KayPro Column

By David Thompson

Non Linear has had its share of problems with drives. The first problems they had, included the clock timing problem (see the fix in the last KayPro Column), and the Tandon drive's sensitivity to an electrostatic field (the Cathode Ray Tube).

Drive heat

They fixed the timing and improved the shielding around the drives, but the additional shielding appears to have created a heat problem, especially on drive A. I've talked to a number of owners who have placed small fans behind their drives to reduce the heat.

I got wind of the problem when I picked up a new system from a local dealer and found that it was generating sector errors on drive A (the same marginal disk worked just fine in drive B and in both drives of my older model).

I took the new system back to the dealer and we checked the disk in the only other unit they had in stock. Both drives of the other unit could read the disk just fine for a few minutes, but soon its A drive began to throw up on that one weak sector. Well now, heat was obviously contributing.

Chuck, the dealer's hardware expert, had dissected large systems for years but hadn't dug into a KayPro, so he welcomed a chance to jump in.

When I left he was on his way out to purchase an allen wrench. It turns out, to remove the drives you just remove the allen screws from each side of the drive housing, unplug the cables from the back of each drive and then pull the drives forward out the front of the cabinet. You don't remove the housing at all.

It wasn't long before Chuck was surrounded by drives, and parts, and cables . . .

Terminators

He found a manufacturing error. On one system there were terminators on both drives, on the other KayPro there wasn't a terminator on either drive. Well, now!

The terminator (in socket 2F on a Tandon drive) is simply a set of pull-up resistors. These resistors make sure the signal lines are high except when pulled low by the drivers on the processor board. Terminators are installed on the last drive on the cable to reduce garbage (ringing) on the line. If there are terminators on more than one drive, it gets difficult for the system to pull the lines low.

A terminator is supposed to be installed on drive B but nowhere else, so both systems were wrong (and there was a difference of about 3,000 between their serial numbers). How much the terminator problems contributed to the errors, I don't know, but it appears that they contributed. We're back to checking for errors, but so far things look better, much better.

Tandon Alignment

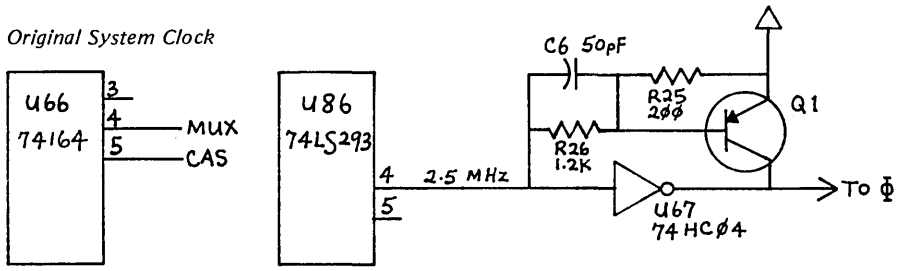
I've gotten calls from individuals and manufacturers who use Tandon drives in their products. The consistent theme of these calls is that about half of the received drives don't meet Tandon's own specs so they have to do a complete alignment procedure before using them in new equipment. Disk manufacturers have been telling me the same thing about all the drive manufacturers so Tandon is not the only one having problems.

After I ordered the OEM manual from Tandon, I got a call from one of their marketing types who was concerned that I might publish something without letting them read it first. Of course, if I were selling 24,000 drives a month to Non Linear, I'd be a little worried about what got into the press. (And, of course, my only reason for starting Micro C was so I could become a corporate mouthpiece.)

To their credit, Tandon shipped the manual promptly and it's the best I've seen. You can get the manual ($25) by calling 213-993-6644 and telling them you want to order the OEM manual for the TM-100-1 drive (manual number 179022-001).

Speeding Things Up

The Kaypro can easily be converted to 4 or 5 MHz with just a few jumpers. The best thing about this modification is that the only fast parts needed are the monitor ROM and the CPU. We tried a few Mostek Z80-As which are only supposed to be good to 4 MHz but half of them ran at 5 MHz with no problems. However, it's really safest to use a Z80B for either 4 or 5 MHz (heat really slows down Z80s and things get quite warm in the KayPro).



First do the drive fix described in issue #11 (Kaypro column). The 4MHz mod assumes you've made this change and it's not a bad idea anyway. If you have a newer system, you'll find that this mod has already been done (there will be small wire-jumpers on U87).

CAS and MUXC must be moved down a pin on the shift register in order for the DRAM timing to be correct. To do this you should unplug U66 and bend out pins 4 and 5 so they won't go back into the socket. Put U66 back in its socket and connect the trace that used to go to pin 4 to pin 3, and connect the trace that used to go to pin 5 to pin 4.

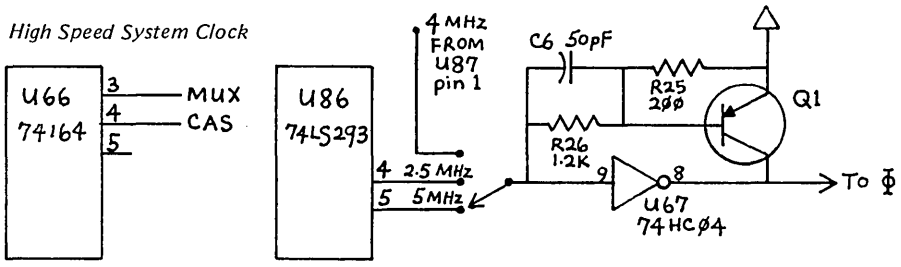
The next step is to bend out pin 4 from U86. This is the 2.5 Mhz clock. 4 Mhz is available on pin 6 of U87 and 5 Mhz is available on pin 5 of U86. The clock of your choice needs to be brought to the forward end of R26 (i.e. the end which is nearest the front of the KayPro).

You can use a single-pole-double-throw switch to select between 2.5 Mhz and one of the faster clocks. You can mount the switch in one of the ventilation slots on the back. The slots are just the right width for the small toggle variety so you don't need to modify the cabinet at all.

The early versions of the disk format and copy programs don't work with the faster clock (which is probably why some commercial mods go back to 2.5 MHz for disk I/O). So you may need to slow down the system once in a while.

If you want both fast speeds then you need to use triple pole version or equivalent. The difference between 4 and 5 MHz is not very obvious but the difference between 4 and 2.5 MHz is like night

High Speed System Clock



and day. Note: You will usually need to do a hardware reset when you change speeds since the glitch usually sends the system out to pasture.

The 4 MHz signal is not a true 50% high/low waveform. It is 60% high and 40% low because it is generated by dividing the 20 MHz crystal by 5. This waveform isn't perfect but it has worked well on my Big Board for two years now. Even so, it's a good idea to use a Z80B part just to be on the safe side. The 5 MHz signal is 50% high and low.

Now that I am used to a fast Kaypro, the standard 2.5 MHz version seems to crawl.

Deluxe Size KayPro Schematic

Non Linear has finally produced a KayPro II schematic on a half-dozen pages but it's easy to spend a half hour trying to locate all the places a single signal goes.

So we have done a single-sheet schematic (wall size) and we're finalizing a theory of operation that's keyed to the schematic.

Frank Guthrie did a super job with the schematic layout and drawing. He organized the circuit into processor, video, and I/O sections, and then drew the whole thing in positive logic. In the process, he found uncounted errors in Non Linear's originals. (We ran out of hands and toes.)

Anyway, there'll be no more searching the "twisty maze of passages, all different," for the other end of a line.

Dana Cotant, who's just joined Micro C's technical department (he IS the technical department), is doing the theory of operation. He is doing detailed circuit descriptions keyed to the schematic and to block diagrams. If you are at all interested in what's going on inside the KayPro, this is for you. (See our KayPro ad in this issue for price.)

KayPro User Disks

Dana and I have been modifying some of the BB I software so it will run on the KayPro (and vice versa). There are enough differences between the KayPro and the BB monitors that some software needs futzing to move over. We've also been making some of software we've received for the KayPro available on the BB I disks. Modem7+ for the BB I is an example of this.

The KayPro disks are $12 instead of $15 because they are cheaper and because they only hold 191K.

Eight Inch Drive

We've just received an announcement of the Expander, an 8" floppy interface for the KayPro. The interface lets you use an 8" drive as drive C (241K single-density only). The original 5" drives continue to work as usual.

The Expander retails for $199.00 (not including the 8" drive, power supply, and cabinet). It's available from:

Auburn Computer Center
1265 Grass Valley Hwy
Auburn, CA 95603
916-885-1040

15 Megabytes on a KayPro II

You have to realize that I've never had 15 Megabytes of anything, so having "drives A and B" with over 7 Meg each is pretty unreal. The one I have is called the Delphi and is manufactured by the Computer Collaborative.

I heard about the drive from Wayne Campeau at Anchor Computing in Seattle. Anchor is already installing these drives in KayPros and people have really liked them.

The winchester itself is a 19.4 Megabyte (unformatted) 5.25" unit manufactured by International Memories Inc. It is shock mounted and includes: thin-film plated media, a dedicated area for the heads during shipping, and heavy duty head positioning. The folks at the Computer Collaborative chose this unit because they wanted a hard disk that would be rugged enough to be hauled around with the KayPro. The drive comes with a 2-year guarantee.

They added a Data Technology Corp controller, a power supply, a fancy cabinet and made it run.

Installation is trivial. Unplug the Z80, plug the SASI-like adaptor board into the Z80 socket and plug the Z80 into the adaptor. A ribbon cable runs out under the lid to the winchester. Then you boot up their version of CP/M and you are on your way.

The present manual is simply step-by-step instructions on installation (along with suggestions of things to check if it doesn't come up) followed by the OEM manuals for the controller and the winchester. I'd like to see them add a commented source of the CBIOS. (I'm not your average KayPro owner.)

So far it has run flawlessly and has made the KayPro really super for text editing and software development. You still have access to the original KayPro drives as C and D for backing up data.

If you boot up your original KayPro system disk, the 5" drives are back to being A and B and the system runs as though it had never heard of the Delphi.

I have a preliminary version of the Delphi. They are working on cutting the costs of the cabinet, controller, and power supply by designing their own. If they succeed, then they should be able to get the price of the unit under $2,000 and still maintain their high quality. (It looks like they might just pull it off.) They are also finishing up a version for the BB I.

The Delphi winchester drive is available from:

Computer Collaborative Inc
6273 19th Ave NE
Seattle, WA 98115
206-524-5369

For Hardware fanatics

Those of you who want to get much more intimate with your KayPro (maybe "friendly" is a better word)—and much more familiar with inner workings of computers in general—should consider building a Big Board.

You can order the documentation on the Big Board for just $5.00 which includes schematics, construction instructions (step by step) and a good description of the system.

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