^C> to exit.        |
------------------------------------------------------------------
```

Screen 4-11 Backup Utility-Source Diskette Prompt

If the source diskette is not a TYPE A diskette or formatted, an error screen appears. Remove the diskette from the SOURCE drive, insert the proper diskette, type **Y** and press RETURN. If you type an **N** and press RETURN, you are taken back to the verify prompt (Screen 4-9.)

```
---------------------------------------------------------------------
|    Unable to verify    SOURCE     disk as Double Density, Double Sided
|
|
|            Do you wish to try again?
|
|
|
|
|  <Y>es, <N>o or <^C> to exit.
---------------------------------------------------------------------
```

Screen 4-12   Backup Utility-Source Diskette Error

The next screen prompts you to insert the DESTINATION diskette into the selected DESTINATION drive. The activity light on the selected drive blinks as a helpful reminder. Insert your DESTINATION diskette into the drive, and make sure you have inserted the proper diskette before pressing RETURN.

```
---------------------------------------------------------------------
|                        Load DESTINATION DISK into A:
|
|
|
|
|  Press <RETURN> to continue or control C <^C> to exit.
---------------------------------------------------------------------
```

Screen 4-13   Backup Utility-Destination Diskette Prompt

When the DESTINATION diskette is first inserted, the Utility automatically checks the diskette for previous formatting and whether or not the diskette contains any information. If your DESTINATION diskette has not been formatted already, an error message appears.

```
-----------------------------------------------------------------------
|                                                                     |
|   Unable to verify DESTINATION disk as Double Density, Double Sided |
|                                                                     |
|                                                                     |
|          Do you wish to try again?                                  |
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
| <Y>es, <N>o or <^C> to exit.                                        |
-----------------------------------------------------------------------
```

           Screen 4-14 Backup Utility-Destination Diskette Error

You may retry with another diskette or type control C to exit to CP/M (Hold the **Ctrl** key while simultaneously pressing the **C** key), format the diskette using the FORMAT Utility, and then re-run BACKUP.

If the DESTINATION diskette contains programs or data, the following message appears:

```
-----------------------------------------------------------------------
|                                                                     |
|                 The DESTINATION Disk is not Blank                   |
|                                                                     |
|   NOTE: ALL DATA NOW ON THE DESTINATION DISK WILL BE LOST IF YOU PROCEED! |
|                                                                     |
|                                                                     |
|           Do you wish to proceed with Backup?                       |
|                                                                     |
| <Y>es, <N>o or <^C> to exit.                                        |
-----------------------------------------------------------------------
```

           Screen 4-15 Backup Utility-Destination Diskette Error

If the DESTINATION diskette contains data or programs and you are positive that you no longer need to keep any of the information currently on the DESTINATION diskette, then type a **Y**. Press the RETURN key and continue on to the next step.

If you are uncertain, answer the prompt by typing an **N** and pressing the RETURN key. Exit the Utility by typing a control C. Follow the directions on the screen until you have the A> prompt visible on the screen and then use the DIR command to see what files are currently on the diskette. Once you have determined what is on the diskette, you may re-run the BACKUP Utility using the same or a different DESTINATION diskette. BE SAFE! Take time to **CHECK EVERYTHING!**

When using multiple drives, each cylinder number is displayed as it is transferred from the SOURCE diskette to the DESTINATION diskette. A total of 40 cylinder numbers will be displayed using the numbers 0 through 39.

```
----------------------------------------------------------------
|            Backup Function underway                          |
|                                                              |
|   Symbols are:                                               |
|            Numbers - Correspond to Track Numbers             |
|              w     - Correspond to Hard  Write Errors        |
|              r     - Correspond to Hard   Read Errors        |
|              v     - Correspond to Hard Verify Errors        |
|                                                              |
|                                                              |
|        0    1    2    3    4    5    6    7    8    9         |
|       10   11   12   13   14   15   16   17   18   19        |
|       20   21   22   23   24   25   26   27   28   29        |
|       30   31   32   33   34   35   36   37   38   39        |
|                                                              |
----------------------------------------------------------------
```

Screen 4-16 Backup Utility-Multiple Drive Cylinder Display

When you use a single drive, each cylinder number is displayed as the cylinder is read. A total of 10 cylinders will be read from the diskette at one time. The screen next prompts you to remove the SOURCE diskette and to insert the DESTINATION diskette. The ten cylinders just read into memory are then written to the DESTINATION diskette. You are again prompted to re-insert the SOURCE diskette. This process is repeated only 3 more times in order to copy an entire diskette.

```
----------------------------------------------------------------
|            Backup Function underway                          |
|                                                              |
|   Symbols are:                                               |
|            Numbers - Correspond to Track Numbers             |
|              w     - Correspond to Hard  Write Errors        |
|              r     - Correspond to Hard   Read Errors        |
|              v     - Correspond to Hard Verify Errors        |
|                                                              |
|                                                              |
|        0    1    2    3    4    5    6    7    8    9         |
|                                                              |
----------------------------------------------------------------
```

Screen 4-17 Backup Utility-Single Drive Cylinder Display

If any errors occur during the BACKUP procedure for either single or multiple drives, they are displayed as lower case letters after the cylinder number. Refer to the error code table displayed above the numbers for the error type.

* NOTE *

Single drive users should pay close attention to the screen while the cylinder numbers are being displayed because the numbers and the error codes will scroll off the screen after every 10 cylinders have been transferred.

```
 --------------------------------------------------------------------
|         Backup Function underway                                   |
|                                                                    |
| Symbols are:                                                       |
|         Numbers  - Correspond to Track Numbers                     |
|            w     - Correspond to Hard  Write Errors                |
|            r     - Correspond to Hard   Read Errors                |
|            v     - Correspond to Hard Verify Errors                |
|                                                                    |
|                                                                    |
|     0    1    2v   3    4    5    6    7    8    9                  |
|                                                                    |
 --------------------------------------------------------------------
```

Screen 4-18   Backup Utility-Single Drive Error Display

On single drive systems, the DESTINATION diskette is especially marked by the Utility so that if the SOURCE diskette is inserted by mistake, an error message appears.

```
-------------------------------------------------------------------
|                THIS IS NOT THE CORRECT DESTINATION DISK          |
|                                                                  |
|                    Please check the Disk                         |
|                                                                  |
|                                                                  |
|                Load DESTINATION Disk into A:                     |
|                                                                  |
| Press <RETURN> to continue or control C <^C> to exit.            |
-------------------------------------------------------------------
```

Screen 4-19   Backup Utility-Wrong Diskette Prompt

     When the BACKUP is completed, you are asked whether the
BACKUP function is to be repeated using the same drive(s) as
previously specified; the SOURCE and DESTINATION diskettes may
be the same as before or different.

```
-------------------------------------------------------------------
|       30   31   32   33   34   35   36   37   38   39            |
|                                                                  |
|                                                                  |
|         Do you wish to repeat the Backup function?               |
|                                                                  |
|                                                                  |
|                                                                  |
|                                                                  |
| <Y>es, <N>o or <^C> to exit.                                     |
-------------------------------------------------------------------
```

Screen 4-20   Backup Utility-Repeat Prompt

If you want to make another BACKUP, type a **Y** for yes. Press the RETURN key, and you will return to the prompt which reaffirms the selected drive.

```
-------------------------------------------------------------------
|              The Backup will be FROM A: TO A:                    |
|                                                                 |
|                                                                 |
|              Do you wish to proceed with Backup?                |
|                                                                 |
|                                                                 |
|                                                                 |
|                                                                 |
| <Y>es, <N>o or <^C> to exit.                                    |
-------------------------------------------------------------------
```

Screen 4-21   Backup Utility-Confirmation Prompt

Now you may insert new SOURCE and DESTINATION diskettes or use the same SOURCE diskette and a new DESTINATION diskette.

If you do not want to make another backup, type an **N**, and press the RETURN key. The following prompt is displayed:

```
-------------------------------------------------------------------
|              Place SYSTEM disk in A:                             |
|                                                                 |
|                                                                 |
|                                                                 |
|                                                                 |
|                                                                 |
|                                                                 |
| Press <RETURN> to exit to CP/M.                                 |
-------------------------------------------------------------------
```

Screen 4-22   Backup Utility-Exit Prompt

Make sure that you remove your SOURCE or DESTINATION diskette if it is in the A: drive and replace it with a SYSTEM diskette before pressing the RETURN key.

4.3   CONFIG UTILITY

Command Syntax: **CONFIG**

PMC has included this Software Utility with the MicroMate computer to allow for the maximum amount of peripheral flexibility. For normal installations the Utility will be needed only once. Users who change their peripherals often or who move their computer from one work station to another may want to use it more often.

The CONFIG Utility permits modification of the power-on parameters stored on a SYSTEM diskette. Only the A: drive may be used to read the parameters from or write the parameters to the diskette.

The parameters are never changed by doing a COPYSYS; they are merely copied from one diskette to another along with the CP/M Loader and, optionally, CPM3.SYS (refer to the CP/M User's Guide for further information on COPYSYS.)

NEVER change the parameters on your MASTER diskettes, as the individual baud rates of each diskette may be needed to power-on with a another terminal.

The three groups of parameters are: terminal, modem and drive. The terminal and modem groups each consist of the following parameters: Baud Rate, Word length, Stop Bits, Parity, and the state of the DTR and RTS protocol lines. The drive group consists of a single parameter: Drive quantity.

The values of the power-on parameters are used for the above groups of parameters when the computer is first turned on.

When the Utility is first run, an introductory screen appears. It prompts the user to insert the diskette whose parameters are to be read into the A: drive.   Press RETURN.

The parameters are read from the diskette in drive A: and then the main menu, which is divided into two portions, is displayed. The upper portion of the screen displays the current settings of the power-on parameters; the lower portion of the screen offers choices for changing the parameters of the terminal or modem or for changing the quantity of the disk drives attached to the MicroMate.   Other menu options include writing the parameters back to the disk (drive A: only) or exiting from the Utility to CP/M.

See Section 5.2.1 for the default power-on parameter values as shipped from the factory.

```
----------------------------------------------------------------------
Current settings:

Terminal:  9600 Baud, 8 Bit Word, 1 Stop Bits, No Parity, DTR on, RTS off

   Modem:   300 Baud, 8 Bit Word, 1 Stop Bits, No Parity, DTR on, RTS off

Drive Qty.:  1



Set power-on parameters for:

    <T>erminal
    <M>odem
    <D>isk Drive Quantity
or
    <W>rite new parameters to drive A
    <E>xit to CP/M

Enter your choice    ?
----------------------------------------------------------------------
```

Screen 4-23   Config Utility-Main Menu

4.3.1   TERMINAL & MODEM GROUP

In order for the terminal or modem to "talk" to the computer, the baud rate, word length, stop bits, and parity must be exactly the same for each device. If the terminal parameters do not match those of the MicroMate, the terminal will display "garbage" (sequences of characters and symbols that make no sense) or, because the MicroMate can not understand the data being entered, it may display nothing at all.

If you are unable to determine the values that your terminal uses for Word Length, Stop Bits, Parity, DTR and RTS, it is best to leave them at the factory settings. Many terminals, modems and printers work at these settings.

The DTR (Data Terminal Ready) and RTS (Request To Send) protocol lines are signal lines that the terminal/modem and computer often use to tell each other when to send data and when to receive data. Generally these lines are only needed at very high baud rates. If not used for Protocol then the state of these lines is normally set to High (Logical 1).

Typing a **T** or an **M** (for Terminal or Modem) followed by pressing the RETURN key causes the screen to display a table of the different baud rates that the operating system can support. Type the letter found in the left column that corresponds to the baud rate desired.   Press RETURN.

```
------------------------------------------------------------------------
    |   <A>       50
    |   <B>       75
    |   <C>      110
    |   <D>      134.5
    |   <E>      150
    |   <F>      300
    |   <G>      600
    |   <H>     1200
    |   <I>     1800
    |   <J>     2400
    |   <K>     3600
    |   <L>     4800
    |   <M>     7200
    |   <N>     9600
    |   <O>   19,200
    |
    |   Your Choice ?
------------------------------------------------------------------------
```

Screen 4-24   Config Utility-Possible Baud Rates

The next screen permits changing the control bits. Unless you are sure of the settings of ALL the control bits, answer by typing an **N**. After pressing RETURN, the Main Menu reappears; the new baud rate chosen will now be displayed in the current settings table for the device first selected.

```
------------------------------------------------------------------------
    |            Do you wish to change the Control Bits?
    |
    |   Control bits are:
    |                       Word Length
    |                        Stop Bits
    |                         Parity
    |                     Request To Send
    |                    Data Terminal Ready
    |
    |                     <Y>es  or  <N>o
------------------------------------------------------------------------
```

Screen 4-25   Config Utility-Control Bits Prompt

Should a **Y** be typed and the RETURN key pressed at the "control bits" menu, the prompt will request the word length. The possible values are displayed on the screen. Enter the selected number and press RETURN. The normal setting is 8.

```
_____
|                                                                 |
|                                                                 |
|                                                                 |
|                                                                 |
|    Word Length  <8>, <7>, <6> or <5>  ?                         |
|_____|
```

Screen 4-26 Config Utility-Word Length Prompt

The next prompt asks for the number of stop bits; the choices are displayed on the screen. Again, choose a number, enter your selection, and press RETURN. The normal setting is 1.

```
_____
|                                                                 |
|                                                                 |
|                                                                 |
|    Word Length  <8>, <7>, <6> or <5>  ?                         |
|    Stop Bits <1>  or <2>  ?                                      |
|_____|
```

Screen 4-27 Config Utility-Stop Bits Prompt

Now the prompt on the screen asks whether parity is to be enabled or disabled. The normal setting is <D>isable. Type a **D** and press RETURN. Should you want Parity enabled, type **E** instead of **D**.

```
_____
|                                                                 |
|                                                                 |
|    Word Length  <8>, <7>, <6> or <5>  ?                         |
|    Stop Bits <1>  or <2>  ?                                      |
|    <E>nable or <D>isable Parity ?                               |
|_____|
```

Screen 4-28 Config Utility-Parity Prompt

If **E** is your response, the prompt asks you if parity is to be <E>ven or <O>dd. Type **E** or **O** followed by RETURN.

```
----------------------------------------------------------------
|                                                              |
|   Word Length  <8>, <7>, <6> or <5>  ?                       |
|   Stop Bits <1>  or <2>  ?                                   |
|   <E>nable or <D>isable Parity ?                             |
|   <E>ven  or  <O>dd parity ?                                 |
----------------------------------------------------------------
```

Screen 4-29 Config Utility-Even/Odd Prompt

If a **D** is entered, the question about Even and Odd is not presented.

The last two prompts question whether DTR and RTS are to be On (High) or Off (Low). Answer with the number that corresponds to the state desired. Press RETURN. The main menu reappears after answering all the prompts; the selected new settings are displayed at the top of the screen under the heading, Current Settings.

```
----------------------------------------------------------------
|                                                              |
|   Word Length  <8>, <7>, <6> or <5>  ?                       |
|   Stop Bits <1>  or <2>  ?                                   |
|   <E>nable or <D>isable Parity ?                             |
|   DTR  <0>=off   or   <1>=on ?                               |
----------------------------------------------------------------
```

Screen 4-30 Config Utility-DTR Prompt


```
----------------------------------------------------------------
|   Word Length  <8>, <7>, <6> or <5>  ?                       |
|   Stop Bits <1>  or <2>  ?                                   |
|   <E>nable or <D>isable Parity ?                             |
|   DTR  <0>=off   or   <1>=on ?                               |
|   RTS  <0>=off   or   <1>=on ?                               |
----------------------------------------------------------------
```

Screen 4-31 Config Utility-RTS Prompt

4.3.2   DRIVE GROUP

The single parameter drive quantity, used by the operating system, determines the number of disk drives attached to the MicroMate computer. Changing this parameter is necessary whenever disk drives are added to or subtracted from the MicroMate system; otherwise, the operating system may "hang" if it tries to access a non-existent drive. When setting this parameter, ALWAYS include the built-in drive in your count. The minimum value is 1; the maximum value is **4**.

From the Main Menu choose <D>rive Quantity, type a **D**, and then press the RETURN key. The Drive Quantity Menu appears. The choices are 1-4. Type the number of drives desired; be sure, however, to add the built-in drive A: as number 1.

```
-----------------------------------------------------------------------
|                    Disk Drive Quantity Selection                    |
|                                                                     |
|                                                                     |
| Enter Quantity of Disk Drives available for system use.             |
|                                                                     |
|                   Include built in drive.                           |
|                                                                     |
|      Minimum value is <1>     Maximum value is <4>                   |
|                                                                     |
|                      Quantity?                                      |
-----------------------------------------------------------------------
```

Screen 4-32 Config Utility-Drive Quantity Prompt

4.3.3   OTHER MENU OPTIONS

In order to save these new settings onto the diskette, **the <W>rite option MUST be used.** Type a **W** and press RETURN to write the new parameters to the diskette. DO NOT type an **E** to <E>xit from the CONFIG Utility before writing the new settings, unless you want to abort.

Even if the new parameters are written back onto the diskette before discovering an error, it is possible to return, correct the parameter settings, and rewrite the parameters onto the diskette again.

The new parameters will not take effect until: 1) they are written to the diskette, and 2) the front panel reset button is pressed. So, if an incorrect value is inadvertently entered, written to disk and the Utility exited, you can rerun the Utility to correct the parameter setting, providing the RESET button has not been pressed.
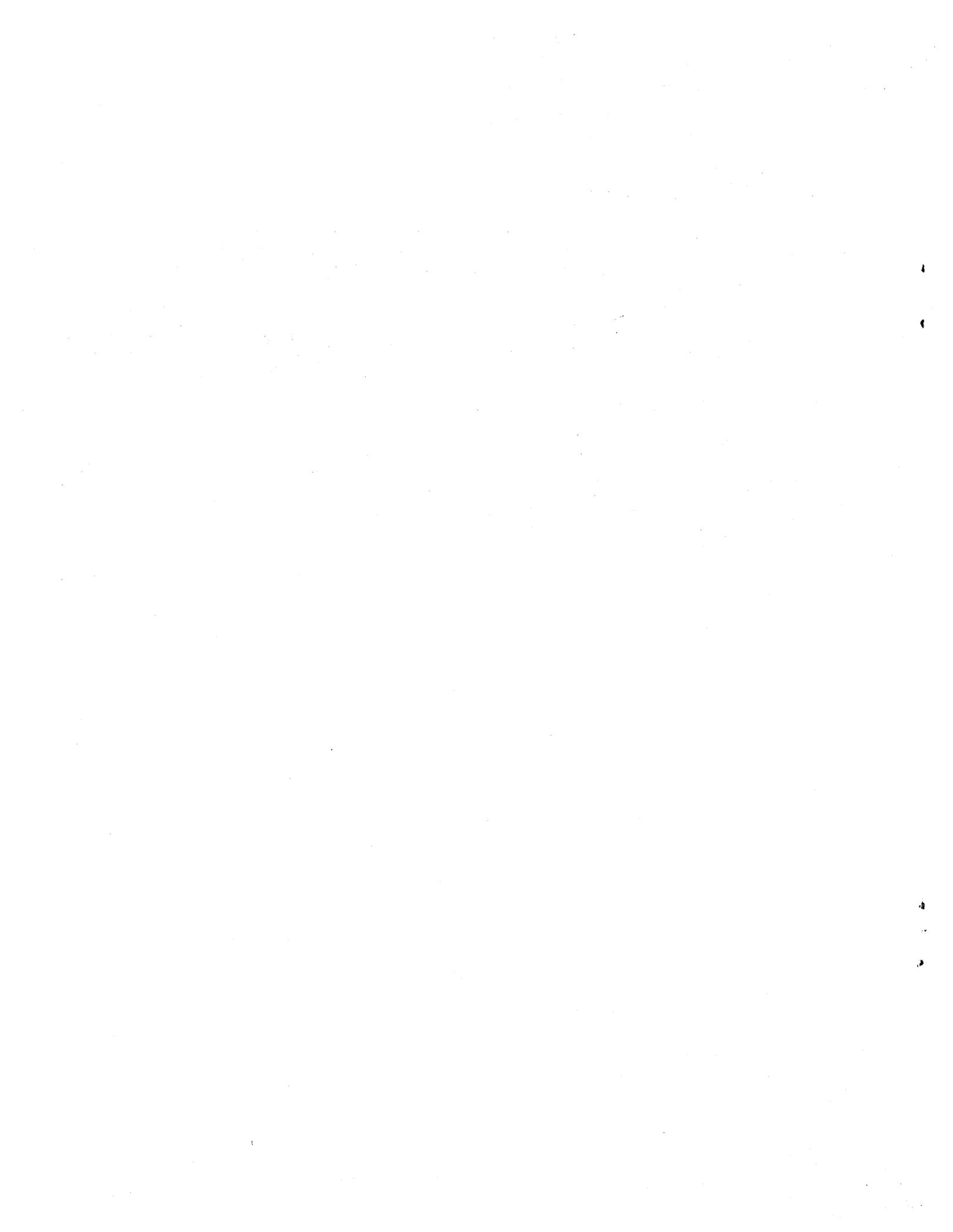
4.4   CONVERT UTILITY

Command Syntax: **CONVERT**

Unfortunately there is no standard method used to store information on a 5 1/4 inch diskette. Some computer manufacturers use Single Sided, Single Density (SSSD), while others use Single Sided, Double Density (SSDD), Double Sided, Single Density (DSSD), or Double Sided, Double Density (DSDD) 5 1/4 inch diskette storage techniques.

PMC includes a CONVERT Utility that will permit users to "emulate" several of the different storage techniques that other manufacturers use.

Any on-line drive may be converted to a different type. Once a drive is converted, you may read and write to the other diskette type; however, the diskette must have been previously formatted by the machine whose type is being emulated. The MicroMate's FORMAT Utility is not capable of formatting any TYPEs other than PMC-101 TYPE A and B.

The popular brand name TYPEs that can be converted are found on the emulation TYPE screen. The actual conversion of the drive occurs after the TYPE selection has been entered and remains effective until you press the RESET button or until you perform a new drive conversion on the same drive.

4.4.1   NORMAL OPERATION

The first screen displayed, after you type CONVERT, provides a brief introduction. Press the Return key to continue. The next screen to appear is the drive selection display that presents the drive letters available for conversion.

```
-----------------------------------------------------------------------
Enter the letter of the Drive to be used.

 do not enter the <> brackets.



        Type <^C> to abort

Your choice if <A>, .......
-----------------------------------------------------------------------
```

Screen 4-33 Convert Utility-Drive Prompt

If you press the RETURN key without entering a drive
letter, the Utility aborts! Once the proper drive is selected,
the Emulation TYPE Screen appears. The "current setting" is
listed on the screen first and is followed by the list of
possible emulations. Select the desired emulation TYPE to finish
the conversion process.

```
-------------------------------------------------------------------
|Drive A is currently set to Type A
|
|TYPE  COMPUTER      SIDES DENSITY       TYPE  COMPUTER       SIDES DENSITY
| <A>  PMC-101         2   Double         <N>  MicroDecision  1    Double
| <B>  PMC-101         2   Double         <O>  MicroDecision  2    Double
| <C>  Omikron         1   Single




                                    <Z>

|Select NEW Type for drive A to emulate, <A> thru <Z> or <^C> to abort:
-------------------------------------------------------------------
```

Screen 4-34 Convert Utility-Emulation TYPE Selection

Once the selection has been made, a confirming prompt is
displayed on the screen.

```
-------------------------------------------------------------------
|                                                                 |
|                                                                 |
|                                                                 |
|                                                                 |
|       Drive A is now set to Type A                              |
|                                                                 |
|A>_                                                              |
-------------------------------------------------------------------
```

Screen 4-35 Convert Utility-Conversion Confirmation

If you abort the Utility or enter a non-existent TYPE letter, a different prompt is displayed, which indicates that no changes were made.

```
--------------------------------------------------------------------
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
|      Utility aborted, NOTHING done.                                |
|                                                                    |
|A>_                                                                 |
--------------------------------------------------------------------
```

Screen 4-36 Convert Utility-Cancellation Confirmation

4.4.2   ADVANCED OPERATION

The advanced command form requires that the user know which drive is to be converted to which type. No prompts will be displayed except for a prompt confirming that the conversion has taken place.

Command Syntax: **CONVERT**,drive,type

```
--------------------------------------------------------------------
|                                                                    |
|A>CONVERT,C,B                                                       |
|                                                                    |
|                                                                    |
|      Drive C is now set to Type B                                  |
|                                                                    |
|A>_                                                                 |
--------------------------------------------------------------------
```

Screen 4-37 Convert Utility-Conversion Confirmation, Advanced

     If the drive specified is an invalid drive or the TYPE
letter is out of range, normal prompts are displayed at the point
of error and you are prompted to enter a valid response.   If the
TYPE letter is not valid the Utility aborts.

```
 _____
|                                                                      |
|                                                                      |
|                                                                      |
|                                                                      |
|                                                                      |
|      Utility aborted, NOTHING done.                                  |
|                                                                      |
|A>_                                                                   |
 _____
```

Screen 4-38   Convert Utility-Cancellation Confirmation, Advanced

                            * NOTE *

     PMC has tried all of the emulations and found them all
     capable of reading and writing to the emulated diskette.
     The emulation types, however, are subject to change by
     each individual manufacturer; therefore, PMC cannot
     guarantee the operation of this Utility.

4.5   SYSTEST

Command Syntax: **SYSTEST**

Before this Software Utility can be used, a special SYSTEST diskette must be made. Use the BACKUP Utility to copy a SYSTEM diskette.   Label the copy diskette SYSTEM TEST.   From this diskette, erase the two files HELP.COM and HELP.HLP to obtain needed working room. Using ED (see CP/M User's Guide), create a file called PROFILE.SUB that contains the single word SYSTEST, followed by a carriage return, and a line feed.

To test the integrity of the hardware, disconnect the terminal end of the RS-232 cable from the terminal and plug it into the connector labelled "MODEM" on the rear panel of the MicroMate. If this step is skipped, all tests except for the DART test, will be performed.

Insert the special SYSTEM TEST diskette into the A: drive and press the reset button. This initiates a continuously running loop that will keep the drive activity light blinking until an error occurs.

The disk drive, serial ports, all 128K bytes of memory, and all major IC chips are tested.

If a parallel printer is attached, the name of each segment of the test, as it begins, is printed. The tests function as normal even if no printer is attached; however, it is difficult to tell which test, if any, fails. There are four tests: Disk, Seek, Dart, and RAM.

Disk test: checks the read/write capabilities of the drive.
Seek test: checks the stepping capability of the drive.
Dart test: checks the operation of the serial ports.
 RAM test: test all 128K bytes of memory.

This is not a diagnostics test, but a functionality test. If an error occurs during any test, an error message is printed out next to the identified test.

For complete details on the error messages, see Appendix B.

DEVIATIONS FROM CP/M PLUS DOCUMENTATION

5.1   DOCUMENTATION

CP/M User's Guide	MicroMate User's Guide
1.1	Read Section 2 instead.
1.4	BACKUP is a faster and easier method. See Section 4.2.
3.3.1	Ignore non-banked sections.
3.5	The DEVICE command and Logical devices are supported. See Section 5.2.
5.COPYSYS	COPYSYS can only be used with TYPE A drives.
5.DEVICE	See Section 5.2 for physical devices. See Section 5.5 regarding Protocols.

CP/M Programmer's Guide	MicroMate User's Guide
	Ignore non-banked sections.
1.1	See Section 6.1 for memory maps.
1.5	The CCP is stored on the system cylinder. See Section 6.4.
1.6.1	See Section 6.5 for Cold Start Operation.

* NOTE *

INFORMATION CONTAINED IN THE PROGRAMMERS GUIDE IS CONSIDERED TECHNICAL INFORMATION AND IS INTENDED FOR THE ADVANCED USER.

CP/M	MicroMate
System Guide	User's Guide
	Ignore non-banked sections.
1.5	See Section 6.1 for memory maps.
1.9	The MicroMate uses a ROM loader. Refer to Section 6.5.
2.5	MULTIO is not implemented.
2.6	XMOVE is implemented.
2:7	Clock is supported. See Section 5.4.
3.4	FLUSH is not implemented.
4.1	Refer to Section 5.3 for file name differences.
4.7.3	TYPE is used. See Section 6.3.
5.1	Type the GENCPM.DAT file for default values.
5.2	The CCP is stored on the system cylinder. See Section 6.4
Apndx.A	Media flag not implemented.
Apndx.B	Ignore.
Apndx.E-J	Ignore (See the source code files)

* NOTE *

INFORMATION CONTAINED IN THE SYSTEM GUIDE IS CONSIDERED
TECHNICAL INFORMATION AND IS INTENDED FOR THE ADVANCED
USER.

5.2   DEVICES

Under CP/M 3.0, Logical devices are implemented for the following physical devices;

TERMNL -Serial communication   to a terminal (TERMINAL connector)
MODEM   -Serial communication   to a modem   (MODEM   connector)
CENTRN -Parallel communication to a printer (PRINTER connector)

5.2.1   DEFAULT POWER-ON PARAMETERS

	Baud Rate	Word Length	Stop Bits	Parity	DTR	RTS
SYSTEM MASTER diskette						
Terminal	9600	8	1	Disabled	On	On
Modem	300	8	1	Disabled	On	On
Drive Qty. 1						
SOURCE MASTER diskette						
Terminal	300	8	1	Disabled	On	On
Modem	300	8	1	Disabled	On	On
Drive Qty. 1						
T/MAKER diskette						
Terminal	110	8	1	Disabled	On	On
Modem	300	8	1	Disabled	On	On
Drive Qty. 1						
QUME QVT-102 Terminal						
Terminal	9600	8	1	Disabled	On	On
Modem	9600	8	1	Disabled	On	On
Drive Qty. 1						

5.3   FILE NAME DIFFERENCES

                 BIOSKRNL.ASM   integrated into BIOS3.ASM
                 CHARIO.ASM   integrated into BIOS3.ASM
                 MOVE.ASM   integrated into BIOS3.ASM
                 BOOT.ASM   integrated into BIOS3.ASM
                 DRVTBL.ASM   integrated into BIOS3.ASM
                 FD1797SD.ASM   DISKIO.ASM
                 PORTS.LIB   PORTS.LIB
                 MODEBAUD.LIB   MODEBAUD.LIB
                 CPM3.LIB   CPM3.LIB
                                                 PMCEQU.LIB
                                                 LDRBIOS.ASM

5.4   REAL TIME CLOCK

        The Real Time Clock is implemented using the Zilog CTC chip
and is interrupt driven.   Therefore, operations involving
considerable disk accesses cause the clock to lose time.

        If the front panel RESET button is pressed or the MicroMate
system is powered-off, the Real Time Clock is reset to 00:00:00.
The DATE SET command (see the CP/M User's Guide) must be used to
set the time again and start the clock running.

5.5   PROTOCOLS

XON/XOFF protocol is supported and can easily be turned ON or OFF by using the DEVICE Utility (see your CP/M User's guide.)

The Bios can support DTR and/or RTS protocol. Neither protocol is implemented at the time of shipment. The protocols cannot be implemented via any Utility. In order to implement one, the other or both, a single word must be changed in the MicroMate equate file and the Bios reassembled.

On the SOURCE diskette at the top of the PMCEQU.LIB file are two equates:

```
DTR   equ   false
RTS   equ   false
```

Using ED (see CP/M User's Guide) change the word "false" to "true" for the protocol(s) you wish to implement.

e.g.: to implement DTR protocol only, the two equate lines should read:

```
DTR   equ   true
RTS   equ   false
```

Save the new PMCEQU.LIB back to disk and exit ED.

The new Bios must now be reassembled. To make life simple, PMC has provided a submit file to do this. At the A> prompt type **SUBMIT BIOS** and then press RETURN. The submit file will reassemble the Bios and link it to the operating system files to create a file called CPM3.SYS. Before the new protocol(s) can take effect the system must be booted from the diskette that contains this new version of CPM3.SYS. Make sure you run COPYSYS (see CP/M User's Guide) to transfer the Boot Loader to the boot cylinder.

Once implemented, the only way to disable the protocol(s) is to change the equate(s) back to false and reassemble the Bios OR re-boot the system using a diskette that has a non DTR and/or RTS protocol version of CPM3.SYS.

If you implement one or both of the protocols, it is advisable to mark the diskette containing the new version of CPM3.SYS. This is the ONLY way to know whether or not this version of the Bios supports the protocol(s).

TECHNICAL REFERENCE

6.1   BANK SWITCHING

Bank switching is done by the operating system and is
transparent to the users' programs. Individual programs **MAY NOT**
perform bank switching, as all banked memory is currently managed
by CP/M PLUS.

The bank switching operation uses a "WINDOW" located between
4000H and BFFFH. This means that the other banks are switched
into and out of this memory space.

The physical location of each logical bank is listed below:

NAME	ADDRESS	LOCATION
Logical Bank 0	4000H-BFFFH	First 64K of memory
Logical Bank 1	0000H-7FFFH	Second 64K of memory
Logical Bank 2	8000H-FFFFH	Second 64K of memory

To select Logical Bank 0: Reset all bits of the bank select port.

To select Logical Bank 1: Set bit 7 of the bank select port; bits
                          0,2,3,4,5,6 may be set or reset.

To select Logical Bank 2: Set bits 1 and 7 of the bank select
                          port; bits 0,2,3,4,5,6, may be set or
                          reset.

* NOTE *

Notice that the CCP is stored in Logical Bank 3; this
corresponds to physical Bank 2 with the zero bit set.
Also, notice that bank numbers 7 and 3 are used for
input to the GENCPM program. This is because we have
found that GENCPM will not allocate the proper buffers
if even bank numbers are used with our particular memory
setup. Therefore, Bank numbers 3 and 7 are used, but
they only set Bank 2 because the other bits are ignored.
DRI has been made aware of this situation.

MEMORY MAPS


```
Physical                                        Logical
Address                                         Address
FFFFh   +-----------------------------+ FFFFh
        |          Resident BIOS       | FB00h
        |          Resident BDOS       | F500h
        |                              |
        |      _____|
        |                              |
        |                              |
        |                              |
        +-----------------------------+ C000h  ----------------------
        |          Banked BIOS         |
        |------------------------------| B500h
        |                              |
        |          Banked BDOS         |
        |                              |
        |                              |
        |------------------------------| 8800h
        |                              |                    Bank 0
        |    Hashed Directory Tables   |
        |                              |
        |                              |
        |     LRU Directory Buffers    |
        |                              |
        |                              |
        +-----------------------------+ 4000h  ----------------------
        |                              |
        |                              |
        |                              |
        |                              |
        |                              |
        |                              |
        |                              |
0000h   +-----------------------------+ 0000h
```

Figure 6-1   Memory Map-First 64K

```
Physical                                      Logical
Address                                       Address
1FFFFh   +--------------------------+  C000h ----------------------

                Hashed Directory Tables


                LRU Data Buffers

                --------------------------    8D00h
                                                            Bank 2
                Copy of CCP f/Warm start
                                              8000h

                Hashed Directory Tables


                LRU Data Buffers



18000h   +--------------------------+  4000h ----------------------


17FFFh   +--------------------------+  C000h ----------------------









                        TPA                                 Bank 1








10000h   +--------------------------+  4000h ----------------------
```

Figure 6-2   Memory Map-Second 64K

6.2   TYPE A DISKETTES

6.2.1   PHYSICAL SPECIFICATIONS: TYPE A PMC-101 DISKETTE

```
Formatted capacity:         400K
Sides:                         2
Cylinders per disk:           40
Tracks per side:              40
Sectors per cylinder:         10
Sectors per track:             5
Bytes per sector:           1024
Sector skew factor:            0
Sector translation table:      1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Directory entries:           128
Reserved tracks:               1
Block size:                 2048
```

6.2.2   DPB: TYPE A PMC-101 DISKETTE

```
dpbl:
        dw      80      ; SPT    128 BYTE RECORDS PER TRACK
        db       4      ; BSH    BLOCK SHIFT
        db      15      ; BLM    BLOCK MASK
        db       1      ; EXM    EXTENT MASK
        dw     194      ; DSM    MAX BLOCK QUANTITY-1
        dw     127      ; DRM    MAX DIR ENTRIES-1
        db     192      ; AL0    ALLOCATION VECTOR LSB
        db       0      ; AL1                         MSB
        dw      32      ; CKS    CHECKSUM VECTOR
        dw       1      ; OFF    TRACKS OFFSET
        db       3      ; PSH    PHYSICAL SECTOR SIZE SHIFT
        db       7      ; PHM    PHYSICAL SECTOR SIZE SHIFT
        db      'A'     ; TYP    PMC extension
```

6.2.3   FORMATTING INFORMATION: TYPE A PMC-101 DISKETTE

Name	Byte	Qty.	
Gap 5	4E	80	
	00	12	
C2	F6	3	
Idx Adr Mrk	FC	1	
Gap 1	4E	50	

repeat this block 5 times per track.

Name	Byte	Qty.	
	00	12	
Al	F5	3	
Data Adr Mrk	FE	1	
Track	?	1	(range 0-39)
Head	?	1	(range 0-1)
Sector	?	1	(range 1-5)
Sector Len	3	1	
CRC	F7	1	(generates 2 bytes)
Gap 2	4E	22	
	00	12	
Al	F5	3	
Data Adr Mrk	FB	1	
Data	E5	1024	
CRC	F7	1	(generates 2 bytes)
Gap 3	4E	85	

Name	Byte	Qty.
Gap 4	4E	250

6.3   TYPE BYTE

This 8 bit coded byte is used by f$read & f$write to
determine the Density, Sides and Head Switching technique of the
drive currently selected. Each physical drive must have a type
byte. The CONVERT Utility changes this byte along with the DPB
and Translation table to emulate other Drive types. MicroMate
TYPE A type byte is 00H which means:

                              DsDd
                              Head Switch on sector count
                              Switch on sector number 6

6.3.1   "TYPE" byte used in DPH

Bit Number

```
7 6 5 4 $ 3 2 1 0
| | | |     | | | |
| | | |     | | ? ?
| | | |     | | +=+- 00=DsDd  01=DsSd  10=SsDd  11=SsSd  Type
| | | |     | |
| | | |     ? ? x x
| | | |     +=+---- 00= Switch on Sector,    01=Switch on Track
| | | |             10= Switch on Even/Odd,  11=Switch on Odd/Even
| | | |
? ? ? ?     0 0 0 x
+=+=+=+---------- 0000=Sct 6 - 1111=Sct 21  (If Sector switching)
| | |
| | ? ?     0 1 0 x
| | +=+--------- 00=Switch on Track 34,   01=36,     (If Track
| |             10=Switch on Track 41,   11=81        Switching)
| |
| ? x x     0 1 0 x
| +------------- 0=Side 0 first, 1=Side 1 first
|
? x x x     0 1 0 x
+-------------- Spare
```

(?=value in question; x=can be either 0 or 1; @=unknown value)

                Figure 6-3 TYPE Byte-Bit Designations

6.3.2   SAMPLE Disk Parameter Header

```
xdph@                                   ;*Extended DPH*
        dw         f$write              ;           Pointer to Write routine
        dw         f$read               ;           Pointer to Read  routine
        dw         f$login              ;           Pointer to Login routine
        dw         f$init               ;           Pointer to Init  routine
        db         @                    ;   UNIT    Actual drive select code
        db         ?                    ;   TYPE    Drive type
dph@                                    ;*DPH*
        dw         Trans@               ;   XLT     Translation table
        db 0,0,0,0,0,0,0,0,0            ;   -0-     BDOS scratch area
        db         0                    ;   MF      Media Flag
        dw         dpb@                 ;   DPB     Disk Parameter Block
        dw         ck@                  ;   CSV     Checksum Vector
        dw         al@                  ;   ALV     Allocation Vector
        dw         0FFFEh               ;   DIRBCB  Directory BCB Vector
        dw         0FFFEh               ;   DTABCB  Data BCB Vector
        dw         0FFFEh               ;   HASH    Hash Table Vector
        db         0                    ;   HBANK   Hash Bank
```

6.3.3   "TYP" byte used in DPB

This byte is only used by the CONVERT Utility to display the current TYPE setting of the selected drive. The byte stored here must be in ASCII. The value range is 'A' thru 'Z'.

6.3.4   SAMPLE Disk Parameter Block

```
dpb@:
        dw         @@@@     ; SPT     128 BYTE RECORDS PER TRACK
        db         @@       ; BSH     BLOCK SHIFT
        db         @@       ; BLM     BLOCK MASK
        db         @@       ; EXM     EXTENT MASK
        dw         @@@@     ; DSM     MAX BLOCK QUANTITY-1
        dw         @@@@     ; DRM     MAX DIR ENTRIES-1
        db         @@       ; AL0     ALLOCATION VECTOR LSB
        db         @@       ; AL1                             MSB
        dw         DRM+1/4  ; CKS     CHECKSUM VECTOR
        dw         @@@@     ; OFF     TRACKS OFFSET
        db         @@       ; PSH     PHYSICAL SECTOR SIZE SHIFT
        db         @@       ; PHM     PHYSICAL SECTOR SIZE SHIFT
        db         '?'      ; TYP     PMC extension
```

6.4   BOOT CYLINDER

The physical layout of data on the boot cylinder is shown below:

Cylinder 0:

			Physical Sector #	Segment Length	
Track 0	Side 0	Sector 1	1	128bytes	Disk Load info
			1	128bytes	Serial Init info
			1	768bytes	empty
			2	1024bytes	CPMLDR(Max length
			3	1024bytes	CPMLDR 800h)
			4	1024bytes	empty
			5	1024bytes	empty
Track 0	Side 1	Sector 1	1	1024bytes	CCP.COM(Max Length
			2	1024bytes	CCP.COM E00h)
			3	1024bytes	CCP.COM
			4	1024bytes	CCP.COM
			5	1024bytes	empty

6.4.1   TRACK 0, SECTOR 1 - DISK LOAD INFORMATION SEGMENT

All values are in HEX

BYTE#
00   Exec Bank   Execution will begin in this Bank
01   Exec adr LSB   Execution will begin at this address
02   MSB

          Load #1
03   BANK   00=bnk0, 80=bnk1, 82=bnk2, FF=no more
04   Load adr LSB   Loading will begin at this address
05   MSB
06   Side select   00=side 0, 02=side 1
07   Trk   Track number to load from
08   Sct   Starting Sector number to load
09   Qty   Quantity of physical sectors to load

          Load #2
0A   BANK   00=bnk0, 80=bnk1, 82=bnk2, FF=no more
0B   Load adr LSB   Loading will begin at this address
0C   MSB
0D   Side select   00=side 0, 02=side 1
0E   Trk   Track number to load from
0F   Sct   Starting Sector number to load
10   Qty   Quantity of physical sectors to load

          Load #3
11   BANK   00=bnk0, 80=bnk1, 82=bnk2, FF=no more
12   Load adr LSB   Loading will begin at this address
13   MSB
14   Side select   00=side 0, 02=side 1
15   Trk   Track number to load from
16   Sct   Starting Sector number to load
17   Qty   Quantity of physical sectors to load

          Load #4
18   BANK   00=bnk0, 80=bnk1, 82=bnk2, FF=no more
19   Load adr LSB   Loading will begin at this address
1A   MSB
1B   Side select   00=side 0, 02=side 1
1C   Trk   Track number to load from
1D   Sct   Starting Sector number to load
1E   Qty   Quantity of physical sectors to load

etc.
etc.
     1 entire 128 byte segment is reserved for load information

6.4.2   TRACK 0, SECTOR 1 - SERIAL INITIALIZATION SEGMENT

All values are in HEX

BYTE#
+80   Power-on baud rate byte. High Nibble is A channel, Low
           nibble is B channel. Default = E6H.

+81   Quantity of Disk Drives attached to system (include built
           in drive). Default = 01H.

+90   Serial channel A (TERMINAL) initialization data.
           Contains register number followed by the data byte for
           Registers 00,01,03,04,05 ONLY. Default = 00H, 18H, 01H,
           00H, 03H, C0H, 04H, 44H, 05H, EAH.

+A0   Serial channel B (MODEM) initialization data. Contains
           register number followed by the data byte for registers
           00,01,02,03,04,05. Default = 00H, 18H, 01H, 00H, 02H,
           70H, 03H, C0H, 04H, 44H, 05H, EAH.

+B0 through +FF is not used.

6.5   BOOT SEQUENCE

6.5.1   ROM

At power-on the Phantom ROM begins execution at Address 0000H.

The ROM first Disables Interrupts and then loads in Sector 1, Track 0, Side 0. The information transferred from this sector is essential to the system setup as it contains the power-on parameters for booting the operating system. The information is used as follows:

1) Set the baud rates of both serial channels.
2) Initialize the DART.
2) The drive quantity is stored in the I register.
3) Determine the bank, load address, side, track
    starting sector number, and sector quantity for
    the first load procedure.
4) Load the segment as specified.
5) Determine if any more load segments are specified.
    If so, go back to step 4 until all segments are
    loaded into memory.
6) Determine the execution address and bank. Disable
    interrupts, phantom out the ROM and pass control
    to the execution address.

The first segment that is loaded contains the CPMLDR and it is placed in bank 0 at location 3000H. The second segment contains the CCP and is loaded into bank 2 at location 8000H. Execution begins at location 3000H in Bank 0.

6.5.2   CPMLDR

The minimal Bios portion of the CPMLDR contains only the disk read routine READ:, and the CONOUT: routine. The CPM3.SYS file is loaded into the appropriate banks of memory before control is passed to the Bios BOOT: routine.

6.5.3   BIOS BOOT

The Bios BOOT: routine resides in the space used by the ALL and CKS vectors and will be overlayed when the first Disk I/O occurs. The following functions are performed:

1)   Retrieve the Drive Quantity byte from I register
2)   Adjust Drive table to match drive quantities
3)   Retrieve the baud rate entries from BRG
4)   Set baud rates in CTBL
5)   Set CON:=TERMNL
6)   Set AUX:=MODEM
7)   Set LST:=CENTRN
8)   Load I register with MSB of the Interrupt Vector Table
9)   Reset CTC channels
10) Send LSB of the IVT to the CTC
11) Set interrupt mode to IM2
12) Print Sign On message
13) Set BIOS and BDOS entry points in page 0
14) Copy CCP from bank 2 to TPA in bank 1
15) Pass control to the CCP

TERMINAL CABLE

Standard RS-232 Terminal Cable.

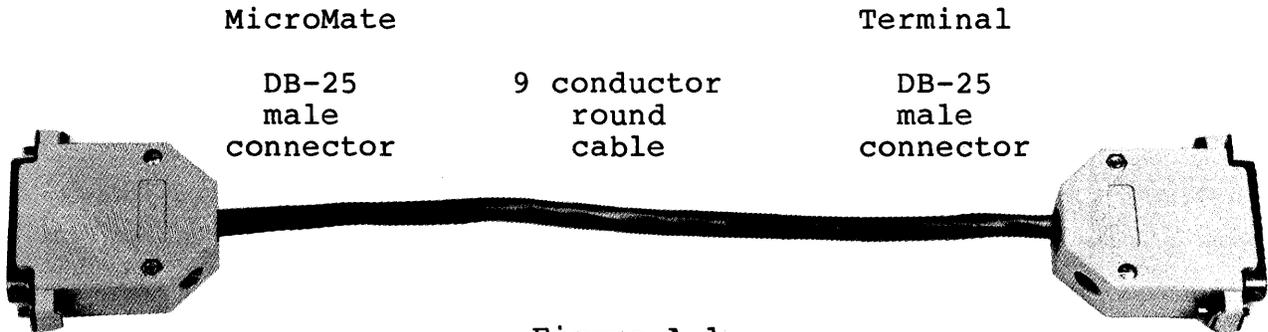   MicroMate   Terminal

          DB-25   9 conductor   DB-25
          male   round   male
          connector   cable   connector

Figure A-1

Signal Name	Pin #		Pin #	Signal Name	Signal Direction
Ground	1	———	1	Ground	
Rx data	2	———	2	Tx data	<--
Tx data	3	———	3	Rx data	-->
CTS	4	———	4	RTS	<--
RTS	5	———	5	CTS	-->
DTR	6	———	6	DSR	-->
Ground	7	———	7	Ground	
DCD	8	———	8	DCD	-->
DSR	20	———	20	DTR	<--

MODEM CABLE

Standard RS-232 Modem Cable.

MicroMate   Modem

          DB-25   9 conductor   DB-25
          male   round   male
          connector   cable   connector

Figure A-2

Signal Name	Pin #		Pin #	Signal Name	Signal Direction
Ground	1	-----------------------------------	1	Ground	
Tx data	2	-----------------------------------	2	Tx data	-->
Rx data	3	-----------------------------------	3	Rx data	<--
RTS	4	-----------------------------------	4	RTS	-->
CTS	5	-----------------------------------	5	CTS	<--
DSR	6	-----------------------------------	6	DSR	<--
Ground	7	-----------------------------------	7	GROUND	
DCD	8	-----------------------------------	8	DCD	<--
DTR	20	-----------------------------------	20	DTR	-->

SERIAL PRINTER CABLE

"flipped" or "Null-Modem" RS-232 printer cable.

           MicroMate   Printer

              DB-25   9 conductor   DB-25
              male   round   male
           connector   cable   connector
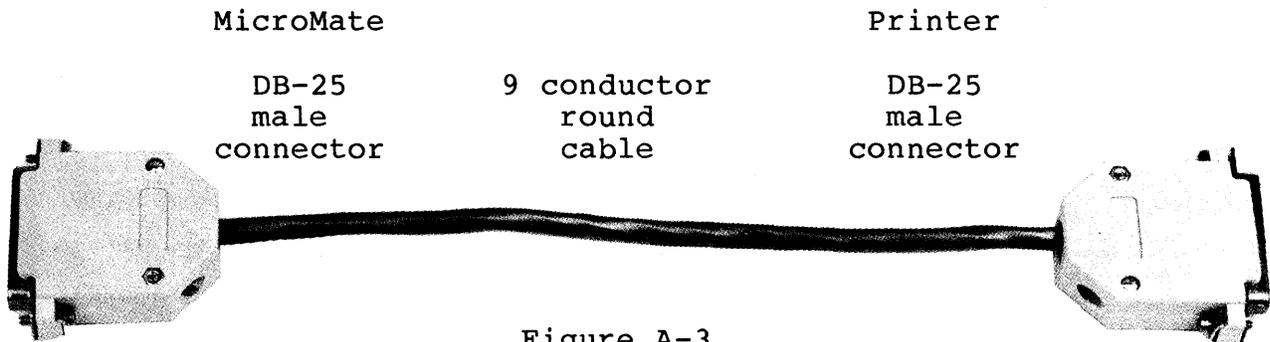
Figure A-3

Signal Name	Pin #		Pin #	Signal Name	Signal Direction
Ground	1	-----------------------------------	1	Ground	
Tx data	2	-----------------------------------	3	Rx data	-->
Rx data	3	-----------------------------------	2	Tx data	<--
RTS	4	-----------------------------------	5	CTS	-->
CTS	5	-----------------------------------	4	RTS	<--
DSR	6	-----------------------------------	20	DTR	<--
Ground	7	-----------------------------------	7	Ground	
DCD	8	no connection			
DTR	20	-----------------------------------	6	DSR	-->

STANDARD DB-25 CONNECTOR

male connector
viewing "pin" end (not "cable" end)

Pin#   Pin#

14
15
16
17
18
19
20
21
22
23
24
25

1
2
3
4
5
6
7
8
9
10
11
12
13

Figure A-4

PARALLEL PRINTER CABLE

| 34 Pin edge connector | 34 conductor flat cable | Centronics D connector |
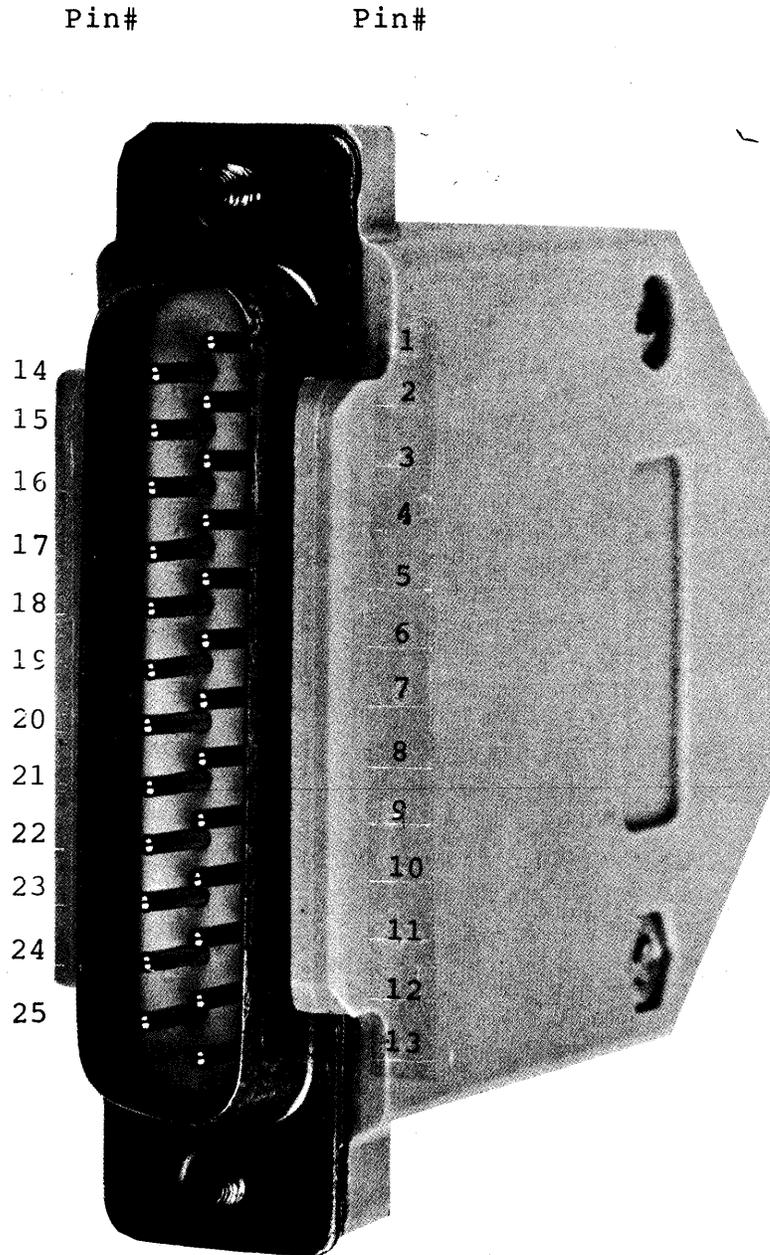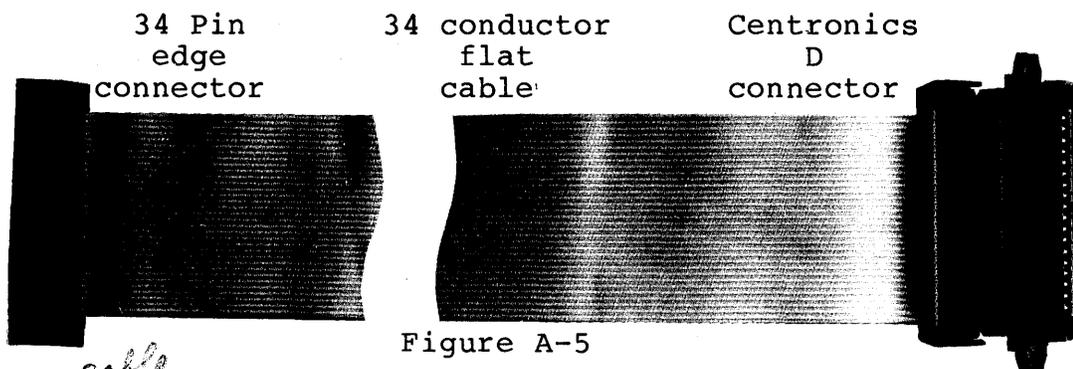
Figure A-5

Signal Name	Pin # cable	plug #'s	Pin #	Signal Direction
Strobe	1	———— 1 19	1	—>
Ground	2	———— 2	2	
Data 0	3	———— 20	3	—>
Ground	4	———— 3	4	
Data 1	5	———— 21	5	—>
Ground	6	———— 4	6	
Data 2	7	———— 22	7	—>
Ground	8	———— 5	8	
Data 3	9	———— 23	9	—>
Ground	10	———— 6	10	
Data 4	11	———— 24	11	—>
Ground	12	———— 7	12	
Data 5	13	———— 25	13	—>
Ground	14	———— 8	14	
Data 6	15	———— 26	15	—>
Ground	16	———— 9	16	
Data 7	17	———— 27	17	—>
Ground	18	———— 10	18	
No connect	19	———— 28	19	<— ACKNOWL
Ground	20	———— 11	20	
Busy	21	———— 29	21	<—
Ground	22	———— 12	22	
Paper Out	23	———— 30	23	<—
Ground	24	———— 13	24	
Select	25	———— 31	25	<—
No connect	26	———— 14	26	
No connect	27	———— 32	27	
Fault	28	———— 15	28	<—
No connect	29	———— 33	29	
No connect	30	———— 16	30	
No connect	31	———— 34	31	
No connect	32	———— 17	32	
No connect	33	———— 35	33	
No connect	34	———— 18	34	
		36	35 } no wire to these pins	
			36 }	

ADD-ON DISK DRIVE CABLE

| 34 Pin edge connector | 34 conductor flat cable | 34 pin edge connector | 34 pin edge connector | 34 pin edge connector |

Figure A-6

Signal Name	Pin #		Pin #	Pin #	Pin #	Signal Direction
Ground	1	------------------- 1	------- 1	------- 1	
No connect	2	------------------- 2	------- 2	------- 2	
Ground	3	------------------- 3	------- 3	------- 3	
No connect	4	------------------- 4	------- 4	------- 4	
Ground	5	------------------- 5	------- 5	------- 5	
Drv Sel 3	6	------------------- 6	------- 6	------- 6	-->
Ground	7	------------------- 7	------- 7	------- 7	
Index	8	------------------- 8	------- 8	------- 8	<--
Ground	9	------------------- 9	------- 9	------- 9	
Drv Sel 0	10	------------------- 10	------- 10	------- 10	-->
Ground	11	------------------- 11	------- 11	------- 11	
Drv Sel 1	12	------------------- 12	------- 12	------- 12	-->
Ground	13	------------------- 13	------- 13	------- 13	
Drv Sel 2	14	------------------- 14	------- 14	------- 14	-->
Ground	15	------------------- 15	------- 15	------- 15	
Motor On	16	------------------- 16	------- 16	------- 16	-->
Ground	17	------------------- 17	------- 17	------- 17	
Direction	18	------------------- 18	------- 18	------- 18	-->
Ground	19	------------------- 19	------- 19	------- 19	
Step	20	------------------- 20	------- 20	------- 20	-->
Ground	21	------------------- 21	------- 21	------- 21	
Write Data	22	------------------- 22	------- 22	------- 22	-->
Ground	23	------------------- 23	------- 23	------- 23	
Write Gate	24	------------------- 24	------- 24	------- 24	-->
Ground	25	------------------- 25	------- 25	------- 25	
Track 0	26	------------------- 26	------- 26	------- 26	<--
Ground	27	------------------- 27	------- 27	------- 27	
Wrt Prot	28	------------------- 28	------- 28	------- 28	<--
Ground	29	------------------- 29	------- 29	------- 29	
Read Data	30	------------------- 30	------- 30	------- 30	<--
Ground	31	------------------- 31	------- 31	------- 31	
Head 2	32	------------------- 32	------- 32	------- 32	-->
Ground	33	------------------- 33	------- 33	------- 33	
No connect	34	------------------- 34	------- 34	------- 34	

STANDARD EDGE CONNECTOR

female connector
viewing "pin" end (not "cable" end)

Pin#   Pin#

34	33
32	31
30	29
28	27
26	25
24	23
22	21
20	19
18	17
16	15
14	13
12	11
10	9
8	7
6	5
4	3
2	1
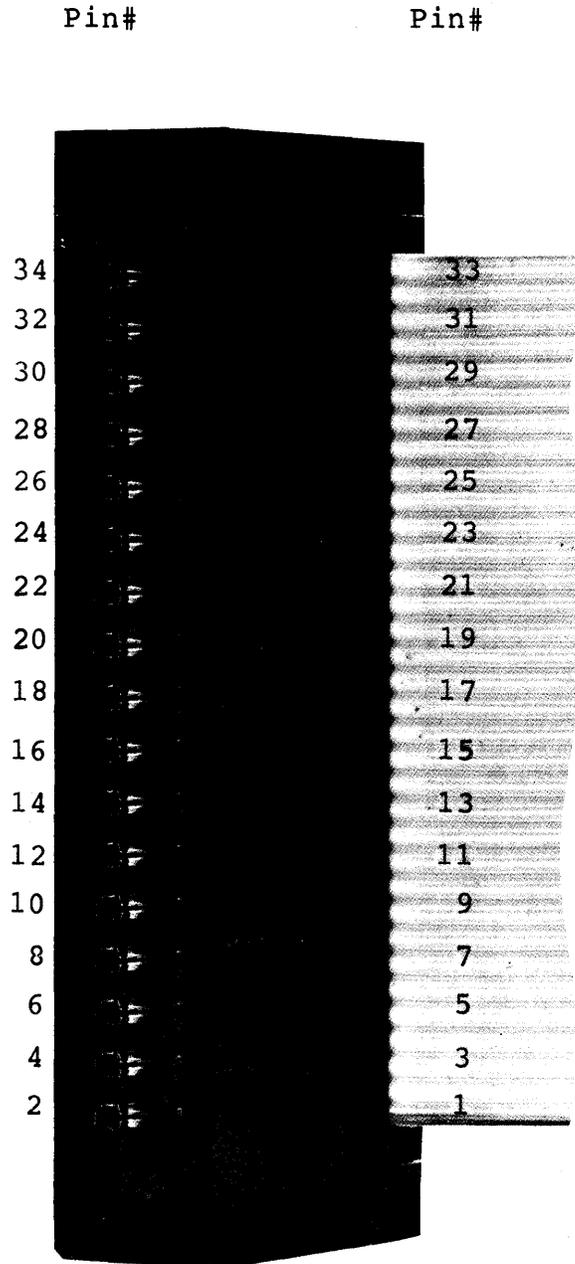
Figure A-7

INTERFACE CONNECTOR

female connector
viewing "pin" end (not "cable" end)

```
 _____
|_|_|_|_|_|_|_|_|_|_|_|_|_|
|_|_|_|_|_|_|_|_|_|_|_|_|_|
```
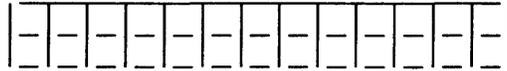
13   Figure A-8   1

Signal Name	Pin #
Data 0	1
Addr 0	2
Data 1	3
Addr 1	4
Data 3	5
Addr 6	6
Data 2	7
Addr 2	8
Data 4	9
Ground	10
Data 6	11
Addr 4	12
Data 5	13
Addr 3	14
Data 7	15
Addr 5	16
IN	17
RESET	18
OUT	19
+12vdc	20
CTC trgl	21
-12vdc	22
+ 5vdc	23
Ground	24
+ 5vdc	25
Ground	26

Modem (J7)

Terminal (J6)

Power (J5)

Interface (J4)

Internal
Drive (J3)

Disks (J1)

Printer (J2)

Figure A-9

BACKUP Utility ERROR MESSAGES

"Unable to verify DESTINATION disk as Double Sided, Double Density"

> Problem:
> The DESTINATION diskette either is
> not formatted at all or is not
> formatted as a TYPE A diskette.
> Solution:
> Abort the Utility, re-format the
> diskette or use a different one.

"Unable to verify SOURCE disk as Double Sided, Double Density"

> Problem:
> The SOURCE diskette is not a TYPE A
> diskette.
> Solution:
> Abort the Utility, use a different
> source diskette.

"The DESTINATION Disk is not Blank."

> Problem:
> The DESTINATION diskette contains
> program and/or data files. Make
> sure you have no need for these
> files before proceeding with the
> BACKUP Utility, as they will be
> overwritten by new files.
> Solution:
> Abort the Utility and check the
> destination diskette if not sure of
> contents. Otherwise proceed.

"THIS IS NOT THE CORRECT DESTINATION DISKETTE"

> Problem:
> During a single drive backup the
> wrong diskette was inserted when
> prompted for the destination
> diskette.
> Solution:
> Insert the correct diskette or
> abort the Utility.

"w"

       Problem:
           An error occurred while writing
           data to the DESTINATION drive.
       Solution:
           Run the Utility again. If the same
           error occurs, discard the
           destination diskette.

"r"

       Problem:
           An error occurred while reading
           data from the SOURCE drive.
       Solution:
           Run the Utility again. If the same
           error occurs, the source diskette
           cannot be copied with this Utility.

"v"

       Problem:
           The data read back from the
           DESTINATION drive is not the same
           as the data read from the SOURCE
           drive.
       Solution:
           Run the Utility again. If the same
           error occurs, discard the
           destination diskette.

CONFIG Utility ERROR MESSAGES

"CANNOT READ PARAMETERS FROM DISK"

      Problem:
         The diskette is not a boot diskette
         -or- is no longer usable as a boot
         diskette.
      Solution:
         Use a different boot diskette.

"CANNOT WRITE PARAMETERS TO DISK"

      Problem:
         The diskette is not a boot diskette
         -or- is no longer usable as a boot
         diskette -or- there is a write
         protect tab covering the write
         protect notch.
      Solution:
         Remove write protect tab -or- use a
         different boot diskette.

"DRIVE IS WRONG TYPE"

      Problem:
         The A: drive is not currently set
         to TYPE A.
      Solution:
         Use CONVERT Utility to convert A:
         drive to TYPE A.

DISK RELATED ERROR MESSAGES

Abbrev	Full	Meaning
RDY	NOT READY	Drive error. Solution: If error persists contact your dealer for service.
FLT	WRITE FAULT	Could not write data. Solution: If error persists contact your dealer for service.
RNF	RECORD NOT FOUND	Could not find track or sector. Solution: Re-format diskette.
LD	LOST DATA	Could not read data in fast enough. Solution: If error persists contact your dealer for service.
DREQ	DATA REQUEST	Controller error. Solution: If error persists contact your dealer for service.
CRC	CYCLIC REDUNDANCY CHECK	Wrong data was read back. Solution: If error persists Re-format diskette.
WP	WRITE PROTECT	Write protected diskette. Solution: Remove Write Protect Tab.

SYSTEST Utility ERROR MESSAGES

Drive activity light blinks faster than 1 cycle per second.

> Problem:
> The terminal cable is not connected
> between the MODEM connector and the
> TERMINAL connector -or- if the
> cable is connected then there is a
> problem with one or more of the
> protocol lines (CTS/RTS or DSR/DTR)
> of either channel.
>
> Solution:
> Connect terminal cable between
> MODEM connector and TERMINAL
> connector on MicroMate rear panel
> -or- check that cable is wired
> correctly. (If neither solution
> works see the next solution.)

Drive activity light does not blink.

                -or-

Drive activity light stays on for more than 2 minutes.

> Problem:
> Any one of the errors listed below
> occurred.
>
> Solution:
> Contact Your Dealer for Service.

"Disk Test-- OPEN ERROR"

> Problem:
> The disk failed to create a new
> file named TESTFILE.XXX or this
> file already exists on the disk.
>
> Solution:
> Check test diskette. Erase any
> file named TESTFILE.XXX. Re-boot
> test diskette.

"Disk Test-- WRITE ERROR"

> Problem:
> An error occurred while writing
> data to the test file.

"Disk Test-- READ ERROR"

> Problem:
> An error occurred while reading
> data from the test file.

"Disk Test-- VERIFY ERROR"

> Problem:
> The data read back from the test
> file was not the same as the data
> written to the file.

"Disk Test-- CLOSE ERROR"

> Problem:
> An error occurred while closing the
> file (updating the directory).

"Disk Test-- ERASE ERROR"

> Problem:
> The file name could not be removed
> from the directory.

"Seek Test-- HOME ERROR"

> Problem:
> The drive failed to seek or find
> track 0.

"Seek Test-- SEEK ERROR"

> Problem:
> The drive failed to seek or find
> track 39.

"Dart Test-- DART ERROR"

> Problem:
> The DART "A channel" did not
> properly receive a character sent
> by the "B channel" or vice versa.

"RAM Test-- RAM ERROR   96+00@9F80b0"

```
                         |  |  | |  | ___ Bank number
                         |  |  |_|_____ Memory Address (in Hex)
                         |  |_____ Byte read back
                         |_____ Byte written
```
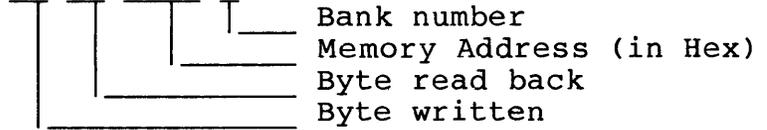
> Problem:
> Memory address did not pass a
> rotating bit test.

PROBLEMS AND THEIR PROBABLE CAUSES

PROBLEM	CAUSE	CURE
Drive makes a loud grinding noise when attempting to Boot.	Not a system diskette. Disk is crashed	Use a system diskette. Use a different diskette.
Lock up during Power-on. System stops after 61K TPA message appears.	Drive failed to select side 2	Power down & back up.
System will not boot after pressing RESET button.	Drive failed to step.	Power down & back up.
Computer fails to recognize characters typed on keyboard even when computer output displays fine on the terminal.	Terminal set for 8 bit word and 8th bit is set to 1.	Change settings so bit 8 is set to 0.
Epson printer, double linefeeds.	Pin 14 may be grounded.	Pin 14 in your cable may need to be cut.
PROFILE.SUB does not load when system is booted.	Unknown	Press RESET again.
Random "^Q"s appear on screen or unexpectedly exit from T/Maker edit.	CP/M has Xon/Xoff OFF and terminal has Xon/Xoff ON	Turn on CP/M's Xon/Xoff or turn off Terminal's Xon/Xoff.

Computer Dictionary. 3d ed.
        Sippl, C. J.   1982.   Howard W. Sams & Co., Inc.
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        Freedman, Alan. 1983.   Prentice Hall, Inc.
                    New York

The CP/M Handbook with MP/M.
        Zaks, Rodnay.   1980.   Sybex Inc.
                    Berkeley

International Computer Dictionary.
                    1981.   Sybex Inc.
                    Berkeley

Mastering CP/M.
        Miller Alan R. 1983.   Sybex Inc.
                    Berkeley

Microcomputer Dictionary. 2d ed.
        Sippl, C. J.   1983.   Howard W. Sams & Co., Inc.
                    Indianapolis

GLOSSARY

ABORT

Stop a utility or a program which is in progress and return to CP/M.

BACKUP

Make an exact copy of a diskette or file.

BANK

A 32K byte portion of memory that is electronically switched in or out of a "WINDOW" and can only be used by the operating system.

BAUD RATE

The speed at which two serial devices talk to each other. The baud rate of the two devices must be the same in order for each device to understand the other.

BDOS

The Basic Disk Operating System. That portion of CP/M which manages the disks files.

BIT

An abbreviation for binary digit. There are 8 bits to a byte.

BIOS

The Basic Input/Output System. That portion of CP/M which talks to the various devices.

BOOT

The series of steps required to load the operating system from the diskette into the computer.

BOOT DISKETTE

A diskette containing both the CP/M loader, which is on cylinder 0, and the CPM3.SYS file.

BYTE

A byte consists of 8 bits; it equals one character of data.

CANCEL

See ABORT.

CCP

The Console Command Processor. That portion of CP/M which interperts the input commands.

CHANNELS

The electrical paths along which information may flow.

COLD START

The first time a system is booted after being powered on.

CONFIGURATION
     A computer, terminal, and/or peripherals linked and
     programmed to operate as a system.

CONTROL BITS
     The Bits which are used to determine a specific function.

CONTROL C
     Press and hold the **Crtl** key while simultaneously pressing
     the **C** key.

CP/M
     Control Program for Microcomputers.

CPU
     A Central Processing Unit. This is the heart of the
     computer. The MicroMate uses a Z-80A CPU.

CTS/RTS
     Clear To Send/Request To Send. A protocol used by serial
     devices.

CURRENT SETTING
     The value currently assigned to a parameter.

CURSOR
     The one-character symbol that indicates where the next
     character will appear on the screen.

CYLINDER
     A combination of two tracks, comprised of a track on one
     side and the corresponding track on the opposite side of a
     diskette.

DESTINATION DISK
     The diskette or drive to write TO.

DEVICE
     A hardware apparatus.

DIRECTORY
     A portion of a diskette that contains the names of the files
     on that particular diskette. Use DIR command to see a list
     of file names.

DISK DRIVE
     The mechanism used to read and write diskettes.

DOUBLE DENSITY
     A method of storing twice as much data in a sector.

GLOSSARY

DOUBLE SIDED
     A diskette or drive that uses both sides.

DRI
     Digital Research Inc. Manufacturer of CP/M.

DRIVE SLOT
     An opening in the front of a disk drive designed to accept
     the insertion of a diskette.

DSDD
     Double Sided, Double Density.

DSSD
     Double Sided, Single Density.

DTR
     Data terminal ready.

EDGE CONNECTOR
     A type of connector to be fitted onto an especially designed
     edge of a printed circuit board.

EMULATE
     Imitate.

ERASE
     Permanently remove a file from a diskette.

FIRMWARE
     Software provided in a ROM.

FLIPPED CABLE
     See Null-modem

FORMAT
     The preparation of a diskette that allows it to accept
     information.

GARBAGE
     Random, meaningless charaters on the screen.

HANG
     When the computer does not respond to any keyboard input,
     including a control C. There are only two things you can do:
     press RESET or power-off and back up again.

HARD ERROR
     Non-recoverable error.

HOME
     The position of the cursor at the top left of the screen.

INPUT
     Information read from a device into the computer memory.

INTERFACE
     A means of connecting a device to a computer system.

K BYTES
     Abbreviation for Kilobytes. 1K byte = 1024 bytes.

LED
     Light Emitting Diode. (A small light bulb.)

LOAD
     Move a software program from the diskette into the memory of
     the computer.

LOAD ADDRESS
     The location in memory where a program is stored when it is
     transferred from disk.

MASTER DISKETTE
     An original diskette supplied by or purchased from the
     manufacturer.

MENU
     Information or instructions displayed on a screen to help
     you execute a Program or Utility.

MODEM
     A device designed to be used for the transmission of data
     over the telephone lines.

NULL-MODEM
     A cable used to eliminate the need for modems when
     connecting two computers together. The connectors are cross
     wired.

OPERATING SYSTEM
     Software that unites all of the hardware components and
     performs the normal house keeping chores.

OUTPUT
     Information sent FROM the computer TO a device.

PARALLEL
     Simultaneous transmission of multiple data bits.

PARAMETER
Paramaters are used to define characteristics for a program, utility or operating system and they can be changed by the user.

PARITY
A checking method used by the serial transmission hardware.

PERIPHERIAL
A physical device designed to be attached to and serviced by the computer.

POWER-ON
Turn on the electricity, initially.

PROM
A programmable ROM.

PROMPT
A line of information appearing on the screen indicating what should be typed where.

PROTOCOL
A set of rules computers use to exchange information.

RAM
Random access memory--memory that can be read FROM and written TO; any data stored in RAM is lost when the computer is turned off.

READ
Transfer information from a diskette to memory.

RIBBON CABLE
A multi-conductor flat cable.

ROM
Read only memory--software stays in this memory even when the power is turned off.

RUN
Load and execute a program or utility.

SECTOR
A portion of a diskette track.

SEGMENT
A portion of a BANK.

SERIAL
The transmission of data bits in sequence.

SINGLE BOARD COMPUTER
    An entire computer contained on one printed circuit board.

SINGLE DENSITY
    A method of storing data in a sector.

SOFT ERROR
    An error condition from which you can usually recover.

SOFTWARE
    A set of instructions telling a computer to perform certain
    functions.

SOURCE DISK
    The disk or drive to read FROM.

SSDD
    Single Sided, Double Density.

SSSD
    Single Sided, Single Density.

STOP BIT
    Bits which tell the serial receiving device when a character
    has been completely received.

SYSTEM DISKETTE
    See BOOT diskette.

SYSTEM GENERATION
    The process of placing a copy of the operating system onto
    an especially reserved cylinder of a diskette.

TALK
    Bi-directional communication between devices.

TRACK
    Electromagnetic concentric circle which is formed on a
    diskette.

UTILITY
    A software tool.

VERIFY
    Reaffirm the integrity; test the accuracy and completeness.

WARM START
    Reloading the CCP by typing Control C from the A> prompt.
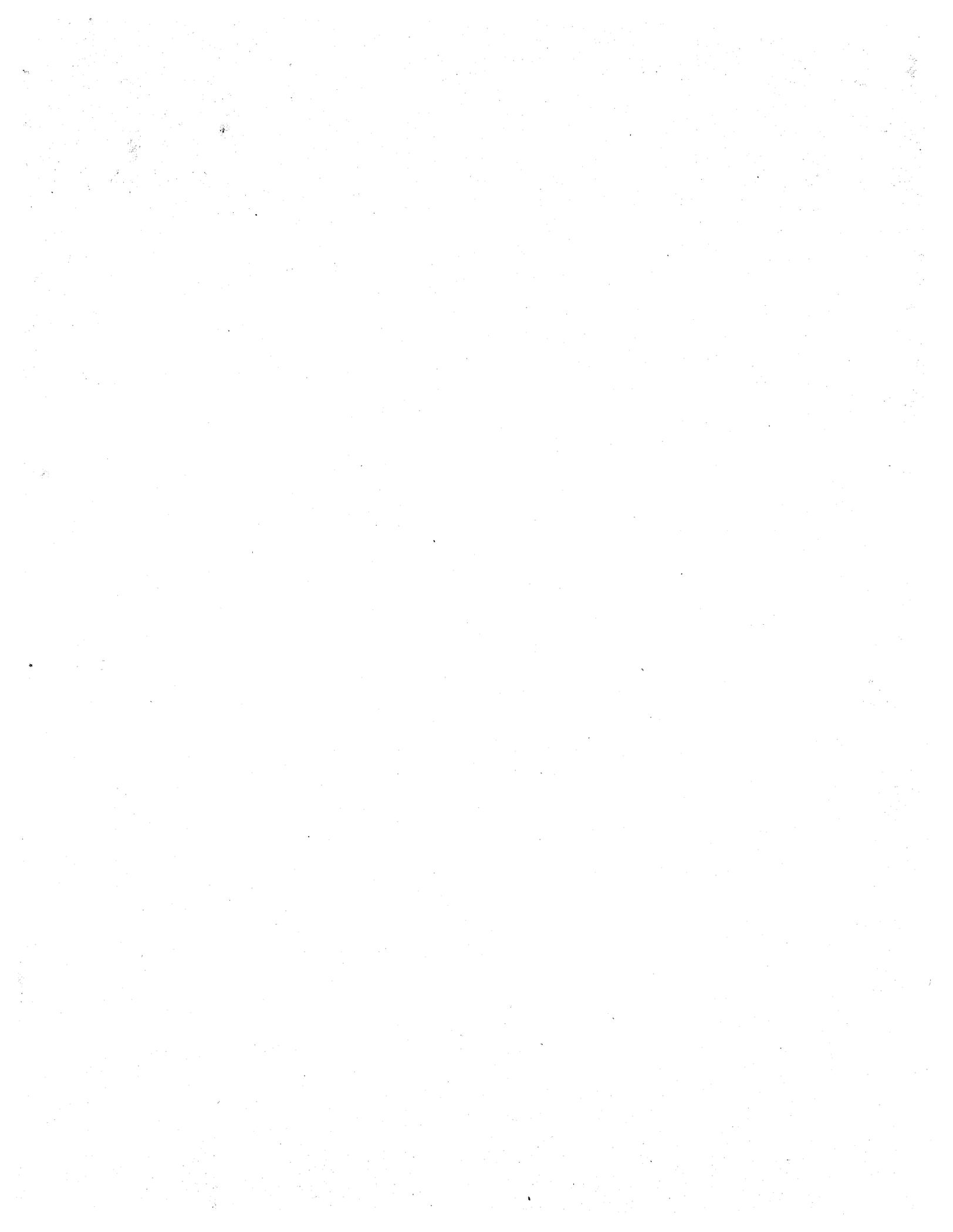
WINDOW
    An area within the addressing range of the CPU that is used
    to access memory outside of the CPUs addressing range.

WRITE
    Transfer information from memory to a diskette.

WRITE PROTECT NOTCH
    A notch in the diskette jacket that when covered prevents
    the diskette from being written to.

Personal Micro Computers, Inc.   475 Ellis St., Mt. View, CA 94043