

ADDENDUM TO THE USER'S GUIDE

FOR YOUR KAYPRO COMPUTER

March 20, 1984

This document gives information about your KAYPRO which is not covered in the KAYPRO USER'S GUIDE. This information takes precedence over material in the user's guide.

Kaypro Corporation
Post Office Box N
Del Mar, CA 92014

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**FEATURES DISCUSSED IN THIS ADDENDUM
WHICH ARE NOT COVERED IN THE
KAYPRO USER'S GUIDE**

HARDWARE FEATURES

- * Half-high diskette drives instead of full-high drives
- * Two serial ports (on rear panel) instead of one
- * Real-time clock (KAYPRO 4 only)
- * On-board MODEM with rear panel connector (KAYPRO 4 only)
- * Cooling fan (KAYPRO 4 only)

SOFTWARE FEATURES

- * MFDISK.COM - allows formatting, reading, and writing to diskettes from other manufacturers' computers.
- * CLOCK.BAS - allows access to the real-time clock. Graphic display of date, day of week, and time to the hundredth of a second.
- * MBMENU.BAS - menu-driven access to Microsoft's BASIC80 programming language and the GAMES
- * MODEM program - SUPRTERM Version 5
- * Automatically recognizes the XEROX single-sided/single-density format

Note: All software distributed with your computer has been installed at the factory. You do not need to do any of the installation procedures mentioned in software manuals.

MEMORY SPACE CONFLICTS

Four programs included with your KAYPRO leave residual messages in a portion of memory that can cause conflicts with other software. These four programs are:

MFDISK.COM
XSUB.COM
RAMDISK.COM
MSDOS.COM

Whenever you are finished with any of these programs, please press the reset button on the rear panel. Pressing the reset button will re-initialize the sensitive memory area and prevent problems.

**USING THE CONFIG PROGRAM
TO CHANGE VARIOUS FEATURES ON YOUR KAYPRO**

The CONFIG program will change the I/O byte, redefine arrow keys (cursor keys, arrow keys), redefine the numerical keypad, set the write-safe flag, change the printer baud rate, and change the modem baud rate.

Sample Menu:

K A Y P R O C O N F I G U R A T I O N P R O G R A M

	Help	function
Change IOBYTE	i	I
Redefine the vector pad	v	V
Redefine the number pad	n	N
Set the write safe flag	w	W
Change the printer baud rate	p	P
Change the modem baud rate	m	M
Exit the CONFIG program	x	X

please enter your selection ===>

Notice the relationship between upper-case and lower-case letters in this program.

- * Entering a lower-case i will get you information about why you might want to change the IOBYTE and instructions on how to do it.
- * Entering an upper-case I takes you to the area where you actually make the changes.

Please note:

- * All changes affect drive A, not drive B.
- * Changing the modem baud rate affects the serial data port, not the internal modem.
- * Each key on the numeric pad may be assigned a string of up to four characters.

USING THE MULTI-FORMAT PROGRAM

As a rule, you cannot buy a program created for one computer and use it in another computer, even though the diskettes are the same size. The MFDISK program, on the CP/M diskette, is the Kaypro Corporation answer to this common problem. MFDISK enables you to assign one or both of your diskette drives to a format alien to the KAYPRO line of computers. By using the MFDISK program, you can read and write other CP/M disk formats such as:

Kaypro Single Density	TRS-80 Single Density
Kaypro Double Density	TRS-80 Model III
Kaypro Double Sided/Density	IBM PC, Double Density
Osborne I, Single Density	IBM PC, Dbl Sided/Dbl Density
Osborne I, Double Density	TI Professional, Double Density
Xerox 820, Single Density	Morrow Micro Decision
Xerox 820, Double Density	Zenith Z-10, Double Density
	NEC PC-8100a

Due to Kaypro's policy of constantly improving our products there may be some differences in the exact choices on the menu. There will also be differences depending on whether you have a KAYPRO 2 or a KAYPRO 4.

To run the program, type: MFDISK
You will be asked:

Do you want to S)elect a disk, I)nquire about a format, F)ormat a disk, or R)eturn to complete selection, and go to CP/M?

S)elect - Assigns an alien format to either drive A, or drive B.

I)nquire - Attempts to figure out what format the other diskette is. Handy if you don't know what computer the diskette came from.

F)ormat - Formats a diskette in the chosen format, then assigns that format to the chosen drive.

R)eturn - Exits the MFDISK program; then the alien format becomes effective upon exiting to CP/M.

Enter your choice by typing the first letter.
Follow the prompts.

Once MFDISK has been run, each time a warm boot occurs, the system will tell you what the drive assignments are. These drive assignments remain active until MFDISK alters the assignment or the computer is reset. A report of "No Disk Entered" indicates that the drive has not been assigned to an alien format.

SAMPLE SESSION

For this example, we will assume that you wish to move a file, called FOO.DOC, from a NEC PC-8000a diskette to a diskette for your KAYPRO 4.

1. Prepare a diskette to receive the file from the NEC diskette.
 - a. Use the COPY program to format diskettes to the KAYPRO format.
 - b. Put the CP/M file, PIP.COM, on it.
2. Place the diskette with MFDISK in drive A.
3. Put the NEC PC-8000a diskette in drive B.
4. Type: MFDISK
Press RETURN.

5. When the MFDISK menu appears on the screen, press S.

A reverse video bar will appear just above the first diskette format.

6. Use the arrow keys to move the bar until it is on top of NEC PC-8000a.
Press RETURN.
7. When the prompt asks which disk drive to change, press B.
8. The main menu for MFDISK will return to the screen. Put the diskette that is to receive FOO.DOC in drive A.
9. Now press R.

You will see the following message on your screen:

```
{Warm Boot}  
A:= No Disk Entered  
B:= NEC PC-8000a  
  
A0>
```

This message indicates that drive A is in KAYPRO format and drive B is in NEC PC-8000a format. A message like this will be displayed whenever a warm boot occurs and one drive is assigned to an alien disk format.

10. Type: PIP A:=B:FOO.DOC[V]
Press RETURN.

This command will transfer FOO.DOC from drive B:, the NEC PC format, to drive A, the KAYPRO format.

FORMATTING SINGLE-SIDED DISKETTES FOR USE ON THE KAYPRO 2

The SSCOPY program allows the KAYPRO 4, which has double-sided diskette drives, to format diskettes which can be read by the KAYPRO 2, which has single-sided drives.

SSCOPY cannot be used to COPY files from a double-sided diskette to a single-sided diskette. In order to use the copy, image, or any other file-copying options of this program, the source diskette and the destination diskette must both be single-sided.

To copy files from a double-sided diskette to a single-sided one, format the single-sided diskette with SSCOPY. To do this:

1. Type after the A> prompt: SSCOPY
Press RETURN.
2. Follow the prompts.
3. When the diskette has been formatted, copy the files, using PIP as instructed in the KAYPRO USER'S GUIDE.

MBASIC Diskette

The MBASIC diskette for your KAYPRO contains two files in addition to the files mentioned in INTRODUCTION TO SOFTWARE. These are MBMENU.BAS and CLOCK.BAS.

USING THE MBASIC DISKETTE MENU

MBMENU.BAS gives a menu of selections including all of the games as well as access to the MBASIC programming language. To run the menu program:

1. Place the MBASIC diskette in drive A.
2. Enter CTRL-C. (Hold the CTRL key down while pressing C.)
3. Type: MBASIC MBMENU
Press RETURN.

The menu will appear on the screen. Each choice has a number next to it.

4. Enter your choice by typing its number.
Press RETURN.

Descriptions of the programs will appear on the right-hand portion of the menu.

5. Follow the prompts as they appear, and have fun.

USING THE REAL-TIME CLOCK

CLOCK.BAS gives you access to the real-time clock included in your KAYPRO 4. The KAYPRO 2 does not have the real-time clock.

To run the clock program:

1. Place the MBASIC diskette in drive A.
2. Type: MBASIC CLOCK
Press RETURN.

When the clock program has loaded and started to run, the screen will be erased.

3. When you see a prompt asking if you want to reset the clock, press N.

The screen will clear again and the program will draw a border. Then it will begin the clock graphics display. The KAYPRO real-time clock gives you the year, month, day of week, hour (in military style), seconds, and hundredths of seconds.

To exit the program:

4. Press ESCape.
5. When the prompt asking if you want to reset the clock appears, press ESCape again.
6. Type: SYSTEM
Press RETURN.

SUPRTERM - THE MODEM PROGRAM (KAYPRO 4 only)

Your KAYPRO 4 comes with two versions of the SUPRTERM telecommunications program. The standard version, ST.COM, is the one you will be using the most. A special version, STD.COM, is for use with the Dow Jones News/Retrieval Service. The Dow Jones service requires special handling of terminal characteristics; so a separate version of the program is needed to handle this requirement.

SUPRTERM on the internal modem looks and operates the same as described in the SUPRTERM manual, with one exception. The Format option for setting Baud Rate no longer exists on the menu. Since the internal modem only operates at 300 baud, no reason for the selection exists. This version of SUPRTERM will not work with an external modem nor with previous models of KAYPRO computers.

COOLING FAN
(KAYPRO 4 only)

Occasionally the fan filter on the back panel will need to be cleaned. DO NOT REMOVE THE SCREWS ON THE GRILL HOLDER. Simply grasp the center section with two fingers and pull until the grill pops out. Clean the filter by gently agitating it in mild soap or detergent. Rinse in clear water, let it dry, replace it, and replace the grill.

USING GRAPHICS ON YOUR KAYPRO

The KAYPRO has graphics capability. However, it needs a program to tell it what to do. If you are able to write these programs, then the information you need is on the following pages. If you are not able to write the programs and want to use the KAYPRO graphics capability for business or other purposes, then it is best to find someone to write a program to do what you want.

VIDEO GRAPHICS AND ATTRIBUTES COMMAND SET

The KAYPRO has a graphics and attributes set that currently includes drawing and erasing lines, drawing and erasing pixels, inverse video, reduced intensity, blinking fields, graphics characters, cursor positioning, and cursor on/off.

DRAWING GRAPHICS

To draw graphics on your KAYPRO, the screen is treated as an array 100 pixels high and 160 pixels wide. Any point on the screen can be addressed by a vertical coordinate (ranging from 32 to 131) and a horizontal coordinate (ranging from 32 to 191). The pixel in the upper-left corner of the screen has coordinates of 32,32. It would seem natural to start the numbering of coordinates at 1 or 0. However, some byte values of 32 or less are interpreted by BDOS as control keys.

Line and pixel graphics are drawn on the screen by writing an escape sequence to the console output. For the purpose of drawing lines and pixels, an escape sequence is a 4- or 6-byte sequence defined as follows:

Escape sequence =

ESC <sequence-type> <V1> <H1> [<V2> <H2>]

where:

- 1) ESC is an ASCII 27 (1B hex).
- 2) <sequence-type> one of the following characters:

*	to write a pixel
(space)	to erase a pixel
L	to draw a line
D	to delete a line
- 3) V1, H1, V2, H2 are 1-byte values indicating locations on the screen.

To write a pixel:

The sequence-type must be a *.

V1 is the vertical coordinate of the pixel.

H1 is the horizontal coordinate.

H2 and V2 are not used.

To erase a pixel:

The sequence-type must be a space.

H1, V1, H2, and V2 are the same as above.

To draw a line:

The sequence-type must be an L.

H1 is the horizontal coordinate of the first point of the line.

V1 is the vertical coordinate of the first point.

H2 is the horizontal coordinate of the last point of the line.

V2 is the vertical coordinate of the last point.

To delete a line:

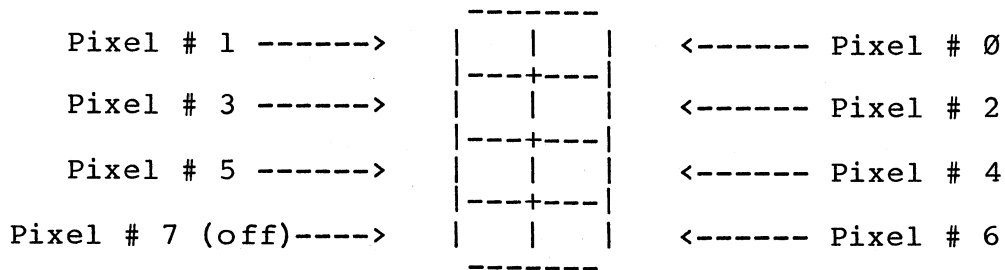
The sequence-type must be a D.

H1, V1, H2, and V2 are the same as above.

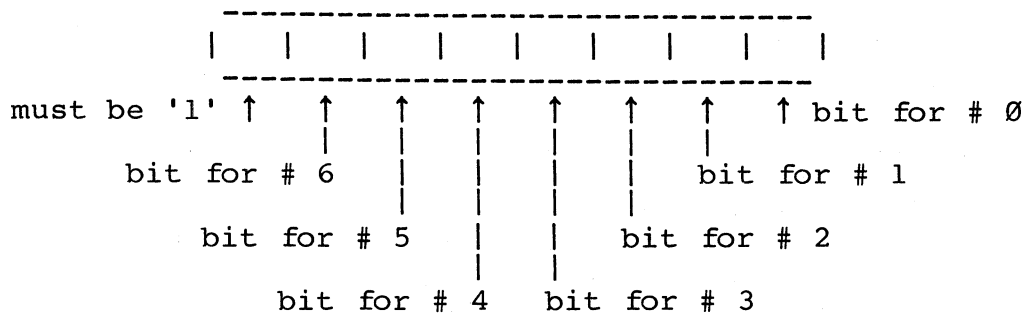
GRAPHICS CHARACTERS

Each of the character positions on the screen occupies the same area as eight pixels (4 high, 2 wide). Thus, pixels can be addressed in groups of eight at a time. To set pixels in a character position, the cursor is moved to that position, and then a byte is sent to the console output. This byte must have the high-order bit set to 1 to distinguish it from normal characters. The remaining seven bits are used to set 7 of the 8 pixels.

i.e., to write these pixels.... ;qc



output this byte:



As shown above, pixel #7 is off. To write a pixel with it on, send the inverse video command (ESC,B,0), then output the inverse for bits 0 through 6, i.e., 10000000b would print a blank graphics character; (ESC,B,0),10000000b would print a solid character.

With video mode on, 2 bytes are required for each graphic character. The Least Significant Bit of byte 1 controls pixel #7. The rest of the characters are controlled by byte # 2 in the normal manner.

CHARACTER ATTRIBUTES COMMANDS

Characters can be set to inverse video, blinking, reduced intensity, or underlined. Also, the cursor can be turned off. These attributes are activated by sending a 3-byte escape sequence to the console output:

Escape sequence =

ESC <on-off-code> <attribute-code>

where:

- 1) ESC is an ASCII 27 (1B hex)
- 2) <on-off-code> is a:

B to set an attribute ON, or
C to set it OFF.

- 3) <attribute-code> has a value of 0 through 5, as follows:

0 = inverse video
1 = reduced intensity
2 = blinking
3 = underline
4 = cursor
5 = video mode

Default for these attributes is:

inverse video	= off
reduced intensity	= off
blinking	= off
underline	= off
cursor	= on
video mode	= off

Comments:

- 1) A line drawn from point A to point B will not always look the same as a line from B to A; it will be a mirror image.
- 2) Graphics characters, pixels, and lines cannot write over normal text characters.

SUMMARY OF GRAPHICS COMMANDS

Graphics commands:

Set pixel	ESC,* ,V1,H1
Clear pixel	ESC," ",V1,H1
Set line	ESC,L,V1,H1,V2,H2
Delete line	ESC,D,V1,H1,V2,H2

Attribute commands:

	To Turn ON:	To Turn OFF:
Inverse video	ESC,B,0	ESC,C,0
Reduced intensity	ESC,B,1	ESC,C,1
Blinking	ESC,B,2	ESC,C,2
Underlining	ESC,B,3	ESC,C,3
Cursor	ESC,B,4	ESC,C,4

SERIAL PORTS RS-232C

Note that the **serial printer** port on the Kaypro series is hard-wired as DCE, Data Communications Equipment. All other serial ports in the KAYPRO equipment line, including the serial data port, are wired as DTE, Data Terminal Equipment.

Pin assignments for the SERIAL PRINTER PORT (DCE)

- Pin 1 -> Chassis Ground
- Pin 2 -> Transmit Data
- Pin 3 -> Receive Data
- Pin 7 -> Signal Ground
- Pin 20 -> Data Terminal Ready (used as printer ready)

Pins not connected -> 4-6, 8-19, 21-25

Pin assignments for the SERIAL DATA PORT (DTE)

- Pin 1 -> Chassis Ground
- Pin 2 -> Transmit Data
- Pin 3 -> Receive Data
- Pin 4 -> Request to Send
- Pin 5 -> Clear to Send
- Pin 6 -> Data Set Ready
- Pin 7 -> Signal Ground
- Pin 8 -> Data Carrier Detect
- Pin 20 -> Data Terminal Ready

Pins not connected -> 9-14, 16, 18-19, 21-25

Note: The BIOS initializes the serial data port, but does not support access to it. This port must be accessed by direct port statements. To assign the serial data port to the Punch or Reader devices, you must modify the BIOS.

I/O PORT ADDRESSES

Use	Port# (hex)	Assignment
Keyboard:		
	05	Keyboard data (R/W). Eight-bit data from detachable keyboard.
	07	Keyboard Control/Status
Video:		
	1C	Video Register Select
	1D	Video Attribute
Parallel Printer:		
	18	Parallel printer port (Write only). Eight-bit data port to Centronics printer connector.
Serial Printer:		
	08	Baud rate for serial printer
	0C	Serial Printer Data (RS-232C)
	0E	Serial Printer Control/Status
Serial Data I/O:		
	00	Baud rate for Serial Data Port (write only). Writing a number between 0 and F (hex) to this port will set the RS-232C baud rate.
	04	RS-232C data (R/W). Data register of the Z80 SIO.
	06	RS-232C Status (R/W). Control/status port for the Z-80 SIO. See Zilog and Mostek Microcomputer Data Books.

Real-time clock (NS-MM58167A, KAYPRO 4 only):

- 22 RTCS. Status port of real-time clock.
- 24 RTCD. Data port (R/W). All I/O values in Binary Coded Decimal.
- 20 RTCA. Attribute select (Write only).

Attribute data:

- 7 = Month
- 6 = Day of Month
- 5 = Day of Week
- 4 = Hour
- 3 = Minute
- 2 = Second
- 1 = Hundredth of Second

System:

- 14 System Port (R/W). This port is used for system control. The various bits are used for memory-bank selection, disk-drive control, and printer handshaking.

BIT

- | | | |
|---|----------|---------------------|
| 0 | Drive A | 0 = Select A |
| 1 | Drive B | 0 = Select B |
| 2 | Side one | 0 = Side one |
| 3 | PSTROB | 0 = Low |
| 4 | MTRON | 0 = Floppy motor on |
| 5 | DDEN | 0 = Double density |
| 6 | Not used | |
| 7 | BANK | 0 = RAM bank select |

Disk Controller Ports:

- 10 Status/Command
- 11 Track
- 12 Sector
- 13 Data

INTERNAL MODEM
(KAYPRO 4 only)

The internal modem on the KAYPRO 4 uses Texas Instruments TMS99531 dialer and TMS99532 modem chips. Both of these chips are accessed through the Z80 PIO and Z80 SIO chips. Specification sheets on these chips are available from Texas Instruments and ZILOG respectively.

Z80 PIO - (Accesses TMS99531 dialer chip through channel b.
Data port at 21 hex and control port at 23 hex.)

PIO bit #	Function	Comment
-----	-----	-----
0	nb1	Least significant bit of digit to dial.
1	nb2	
2	nb3	
3	nb4	Most significant bit of digit to dial.
4	-tt/p	Choice between touch tone or pulse
	-ate	output on the modem chip.
5	alb	Loop back control on modem chip.
6	hook	0=off; hook=connected to phone line.
7	dp	Digit present to dialer chip.
-bstb	pn	Output from dialer, finished with this digit.

Z80 SIO - (Accesses TMS99532 modem chip through channel b.
Data port at 0D hex and control port is 0F hex.)

SIO pin	I/O	Function
-----	-----	-----
-cts	input	Ring indication, changes state while ring is present.
-dcd	input	Carrier received from phone line.
rx	input	Received data from modem chip.
tx	output	Transmitted data to modem chip.
-dtr	output	a/o: answer, originate control on modem chip.
-rts	output	sq: Squelch on modem chip.

Given the above information and the specification sheets from ZILOG and Texas Instruments, qualified persons should be able to write or modify software for this modem.

KAYPRO VIDEO COMMAND PROTOCOL

Your KAYPRO video section was designed to imitate most of the control sequences of a Lear-Siegler ADM-3A terminal. For most commercial software, this means you can "install" or customize the display characteristics by choosing ADM-3A from the menu.

For custom software or those instances where there is no choice of ADM-3A on the menu, the complete command protocol for your KAYPRO is:

CONTROL CHARACTERS

Action	Dec	Hex	Char*
Ring bell	07	07	^G
Cursor left (non-destructive)	08	08	^H
Cursor right	12	0C	^L
Cursor down	10	0A	^J
Cursor up	11	0B	^K
Erase to end of screen	23	17	^W
Erase to end of line	24	18	^X
Clear screen, home cursor	26	1A	^Z
Home cursor	30	1E	^^

* The ^ symbol in front of any character means to press the CTRL key while depressing the indicated character.

ESCAPE SEQUENCES

Insert line	ESCape,R
Delete line	ESCape,E
Cursor address	ESCape,=,row+32,col+32
Reverse video start	ESCape,B,0
Reverse video stop	ESCape,C,0
Half-intensity start	ESCape,B,1
Half-intensity stop	ESCape,C,1
Blinking start	ESCape,B,2
Blinking stop	ESCape,C,2
Underline start	ESCape,B,3
Underline stop	ESCape,C,3
Cursor on	ESCape,B,4
Cursor off	ESCape,C,4
Video mode on	ESCape,B,5
Video mode off	ESCape,C,5
Remember current cursor position	ESCape,B,6
Return to last-remembered cursor position	ESCape,C,6
Status line preservation on	ESCape,B,7
Status line preservation off	ESCape,C,7