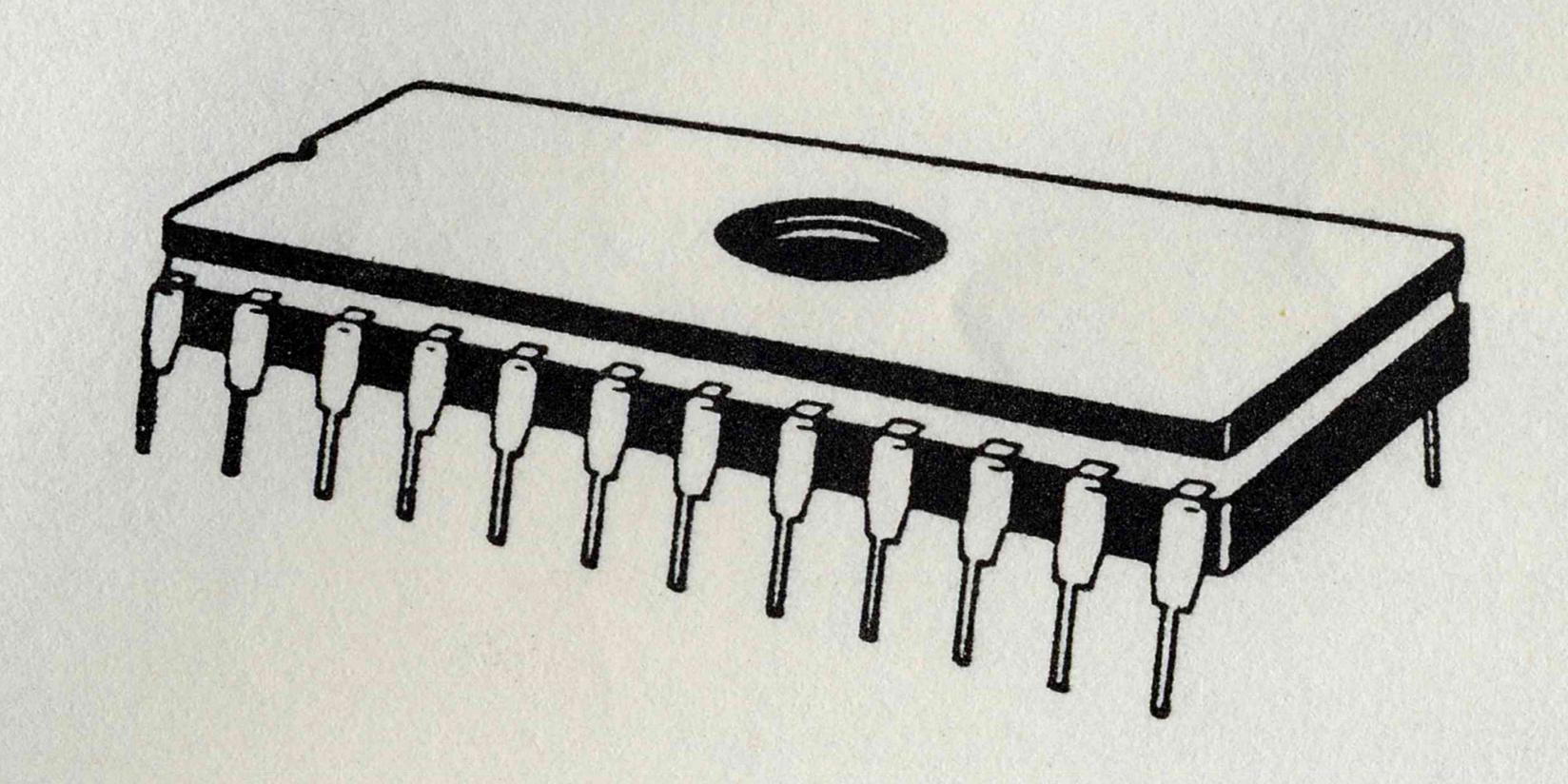
PRO-8
INSTRUCTION
MANUAL



MICRO CORNUCOPIA

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Micro Cornucopia P.O. Box 223 Bend, OR 97709

INTRODUCTION

WELCOME TO THE LAND OF WIDE OPEN DISK SPACES

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There is nothing like having room on the disk, especially when you are using disk hogs like large data bases, or byte-hungry text editors. (Perfect Writer with its swap files is a perfect example.)

I know better than to suggest that this PRO-8 package will solve all your space problems forever. After all, they do fill winchesters don't they? But this should help. Compared with 191K (or even 390K) 784K is a real experience. (And who knows, you might even learn some very interesting things about your Kaypro in the process.)

Changing your Kaypro II into a Kaypro 4

You must have a Kaypro 4 in order to use this PRO-8 package. If your system is a Kaypro 4 (purchased before February 1984) then all you need to do is plug in the enclosed ROM, add one or more drives (if you want the larger disk storage) and you are on your way. If your Kaypro 4 was purchased after February 1 1984 and it has the same graphics capabilities as the Kaypro 10, then you can't use this package. You have a Kaypro 10 board in your Kaypro 4.

If you have a Kaypro II you need to see if you really have a Kaypro 4 board inside. If so, ignore the modifications and go ahead and plug in the ROM and drive(s) and you are on your way. If not, then you need to do the following modifications to turn your II into a 4.

Do You Really Have a Kaypro II?

Note that even if your system is marked "Kaypro II," it may already be a "4" at heart. You may only need to change to double-sided, 48 tpi Tandon TM 100-2s and get a copy of the "4" formatter in order to turn your system into a Kaypro 4. (Or, of course, go ahead and get the PRO-8 package and go all the way up to the quad density drives.)

Your Kaypro II has the heart of a "4" if it has a 2732 monitor ROM and the smaller ICs are soldered in rather than socketed. Look closely at U47 (it has paper stuck to the top) if it has 2716 printed on the ceramic you have a "II" board. If it has 2732A printed on the ceramic, then you have probably have a "4" board.

MODIFICATIONS TO THE PROCESSOR BOARD

Turning a II into a 4

First the Kaypro 2 board needs to be modified to use a 2732 for the monitor ROM. The extra code needed for drive side select will not fit into the nearly-full 2716 monitor ROM of the Kaypro 2.

To run a 2732 in a Kaypro 2 you first need to pick up an additional address line, A11. Pin 2 on U59 is address line A11.

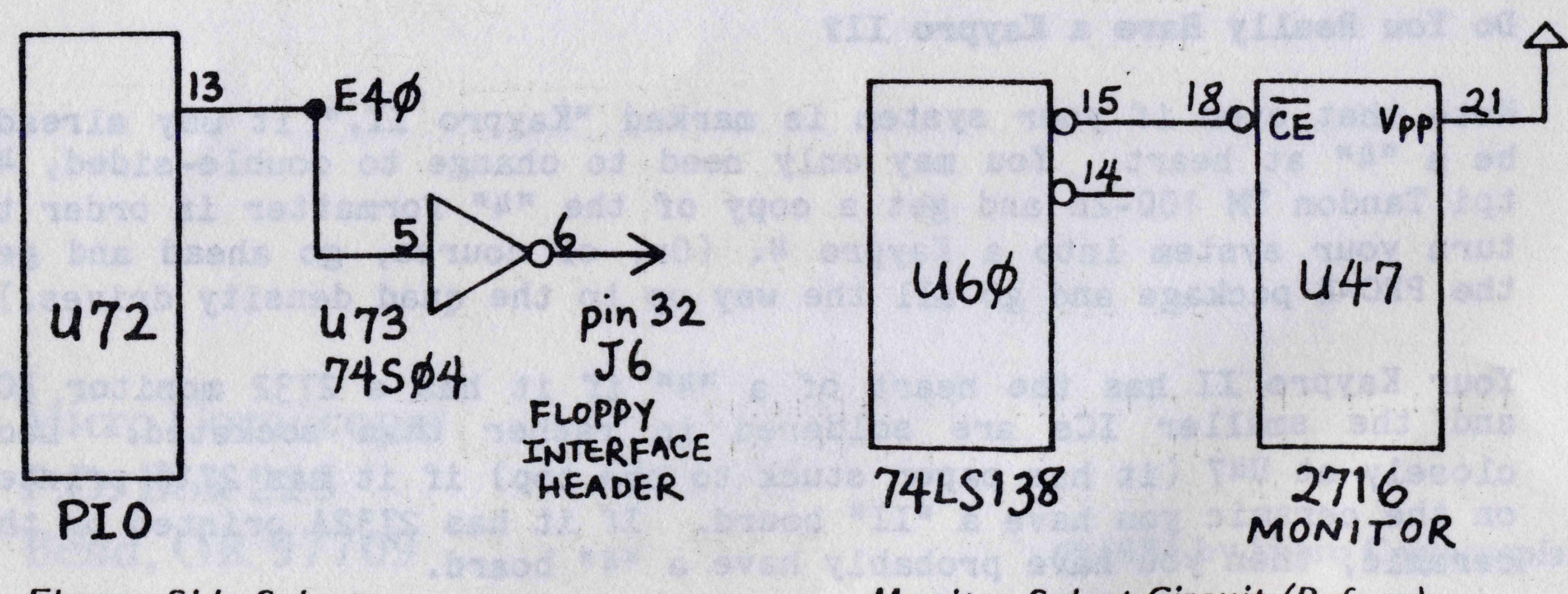
You need to connect A11 to pin 21 on the 2716 socket. Pin 21 is normally tied to +5V. So, when you are ready to put a 2732 into the socket bend pin 21 out so that it doesn't go into the socket and then add a jumper between the bent out pin and U59 pin 2.

You have another option if you don't want to solder to the Monitor ROM (makes it easier to change ROMs later). Simply plug a second 24 pin dip socket on top of the original ROM socket. Bend out pin 21 on the new socket so that it doesn't go into the original socket. Now add the jumper to the socket's pin 21.

An additional select line from decoder U60 must be used to select the second half of the 2732.

To use the select line, remove U60, bend out pin 15, and re-insert U60 into the socket making sure that pin 15 does not make contact with the socket. Now let's gate in this additional signal.

There are a number of unused gates on the Kaypro (see the Micro C schematic for a list). Each of these gates has one or more of its inputs grounded. On U80, pin 5 is a grounded input. Remove U80, bend out pin 5, and re-insert U80. Now connect U80 pin 5 to U60 pin 15.



Floppy Side Select

Monitor Select Circuit (Before)

Of Pins and Pads

When you are working on the underside of the board, you count IC pins clockwise. Pin 1 is just right of the notch on the IC. A solder pad is the small circular piece of copper circuit trace to which socket pins are soldered. When we say pad, we mean the pad on the board. When we say pin we mean the pin on the IC itself. So, after pulling out U60 pin 15 we can jumper to U60 pin 15 (the pin on the IC) and also jumper to U60 pad 15 (the pad on the circuit board that the pin used to be connected to).

Working Under the Board

Jumper the following solder pads. Connect U80 pad 6 to U60 pad 15. This connects the the output of U80 to the output enable (OE) input of the 2732. Also connect a jumper between U80 pad 4 and U60 pad 14. This brings the select for the upper 2K of ROM from the decoder U60 to a gate input in U80.

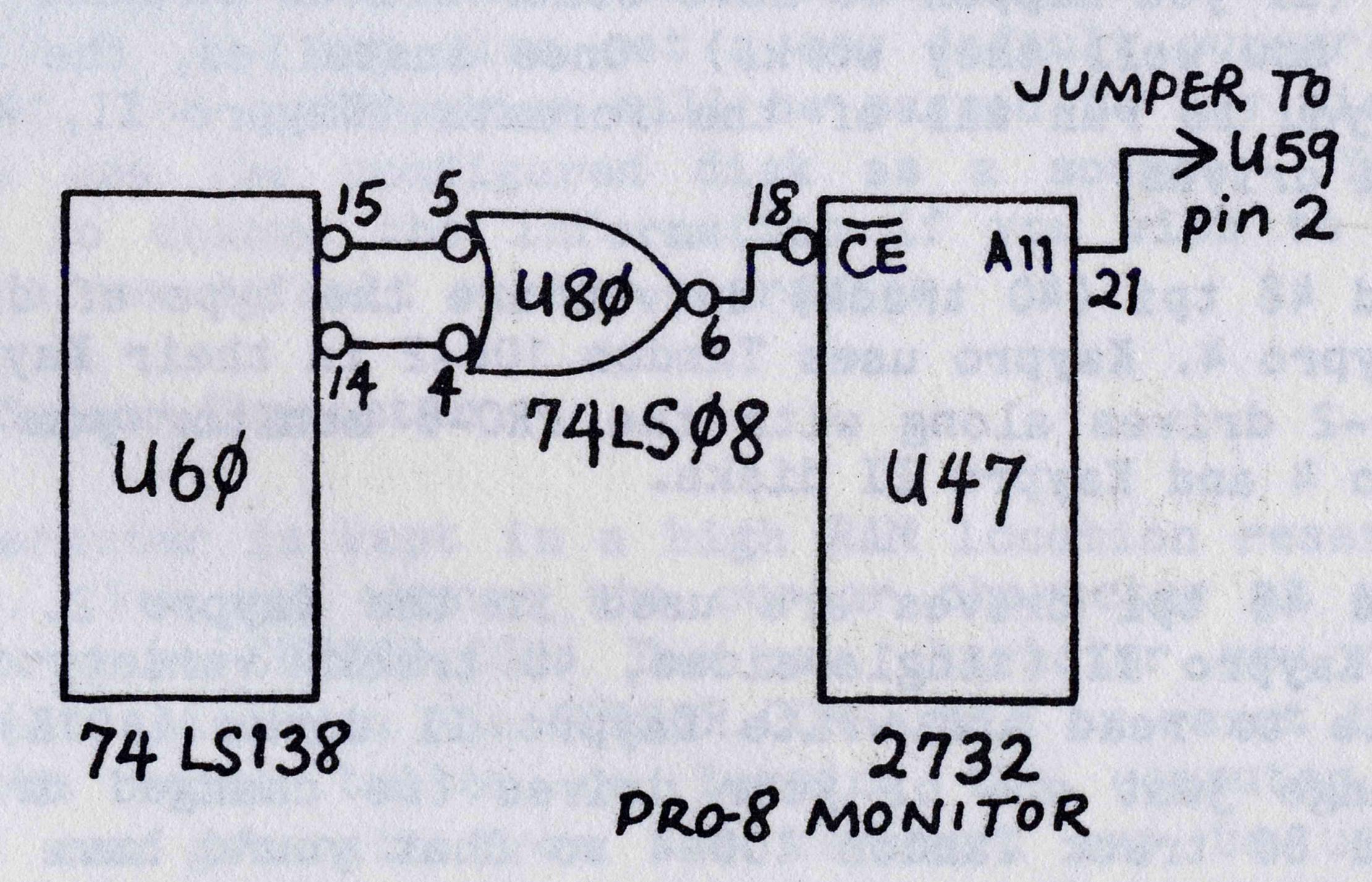
Floppy Drive Side Select

We have to find a spare inverter on the board and it turns out that U73, a 74LSO4 hex inverter, has an unused gate. However, the inverter has to be fast, and have lots of output so we'll replace this 74LSO4 with a 74SO4. (They are identical except that the S part is faster and has more output than the LS part.)

Go ahead and remove U73. Before inserting the 74SO4 in its place, bend out pin 5. Pin 5 is the grounded input of our unused inverter. Insert the 74SO4 into socket U73 making sure pin 5 does not make contact with the socket. Connect this bent-out pin to the solder pad just right of the "E40" printed on top of the circuit board. The "E40" pad is just a convenient way to connect U73 pin 5 (the bent out pin) to U72 pad 13 (the pad underneath the board). This brings the otherwise unused bit 2 from the system PIO to the inverter.

Next we'll connect the output of the inverter to the disk drive cable.

On the solder side of the board, connect U73 pad 6 to J6 pad 32. J6 is the floppy drive connector. Note how the even numbers run up one side of the double row header and the odd pin numbers are on the other side (numbers are on the top of the board).



Monitor Select Circuit (After)

Now your Kaypro 2 will be able to run double-sided drives with the appropriate monitor ROM. All you need now is a Kaypro 4 monitor ROM (available from Micro C) and you have a more or less official Kaypro 4 board. Then, just replace one or both of your drives with double sided 48 tpi units (they plug right in) and you have 390K per disk.

Turning a 4 into an 8

Since everyone now has a "4," it's trivial to go to "8." All you need to do is plug in a new monitor ROM and add some new disk formatters your system disk.

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You get all these, plus the cursor setting program, in the Cornucopia Pro 8 package. You get a special 2732 monitor ROM and the formatters you need to operate any drives you want. In other words, you can use any mix of single sided 48 tpi, double sided 48 tpi, and double sided 96 tpi drives as drives A and B. (What fun!)

You will also be able to boot up with any format disk that drive A will read. In other words, if drive A is a 96 tpi double sided drive, you'll be able to boot up with 191K, 390K, and 784K disks.

In fact, even if you are only going to use 390K drives, I think you'll find the Pro 8 package a valuable addition.

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Define Your Own Cursor

With the Pro 8 package, you will be able to set your cursor to any character you like.

You could select a non-blinking block for text entry, a blinking underline for spreadsheets, and an invisible space for games (makes games look a lot better). You get to choose blink or non-blink no matter which character you select. In fact, you could even use one of the greek characters for the cursor. For now, the new Pro-8 package is the only way you can do this.

Disk Drives

In order to run Kaypro 8 format disks (784K per drive) you will need to have double-sided 96 tpi (often called quad density) disk drives. Tandon 100-4 drives will work fine but any double sided 96 tpi drive should do. (If you happen to have other drives on hand and use them, let us know how well they work.) Once installed, the PRO-8 monitor will allow you to run all of the formats (Kaypro II, 4 and 8) with these 96 tpi drives.

Double-sided 48 tpi (40 track) drives are the type of drives shipped with the Kaypro 4. Kaypro uses Tandon 100-2 in their Kaypro 4. If you install 100-2 drives along with the PRO-8 monitor you can read and write Kaypro 4 and Kaypro II disks.

Single-sided 48 tpi drives are used in the Kaypro 2. If both your drives are Kaypro II (single-sided, 40 track) variety then you will only be able to read and write Kaypro II disks (191K). You could, however change just one of your drives (we changed drive B:) to a double-sided 80 track Tandon 100-4 so that you'd have 191K on drive A: and 784K on drive B:.

Mixing Drive Types

The PRO-8 system will allow you to run any combination of the above drives as drive A: and drive B:. You will be able to boot the computer from any disk a drive can read (all three formats for a quad density drive).

Telling the Monitor

The PRO-8 monitor needs to know the type of drive you're using as A: and B:. A program on the PRO-8 distribution disk (called PRO8SET.COM) stores this information (as well as your cursor selection) on your disk. Later, if you want to change only your cursor you can run CURSOR.COM.

If you have not configured the disk, the PRO-8 monitor will ask you which type of drive you are using as drive A: and as drive B:. Simply answer the question and the monitor will boot the disk. Once you have booted that disk and run PRO8SET.COM the monitor will boot that disk without question. Anyway, the monitor question looks as follows:

What type of drive is drive A:? Enter 8 for 80 track or 4 for 40 track. Selection?

If the A: drive is a 96 tpi (Kaypro 8) you would enter 8, if it is a 48 tpi (Kaypro II or 4) you would enter 4. It does not matter which disk format you use, the PRO-8 system will determine that automatically if you remember:

*** ALWAYS Warm Boot when you change disk formats! ***

Enter the correct number for the type of drive you are using for the B: drive. After you answer this question the Kaypro will boot. You may change your cursor character at this point by running CURSOR. COM or by running the drive initialization program PRO8SET. COM.

Setting up a PRO-8 System Disk

The program PRO8SET.COM will configure your system disk so that you need not enter the dialogue above every time you cold boot the system. The program will ask the same questions about the drives and will place your answers on the system tracks in a reserved place on track 0, sector 0. You may also set a new default cursor character. Once configured, the information will be passed to any disk that you SYSGEN if you use the configured disk as a source. You may run PRO8SET again to change the information if you wish to change the drives or set a new default cursor character.

Changing the Cursor Character

The cursor character is kept in a high RAM location reserved by the PRO-8 monitor. You may change the cursor character at any time by running the program CURSOR.COM. The new character you choose will remain in effect until you run CURSOR.COM again or reset the computer by hitting the reset button or turning the computer off. Any character you can generate from the keyboard may be used for the cursor except TAB, DELETE, RETURN, LINEFEED, or BACKSPACE.

Precautions When Using the 96 tpi Drives

If you decide to upgrade to a Kaypro 8 there are some limitations in using the 96 tpi drives. Because of the narrower track width, you should avoid writing to disks formatted and written by a 48 tpi drive. If you wish to create a disk for a Kaypro 2 or 4, begin with a blank, unformatted disk and format it using the appropriate formatting program. (See FORMAT.DOC for information about formatters on your PRO-8 disk.) Then write files to that disk as you wish but do not write to the disk with a 48 tpi drive.

The quality of diskettes you use is very important with the 96 tpi drives because of the increased data density. We have had some success with disks marked as 40 track disks but not all brands will work. If you are in doubt, use the program 8DISKTST.COM to exercise the disk for several passes before trusting the brand with your important data files. (MAG MEDIA, DYSAN, and 3M double sided double density should work well, Elephants probably won't work.)

Uniform

All programs that use the BIOS for disk I/O should work fine with the 96 tpi drives. A few programs don't. UNIFORM, for example, does not, which is why it needed to be rewritten for the Kaypro 4. If you need to use UNIFORM you will need to keep the B: drive a 48 tpi unit. Then you will be able to use UNIFORM no matter what your A: drive is.

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Section 3

CHANGING DISK DRIVES

New Drive(s)

Changing disk drives in the Kaypro is quite easy. First remove the cover from the Kaypro's cabinet.

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Inside the Kaypro there is a metal shield around the disk drives. The drives are fastened to the metal shield by eight screws. On most systems these are allen-head screws, four in each side of the metal shield. To get at the screws you will probably have to remove the main circuit board (has the Z80 on it).

Once the screws are out, you can unplug the data, power, and ground connectors from the rear of the drives (or just one drive if you are not changing both). Then gently pull the drive(s) out the front of the cabinet.

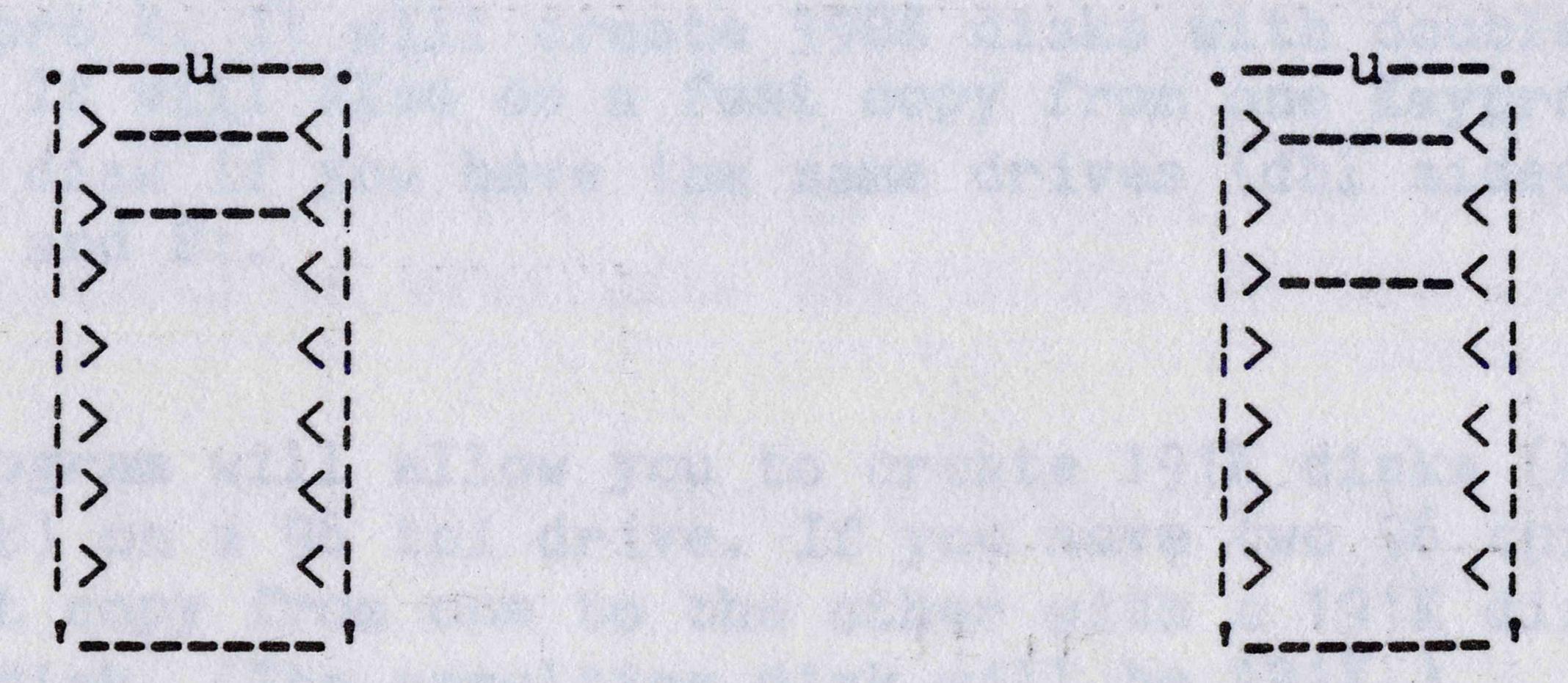
Before installing the new drive(s), you need to set up the shunt(s) and terminator(s) correctly.

Shunts

The shunts are the part of the disk drive circuit that determines if the drive is to be drive A: or drive B:. The shunts on each drive are slightly different. After you have removed the drive you wish to replace, examine the circuit board and locate the shunt (marked 1E on the silk screened legend of the board on Tandon drives). The shunt you find there should resemble one of the shunts in the following diagram:

SHUNT FOR THE A DRIVE

SHUNT FOR THE B DRIVE



Assuming that you will be replacing your present Tandons with new Tandons, you will need to put the shunt from your old Tandon into the sockets marked 1E on the new Tandons. If you are not going to be using Tandons, you'll have to find out how to tell the new drives that one will be drive A: and the other drive B: (assuming you are changing both).

The new Tandons may come with shunts in place but the shunts will have no broken traces. Replace these shunts with the shunts from your present drives.

NOTE:

On the Tandons, the socket has more pins than the shunt. Notice that the notch end of the shunt lines up with the notch end of the socket. There are two empty pins on the other end of the socket, one on each side.

Terminator

The last drive on the cable will have a terminator installed, the other drive will not. The terminator will resemble an IC (integrated circuit) and may be blue in color to make it easy to locate. On Tandon drives the terminator can be found in the socket marked 2F. Most manufacturers will put a terminator in each drive.

Only the last drive on the wide ribbon cable (the one furthest from the main processor board) should have a terminator.

Installation

Slide the new drive(s) back into the system (drive A: is usually on top). Carefully install the DC power connector to the disk drive (it can only go on one way). Also install the green grounding wire to the spade connector on the chassis of the drive. Then connect the ribbon cable. The edge with a red stripe on it is on the pins 1 & 2 end. Now reinstall the main circuit board and all connectors.

Trouble

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If the computer will not boot or access both drives (don't forget to install the PRO8 monitor) go back and check your work and connections.

If the drive select light(s) don't work properly the problem is probably in the shunt. If the system monitor signs on but the motors do not turn you probably don't have power connected. If the system monitor does not sign on then check the pins on the PRO-8 monitor.

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USING THE PRO 8 SYSTEM

Using the PRO8 System Disk Formatters

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The PRO8 disk contains several formatters that will format or copy any Kaypro format. When using any of these formatters keep the following in mind:

- 1. Full disk fast copies are only possible when both drives and both disks are the same. (i.e. it is impossible to do a full disk copy from a 96 tpi drive to a 48 tpi drive even if you are copying to and from a Kaypro 2 or 4 disk format.) Again, BOTH DRIVES MUST BE THE SAME TO DO FULL DISK FAST COPIES. The disk format you end up with will be the same as the source disk. You also must boot up with a system disk that has the same format as the source disk.
- 2. When formatting, use the formatter that is appropriate for the drive that will contain the disk to be formatted. If you are formatting the disk in drive B: you must use the formatter for the type of drive that B: is, no matter what type of drive you have for A:. It is NOT necessary when formatting to have the system disk the same format as the disk your will be formatting.

8COPY. COM

This program allows you to create 784K disks with double sided 96 tpi disk drives (Kaypro 8 format). It also will do a full disk fast copy from one Kaypro 8 disk to a blank disk. It can only be used on 96 tpi drives. The menu is identical to the Kaypro COPY.COM.

4COPY.COM

This program is identical to the COPY.COM shipped with the Kaypro 4. It will create 390K disks with double sided 48 tpi drives. It will also do a fast copy from one Kaypro 4 disk to a blank disk if you have the same drives (dbl sided 48 tpi) for both A: and B:.

2/0N\8.COM

This program will allow you to create 191K disks (Kaypro 2 format) on a 96 tpi drive. If you have two 96 tpi drives you can fast copy from one to the other with a 191K disk as the source disk. (The resulting disk will be 191K.)

4/0N\8. COM

This program will allow you to create 390K disks (Kaypro 4 format) on a 96 tpi drive. You may also do a fast copy from a 390K disk if you have two 96 tpi drives. (The resulting disk will be 390K).

Plus-4 Decoder Board Notes

The Plus-4 Decoder Board plugs onto your main computer where the drive cable is currently connected. You need to obtain a drive cable with the extra drive connectors and plug it into the decoder board. If you will be using four half-height, half-power drives inside the Kaypro, you can simply add two 34-pin data connectors to your present data cable and add two power connectors to the power supply in the Kaypro.

When installing the Plus-4 decoder board, one jumper is required to power the chip on the 4+ board. On J6, pin 4 must be jumpered to +5 volts on the motherboard. U81 pin 14 is convenient.

Teac 55 series and the Mitsubishi M4853s are half-power drives, therefore four drives can operate off of the KAYPRO power supply with our 4+ decoder board. Tandon or CDC drives (if you add drive C and D) will require their own power source.

Make sure you only have one terminator (resistor pack) located on the last physical drive of your system. Exceptions to this statement follow:

If you are using 4 Teac 55 drives then the terminator needs only to be on drive D:. If you are using drives (for C and D) that require their own power supply then a terminator is required on drive B: as well as on drive D:. A 600 OHM terminating resistor pack should do the trick. This way when you need to take your KAYPRO and use it independent of your C: and D: drives, drive A: and B: will be protected by the terminator on B:.

Files on the PRO-8 Utilities Disk

-READ. ME 2/0N\8.COM 4/0N\8.COM 4COPY.COM 8COPY. COM 8DISKTST. COM CRC. COM CRC. DOC CRCKLIST. CRC CURSOR. COM D. COM DISKTEST. DOC FORMAT2.COM PRO8+SET. COM PROSSET. COM RESELECT. COM RESELECT. DOC

**** PRO-8 and Plus-4 Decoder Board Update ******************

NOTE: You will not be able to boot the Pro-8 Utilities diskette. Boot your PRO-8 system from your usual system disk. IMPORTANT: Make a copy of the PRO-8 disk and put it away in a safe place.

If you've done a speed-up modification to your Kaypro you need to switch your machine back to 2.5MHz before attempting to use any of the COPY programs. When transferring files between different floppy formats and different drive types, it is more efficient to use PIP.COM.

The disk contains all the files you will need to use and modify your PRO-8 system. One special case that did not get in the printed manual is the use of a 96 tpi drive in A: and a 48 tpi drive in B:. The file on the disk named RESELECT. DOC explains the process of creating your first 96 tpi system disk. You will need to follow those directions if and only if you have a 96 tpi drive in A: and a 48 tpi drive in B:. All other combinations will cause no problems.

Other New Files and their uses:

PRO8+SET.COM

This program allows you to configure a 4-drive PRO-8 system. You must have done the modifications described in issue #17 for creating the extra drive select signals or purchased our Plus-4 decoder board, and you must create a 63K CP/M in the following way:

- 1) Make a copy of your CP/M system disk and boot it in drive A:. Create the 63K system by entering: MOVCPM 63 *.
- 2) When the program has completed (system warm boots) enter: SYSGEN. When asked for a source disk reply with a carriage return (we will use the system image left in memory by MOVCPM). When asked for a destination disk reply with: A:.
- 3) After the new system is on the disk in A:, hit the reset button. The cold boot sign-on should say Kaypro 63K CP/M.
- 4) You may now run PRO8+SET. COM.

NOTE: If your system is presently set up with the 64K version of ZCPR, you will need to get a copy of the 63K version (New Kaypro 4 version on user disk K22) and reinstall it after you create a 63K system.

FORMAT2. COM

This formatting program will create any format disk in any of the four disk drives. It should be used instead of the copy programs that came with this disk if your drives will not format properly with the other copy programs. It WILL NOT generate system tracks. Use SYSGEN.COM on your CP/M disk to put on system tracks.

Notes on the PRO-8 Package

CAUTION: When working on the drive cables (NEAR THE SWITCHING POWER SUPPLY), please disconnect the power cord from the power jack located at the rear of the cabinet. Switching power supplies are touchy creatures.

When your system boots and the prompt asks what kind of drive is A:, etc., these are hardware dependent questions. Even though you are booting up with your old system disk (ssdd), you have to answer the questions with reference to the physical disk drive (i.e., "8" for 96 tpi drives, "4" for 48 tpi single or double sided drives).

Kaypro II to 4 conversion

It is important that a 3 wire soldering iron be used on all modifications. This will eliminate the probability of damage to any static sensitive chips you may be soldering on.

Monitor Select Circuit

When picking up A11 from U59 DO NOT bend out pin 2, just tack on to the exposed part of the pin. Don't forget to change U73 to a 74SO4, this faster part is critical for the select pulse from U72.

Greg DeHoogh sent us a note on an easier monitor select circuit. Simply bend up pin 1 of U60 and jumper it to pin 8 (ground). This changes U60 to a 1-of-4 decoder using outputs 0,2,4, and 6 which decode on 4K boundaries. This method eliminates the need to add in an extra gate and the accompanying jumpers.

Floppy Side Select

If you are having problems and have an old Kaypro, check U82 (the floppy disk controller). If it is a 1793 disregard the rest of this note. If it is a 1791 you must do the side select circuit a little differently. Bend out pin 6 of U73 and solder from this bent out pin to pin 32 of J6. (Before you had jumpered from U73 pad 6 to J6 pin 32. Remove that jumper). Now bend out pin 13 of U72 (the PIO). Jumper from this bent out pin to the bent out pin 5 of U73. Originally we jumpered to E40, remove that jumper.

These changes are necessary because the original design of the Kaypro used this line to strobe or test for busy on the unused side of the system port. This arrangement was never used for anything but it tied up that bit on the PIO. We are just avoiding that traffic by direct jumpering.

Drive Idiosyncrasies

Jumper options for most drives are located directly behind or near the drive data cable edge connector. Terminator resistor packs are located near the jumper options and are usually socketed.

TEAC

For those who are installing TEAC 55 series drives use FORMAT2 to format your disks. This will eliminate errors on track zero that crop up when using one of the other formatters on this disk. FORMAT2 will not generate system tracks. Use SYSGEN.COM on your CP/M disk to put on system tracks.

Teac drive ribbon connectors are mounted upside down from other drive manufacturers. If you mix Teac drives with Tandon drives the drive data cable may be too short.

To jumper the Teacs change the HS option to the HM option. The drive select options are set by DSO-DS1. Drive A: corresponds to DSO; drive B: corresponds to DS1, etc..

TANDON 101-4

To set up the jumpers do the following:

- 1. W9 open
- 2. W19 closed
- 3. Jumper on W13 sets up for 6ms step rate
- 4. W10 open
- 5. W11 open
- 6. W12 open
- 7. W14 open

To jumper drive select do the following:

- 1. W1 ==> drive A:
- 2. W2 ==> drive B:
- 3. W3 ==> drive C:
- 4. W4 ==> drive D:

The onboard processor only checks the jumper options upon power-up so make sure you power down after the jumpers have been set.

CDC

Make sure the "M" option is jumpered and drive selection is done by jumpering drive number 1 for drive A:; 2 for drive B: and so on.

MITSUBISHI M4853

Move the HS jumper option to the HM option. Drive select options are DSO-DS3, these correspond to drive A: - drive D: respectively. The terminators are soldered in but there are 7 jumpers located behind the terminator. Removing these jumpers isolates the terminator from the board.

Examples

To create a Kaypro 2 format disk:

If A: is 96 tpi and B: is a single sided 48 tpi (Kaypro 2 drive):

Use the copy program that came with your Kaypro 2. Place the disk to format in drive B:. First choose the '0' selection (Other menu) then choose the 'F' selection (Format the disk in B:).

If both A: and B: are 96 tpi drives:

Use 2/ON\8.COM. Choose the 'O' selection then choose 'F' to format the disk in B: or 'X' to format the disk in A:. When using the X option don't forget to remove your system disk from A: and place the disk you want to format in its place.

To create a Kaypro 4 format disk:

If A: is a double sided 48 tpi drive (Kaypro 4) and B: is a Kaypro 2 drive:

Use 4COPY.COM and select the 'O' option and then the 'X' option (Format the disk in A:).

If A: is a double sided 48 tpi drive (Kaypro 4) and B: is a 96 tpi drive:

You may use 4COPY.COM and select the '0' option and then 'X'. Or if you are planning to use the disk in the 96 tpi drive you can use 4<ON>8.COM and select the '0' option and then the 'F' option.

ALWAYS, ALWAYS warm boot (cntl-C) when inserting a disk with a new format (you should warm boot when inserting a new disk anyway).

Once a disk has been formatted to double sided you will never be able to reformat it to single sided unless it is completely erased with a magnet. (This is true of unmodified Kaypro 4's also).

If a disk was formatted or written on by a 48 tpi drive (Kaypro II or 4) do not write on it with a 96 tpi drive (you can read it however). Erase the disk with a magnet or a tape head demagnetizer and reformat it with your 96 tpi drives before writing if the disk has been written on by a 48 tpi drive. Once you have created a 48 tpi disk on a 96 tpi drive, the 48 tpi drives will have no trouble reading or writing on the disk.

Again, you can READ any Kaypro format disk with a 96 tpi drive without any problems.

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Finally

Enjoy your new giant sized Kaypro. If you have also done the Micro Cornucopia 5 MHz speedup, you not only have one of the biggest, but one the most reponsive portable computers on the market. (Better than the IBM even!) Not bad for a little system that retailed for under \$2000.