

**ADDENDUM TO THE USER'S GUIDE
FOR YOUR KAYPRO**

September 11, 1984

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

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Part Number 2288-E

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REDIRECTION Please first direct all queries and problems to your dealer.

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

HARDWARE FEATURES

KAYPRO 4, 4X, 12X and ROBIE:

- * High-density, 2.6 megabyte, diskette drives. (4X, 12X and ROBIE only)
- * Real-Time Clock.
- * On-board MODEM with rear panel connector.
- * Cooling fan.

KAYPRO 2, 2X, 4, 4X, 12X and ROBIE:

- * Two serial ports on rear panel instead of one.

SOFTWARE FEATURES

KAYPRO 4, 4X, 12X and ROBIE only:

- * CLOCK.BAS - allows access to the real-time clock. Graphic display of date, day of week, and time to the hundredth of a second.
- * MASTER MENU - menu-driven access to programs and games.
- * MODEM program - MITE v2.73

KAYPRO 2, 2X, 4, 4X, 12X and ROBIE:

- * MFDISK.COM - allows reading diskettes from other manufacturers' computers.

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.

DISKETTES FOR YOUR KAYPRO 4X, 12X and ROBIE

The diskettes used on your KAYPRO 4X, 12X or ROBIE are not the standard diskettes used on most other computers. The diskette drives are high density (they hold a lot more), and must be purchased pre-formatted.

When you buy high-density diskettes, be certain you get formatted 17-sector, 192 TPI diskettes. More than one diskette format is available, you MUST get 17-SECTOR, 192 TPI PRE-FORMATTED DISKETTES, others will not work. Brown Disk UHR II, or the Maxell equivalent, is the format to specify to your dealer.

The ROBIE, KAYPRO 4X and 12X can read diskettes written by other KAYPRO computers. You can transfer files from standard KAYPRO diskettes to ROBIE diskettes, but it cannot write anything to these other diskettes.

SPECIAL NOTE ON HIGH-DENSITY DRIVES

There are several brands of commercial head cleaning kits available to users. The high-density drives used in Kaypro computers are sensitive to over-cleaning and the use of abrasive cleaning kits. It is easy to permanently damage the read/write head by using abrasive cleaning kits. The following drive cleaning kits are approved for use on Kaypro high-density drives:

1. Scotch #7440.
2. Head Computer Products 5-1/4 inch cleaning disk.
3. Perfect Data 5-1/4 inch cleaning disk.
4. Floppiclone 5-1/4 inch cleaning disk.

If you have a KAYPRO 2X or 4, you need to purchase standard double-density double-sided diskettes. The KAYPRO 2 uses double-density single-sided diskettes.

COPYING THE MASTER DISKETTE(s)

KAYPRO 4X and ROBIE

As soon as you get your KAYPRO 4X or ROBIE set up and plugged in, make a backup copy of the diskette that came with the computer.

Follow this procedure:

1. Put the master diskette in drive A and a sysgened blank diskette in drive B.

(See MAKING BOOTABLE DISKETTES on the following page for instructions on running the SYSGEN program.)
2. Press the reset button on the rear panel.
3. When the master menu appears, use the down-arrow key to go to the UTILITIES programs.
4. Press the right-arrow key. A sub-menu will appear with a list of options.

The first option is used to copy diskettes.

5. Press the right-arrow key.

The COPY menu will appear on the screen.

6. Type: C

This will start the copy process and verify everything that is copied. If any errors are found, they will be reported on the error status line. Any errors invalidate the entire copy process, and it will have to be repeated.

When the copy program is finished, it will report if any errors occurred and ask for your program selection.

7. Type: E

The A0> prompt will appear.

Take the master diskette out of drive A, put it back into the protective envelope, and put this diskette in a safe place. You should not have to use it again unless something happens to the working copy. Now take the working copy out of drive B, and label it as your WORKING COPY. Use this diskette from now on, not the master.

KAYPRO 2, 2X and 4

For these models, follow the same procedure given in the User's Guide. You will need to purchase a box of blank diskettes.

MAKING BOOTABLE DISKETTES

The system tracks of a diskette contain the instructions needed by the computer to start up when you first turn it on or press the reset button on the rear panel. On the KAYPRO 2, 2X, and 4 the copy program performs this function automatically. On Kaypro computers that use the high-density drives you have to run the SYSGEN program to do this function. The SYSGEN program is available on the CP/M diskette of all Kaypro computers but only models with high-density drives have to run the program manually.

To run the SYSGEN program:

1. Put your CP/M, or Master Diskette if you have just acquired the computer, into drive A.
2. Put the diskette you want to initialize in drive B.
3. Type: SYSGEN
Press: RETURN
4. SYSGEN will sign-on and ask for the source drive name.
Press: A (do not touch the RETURN key)
5. Next the program will say SOURCE ON A, THEN TYPE RETURN.
Press: RETURN
6. Now the program will ask for the destination drive name.
Press: B (don't touch RETURN)
7. SYSGEN then says DESTINATION ON B, THEN TYPE RETURN.
Now press: RETURN
8. After a short delay the program will come back and ask for a new destination drive. At this point you can press RETURN to exit the program or put in another diskette to be sysgened.

COPYING STANDARD KAYPRO DISKETTES

The KAYPRO 4X and ROBIE will read, but not write, to standard diskettes produced by a KAYPRO 10, 4, 2X or 2. Recommended procedure is to copy the standard diskette to a high-density diskette. In order to read the standard diskette, the disk drive must speed up to almost twice its regular speed in order to make the data transfer rate compatible.

It takes a few seconds before your computer realizes that you've put the standard diskette in one of the drives. So there will be a longer-than-normal delay before the drive speeds up and the regular diskette can be read.

Procedure for copying standard diskettes:

1. Prepare a high-density diskette to receive the files.
 - a. Take a pre-formatted diskette and run the SYSGEN program on it.
 - b. Transfer PIP.COM to the new diskette.
2. Place the newly prepared diskette in drive A.
3. Put the standard density diskette in drive B.
4. Enter CTRL-C to Warm Boot the computer.

A Warm Boot instruction is entered from the keyboard by holding down the CTRL key while pressing C.

5. Type: PIP A:=B:*. *
Press RETURN

This will transfer all files from the standard diskette to the high-density diskette.

*** WARNING! ***

DO NOT WORK OFF NORMAL DISKETTES. In order to read normal density diskettes, the high-density disk drive must speed up to almost twice the usual operating speed. Extended use at this speed will significantly shorten the service life of the drives. These are special drives and are rather expensive to replace.

USING THE MASTER MENU
(KAYPRO 4X, 12X and ROBIE ONLY)

On the KAYPRO 4X, 12X and ROBIE a Master Menu will be the first thing you see on your screen. The Master Menu is divided into four basic parts.

- * Top of screen - Header information with the version number of the Menu program. On some versions this section will also hold a readout from the system clock giving date and time.
- * Left of center - Menu of programs or operations you may choose. Usually when you first choose an area of operation, a second column will appear that describes further options or individual programs.
- * Right of center - Instructions and detail descriptions will appear in this area.
- * Bottom of screen - instructions on what keystrokes are valid at any time. This is where you will be prompted to enter filenames when they are required.

USING THE MASTER MENU

1. Items on the Master Menu are chosen by using the arrow-keys to move the darkened bar up or down to the type of application you want to do.
2. Press the right-arrow key to select the item.
3. A second column of choices will appear next to the 1st column.
4. Use the up and down-arrow keys to choose an item from the second list.
5. Press the right arrow key to finalize that choice.

At this point you will be prompted to enter a file name if one is needed. Otherwise the program you selected will be run.

There is another method for choosing a menu item other than using the arrow keys. Press the key corresponding to the first letter of the first word of a menu item, then press RETURN. This quick choice method chooses the first item in the menu list that matches the key you pressed. If the item you want is the second occurrence, press the first letter twice, then press RETURN.

EXAMPLES:

You want to enter the Utilities area.

Type: U
Press RETURN

You want to get into the SBASIC programming area.

Type: S (The darkened bar moves to Spreadsheets.)
Type: S (The bar now moves to SBASIC.)
Press RETURN

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 Kaypro Corporation's 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 a number of other disk formats.

As with the COPY program, each version of MFDISK is specific to one model of computer. The version of MFDISK found on the KAYPRO 2 will not work on any other model of Kaypro computer. The versions found on the KAYPRO 2, 2X, 4, and 10 allow you to format diskettes in an alien format. This is because other Kaypro computers use drives that cannot format any media.

To run the program, type: MFDISK
Press RETURN

The first thing you will see is a Menu of Manufacturers. Notice that this menu gives you choices for OTHER manufacturers. This is because MFDISK supports formats from more manufacturers than can conveniently fit on one menu. If the disk format you are looking for isn't on the first menu, check the OTHER menus.

At the bottom of the screen is:

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 - Allows you to choose an alien format either drive A, or drive B. On the KAYPRO 10 you will not get a choice of which drive the alien format is assigned to; it will always be drive C.
- 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. This option appears only on the KAYPRO 2, 2X and 4 versions of MFDISK.
- R)eturn - Exits the MFDISK program; assignment of the alien format becomes effective upon exiting to CP/M.

Enter your choice by pressing the first letter of the option you want.

If you press either S or F, you will now see a contrasting bar appear above the first item on the menu. Use the arrow-keys to move the bar to your choice the same way you would in the Master Menu. When the bar is over the manufacturer of your choice, press RETURN.

The menu will now display one or more formats used by the manufacturer you have chosen. Notice that the right-hand side of the menu distinguishes between double and single-density as well as double and single-sided formats.

Move the contrasting bar to the format of your choice, then press RETURN.

If you have a KAYPRO 2, 2X, or 4, and choose F, for format, MFDISK will now ask if you are sure that you want to format the diskette in the chosen drive. BE CAREFUL! MFDISK will quite cheerfully reformat the systems disk in drive A if you tell it to. Answer the prompt by pressing Y if you really want to go ahead with the formatting procedure.

If you have chosen S, you will return to the main menu and a message below the menu choices will inform you if the format you choose is indeed the format of the diskette in the target drive. At this point you can either try again, or press R to return to the operating system. It is the return to the operating system that make the format assignment final.

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 double-sided double-density diskette to a diskette for your KAYPRO. KAYPRO 2, 2X and 4 owners need to format a diskette. Owners of KAYPRO 4X's, 12X's and ROBIE's will be using pre-formatted diskettes.

1. Prepare a diskette to receive the file from the NEC diskette.
 - a. Use the COPY program to format a diskette to the KAYPRO format. (KAYPRO 2, 2X and 4 ONLY!)
 - 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.
Press RETURN.

The menu will now give you a choice of the different NEC formats.
7. Move the bar to PC-8000a double / double.
Press RETURN.
8. When the prompt asks which disk drive to change, press B.
9. The main menu for MFDISK will return to the screen. Put the diskette that is to receive FOO.DOC in drive A.
10. 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.

11. 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.

When the file transfer is completed, please press the reset button on the back panel of your KAYPRO.

USING THE REAL-TIME CLOCK
(KAYPRO 4, 4X, 12X and ROBIE)

The file, CLOCK.BAS, gives you access to the real-time clock that is part of your computer.

To run the clock program:

1. Select MBASIC and games from the master menu. Be certain that a data disk is in drive B.
2. From the second level of the master menu, select the MBASIC INTERPRETER.
3. When the file name is asked for, type: A:CLOCK
Press RETURN.

When the clock program has loaded and started to run, the screen will go blank.

A prompt will ask if you want to reset the clock.
Type: 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:

1. Press ESCape.
2. When the prompt asking if you want to reset the clock appears, press ESCape again.
3. Type: SYSTEM
Press RETURN.

The master menu will reappear.

TELECOMMUNICATIONS

(KAYPRO 4, 4X, 12X and ROBIE)

Included with all Kaypro computers that have the internal modem, is MITE v2.73. It is delivered pre-installed to use the Kaypro internal modem. MITE is a complete asynchronous telecommunication package. Included with the standard MITE is a front-end for use by new user's. The front-end is accessed by typing AUTO and ties into MITE without the user having to become an expert in telecommunications in order to use a modem with a computer.

Included with the standard Kaypro Mite is the capability to re-install MITE to use an external modem of the user's choice. See the MITE User's Guide for complete details.

SETTING THE BAUD RATE

All Kaypro computers now have two serial ports. There are three programs that set the baud rate of the serial ports. When your ROBIE is first turned on, or the reset button on the back panel is pressed, the baud rate for both ports is automatically set to 300 baud.

The following programs are in the utilities area.

- BAUDM.COM - Sets the baud rate of the Serial Data I/O port. Select the letter opposite the desired baud rate. This baud rate will be effective immediately and remains in effect until the computer is turned off or the reset button is pushed.
- BAUDP.COM - Sets the baud rate of the Serial Printer port. Enter the letter opposite the desired baud rate. That baud rate is effective immediately and remains in effect until the computer is reset or turned off.
- CONFIG.COM - Permanently alters the diskette in drive A to a different baud rate, cursor key definitions, or different definitions of the keys on the data pad.

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), 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.

THE COOLING FAN

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.

MEMORY SPACE CONFLICTS

Two 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

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 from occurring.

USING GRAPHICS ON THE KAYPRO

Even those KAYPRO'S which have graphics capability need a program to tell the computer 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 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 graphics and attributes set on those KAYPRO'S which have graphics capability currently include 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, the screen is treated as an array 100 pixels high, and 160 pixels wide. Any spot 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> is a character of the set:

*	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 "*"
H2 and V2 are not used
V1 is the vertical coordinate of the pixel.
H1 is the horizontal coordinate.

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.
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.

CURSOR POSITIONING

When positioning the cursor, the screen is treated as an array 25 characters high and 80 characters wide. Any character cell on the screen can be addressed by:

a vertical coordinate (ranging from 32 to 56)

a horizontal coordinate (ranging from 32 to 111).

The character in the upper left corner of the screen has coordinates of 32,32. Please note that this applies only to text and graphics characters that occupy a full character cell. Pixel graphics on the Kaypro line address a matrix of 100 by 160 with an initial offset of 32 for each coordinate. This makes an usable matrix of 32 to 132 vertical and 32 to 192 horizontal.

The cursor can be moved to a desired position on the screen by writing an escape sequence to the console output. For the purpose of cursor positioning, an escape sequence is a 4-byte sequence defined as follows:

Escape sequence = ESC EQUAL SIGN <V1> < H1>

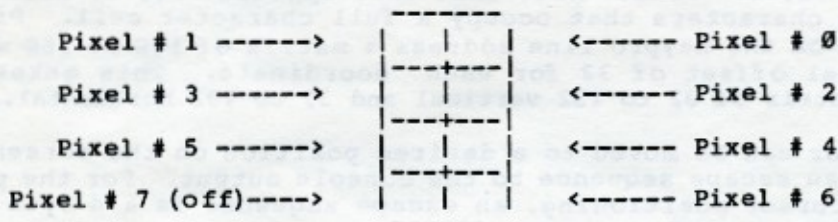
where:

- 1) ESC is an ASCII 27 (1B hex).
- 2) EQUAL SIGN is the character '=' (3D hex).
- 3) V1, H1 are 1-byte values indicating the location on the screen.

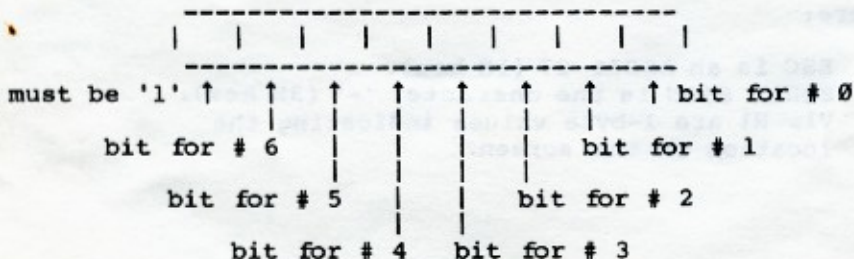
GRAPHICS CHARACTERS

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....



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.

VIDEO MODE

Video Mode, normally off, is enable by the ESCape sequence ESC, B, 5. To return to normal mode output ESC, C,5. With video mode on, 2 bytes are required for each graphic character. The Least Significant Bit of byte 1 controls pixel #7. The other pixels in the character are controlled by byte # 2 in the normal manner.

EXAMPLE: (Assuming that Video Mode is already on.)

To print a solid cursor-sized block on the screen, output the following string to the console from MBASIC.

```
PRINT CHR$(129);CHR$(255)
```

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.
6 = current cursor position.

Default for these attributes is:

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

Note on Current Cursor Position Command.

The Remember Current Cursor Position command stores the current coordinate of the cursor in memory. When the Return To Current Position Sequence is sent to the console the cursor is returned to whatever coordinates are stored in that position.

Comments:

- 1) Examples of line and pixel drawing can be found in GRAPHICS.BAS.
- 2) 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.

SUMMARY OF COMMANDS

Graphics commands:

Draw Pixel	ESC, * , V1, H1
Erase Pixel	ESC, , V1, H1
Draw line	ESC, L , V1, H1, V2, H2
Erase 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
Video mode	ESC, B, 5	ESC, C, 5

To remember current cursor position:

ESC, B, 6

To return to remembered position:

ESC, C, 6

In the S-BASIC graphics package (GRAPHICA.BAS--not included with all models), there are several procedures that allow the user to draw complicated figures with just one command. These are routines for drawing circles, rectangles, squares, and bars.

Circles -- require three parameters:

- 1) the vertical coordinate of the center of the circle
- 2) the horizontal coordinate of the center
- 3) the radius of the circle.

Rectangles -- have four parameters:

- 1) the vertical coordinate of the upper left corner
- 2) the horizontal coordinate of that corner
- 3) the height
- 4) the width.

Squares -- need three parameters:

- 1) the vertical coordinate of the upper left corner
- 2) the horizontal coordinate of the upper left corner
- 3) the length of a side.

Bars -- require eight parameters:

- 1) the vertical coordinate of the base of the bar
- 2) the horizontal coordinate of the base
- 3) the height
- 4) the width
- 5) the depth
- 6) the interior of the bar filled or empty

This parameter should be:

- Ø for an empty bar
 - 1 for a full one.
- 7) vertical illusion of depth up or down
 - 1 for up
 - 1 for down
 - 8) horizontal illusion of depth left or right.
 - 1 for left
 - 1 for right

To observe use of these procedures, run the following program:

```
$INCLUDE GRAPHICS
```

```
VAR V1, H1, RADIUS = INTEGER  
VAR V2, H2, HEIGHT, WIDTH = INTEGER  
VAR V3, H3, LENGTH = INTEGER  
VAR V4, H4, H, W, V.PERSPECTIVE, H.PERSPECTIVE, INTERIOR, DEPTH=INTEGER
```

```
V1 = 15  
H1 = 15  
RADIUS = 1Ø  
CIRCLE V1, H1, RADIUS
```

```
V2 = 3Ø  
H2 = 1Ø  
HEIGHT = 2Ø  
WIDTH = 4Ø  
RECTANGLE V2, H2, HEIGHT, WIDTH
```


V3 = 60
H3 = 20
LENGTH = 30
SQUARE V3, H3, LENGTH

V4 = 80
H4 = 80
H = 50
W = 15
DEPTH = 8
V.PERSPECTIVE = -1
H.PERSPECTIVE = 1
INTERIOR = 0
BAR V4, H4, H, W, DEPTH, INTERIOR, V.PERSPECTIVE, H.PERSPECTIVE

V4 = 20
H4 = 130
H = 50
W = 10
DEPTH = 15
V.PERSPECTIVE = 1
H.PERSPECTIVE = 1
INTERIOR = 1
BAR V4, H4, H, W, DEPTH, INTERIOR, V.PERSPECTIVE, H.PERSPECTIVE

NOTE: If the graphics system fails completely, see the section on Rebuilding System Tracks in this user's guide.

**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)

(Kaypro)

- 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)

(Kaypro)

- 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)	Device	Function
Keyboard:			
	05	ZSIO 1 Chan. B	Keyboarddata(R/W). Eight-bit data from keyboard.
	07	ZSIO 1 Chan. B	Keyboard Control/Status I/O.
Video:			
	1C	6545/6845 EA	CRT controller status/control I/O.
	1D	6545/6845 EA	CRT controller data I/O.
Parallel Printer: (Output only)			
	18 - 1B	74 373	Parallel printer port (Write only).
Serial Printer I/O:			
	08 - 0B	WD 1943 COM 8116	Baud rate for serial printer port.
	0C	ZSIO 2 Chan. A	Serial Printer Data I/O.
	0E	ZSIO 2 Chan. A	Serial Printer Control/Status I/O.
Serial Data I/O:			
	00 - 03	WD 1943 COM 8116	Baudrate for Serial DataPort (write only).
	04	ZSIO 1 Chan. A	Serial data port (RS-232C). Data I/O.
	06	ZSIO 1 Chan. A	Serial data port (RS-232C). Status/Control I/O.

Use	Port# (hex)	Device	Function
Real-time clock:		(NS-MM58167A)	
	20	PIO Chan. A data.	Real-time clock register select and interrupt status.
			Bit functions:
			0 lsb register select (output).
			1 "
			2 "
			3 "
			4 msb register select (output).
			5 not used
			6 rtc interrupt output (input).
			7 rtc not standby interrupt output (input).
	22	PIO Chan. A	Real-time clock PIO control port.
	24	MM 58167A	Real-time clock data I/O.

System:

14 - 17	74 373	System output port.
		Bit functions.
		0 0=Select floppy A (C on K10).
		1 0=Select floppy B (Hard disk on K10).
		2 0=Select side 2.
		3 PSTROB
		4 0=Floppy motor on (48 tpi drives).
		1=Select high speed (High density drive). * see note
		5 0=Select double density.
		6 0=Select normal character set.
		7 0=Select 64K RAM.
		1=Select ROM (RAM 8000-FFFF).

Use	Port# (hex)	Device	Function
-----	----------------	--------	----------

System port cont.

74 244

System input port.

Bit functions.

- 0 0=floppy A selected (C on K10).
- 1 0=floppy B selected (Hard disk on K10).
- 2 0=Side 2 selected.
- 3 PSTROB.
- 4 0=motor is on (48 tpi floppy).
- 5 0=Double density is selected.
- 6 0=Parallel printer is busy.
- 7 0=64K RAM is selected.
1=ROM (RAM 8000-FFFF) selected.

Internal Modem:

0D ZSIO 2
Chan. B

Internal modem data I/O port.

0F ZSIO 2
Chan. B

Internal modem status/control I/O port.

21 PIO Chan. B

Internal modem control lines.

Bit functions.

- 0 lsb digit to dial (output).
- 1 "
- 2 "
- 3 msb digit to dial (output).
- 4 0=touch tone.
1=pulse dial.
-ate on modem chip.
- 5 0=not loop back (test mode).
- 6 0=off hook (on line).
- 7 1=digit present to dialer chip, not BSTROBE input present next digit from dialer chip.

23 PIO Chan. B

Modem PIO control port.

The internal modem on the KAYPRO 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.

Disk Controller Ports:

10	1793	Floppy disk controller status/ command I/O port.
11	1793	Floppy disk controller track register I/O port.
12	1793	Floppy disk controller sector register I/O port.
13	1793	Floppy disk controller data register I/O port.
80	WD 1002	Hard disk controller card data I/O port.
81		Error Register (input). Write Precomp. (output).
82		Sector count register I/O.
83		Sector number register I/O.
84		Cylinder low register I/O.
85		Cylinder high register I/O.
86		Size/drive/head register I/O.
87		Status register for input. Command register for output.

* Note on High density drives:

A 1 in bit position 4 will select high speed on the high density diskette drive. To reset the drive to low speed it is necessary to change this bit to a 0 AND open the drive door, then close it.

VIDEO COMMAND PROTOCOL

The 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 the 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 KAYPRO computers 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	^^

ESCAPE Sequences

Insert line	ESCape,E
Delete line	ESCape,R
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 position	ESCape,C,6
Status line preservation on	ESCape,B,7
Status line preservation off	ESCape,C,7

Note: For escape sequences, except cursor positioning, characters after ESCape are ASCII characters. The row and column specifiers for cursor positioning are straight numeric with offsets of 32.