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Z-100 LifeLine
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Z-100 LifeLine Web Site: **https://z100lifeline.swvagts.com (new effective September 2019)**

HOWGOZIT

As you may recall from the last issue, I'm now sending you the "*Z-100 LifeLine*" for free! The only catch is that you can't expect it to come very often and I can't send any more free disks - the post office is just getting too expensive.

However, I did hope to continue publishing it when I have the opportunity and something to pass on. I just did not expect it to be two years between issues. I'm very sorry about that, as I have missed you all. My personal issues have now been resolved and I'm ready to go back to work.

The "*Z-100 LifeLine*" website is still active, though I have not undated it in quite a while, and e-mail traffic remains busy. New people are still interested in repairing their Z-100's and those who just obtained one are very interested in getting their's to run and to even do some upgrades. So keep in touch. Let me know how you are doing.

On the other hand, if you are no longer interested, please let me know. I really can't afford to just send you junk mail that you won't read. Just drop me an e-mail to stop the mail.

So, as a reward for staying with me through these hard times, this is a very special issue. I hope you like it...

A Color Z-120 All-In-One!

Yes, you heard me right. And for those who may have thought that this sounds familiar, you are showing your age, because it was shown at the first Z-100 Get-together in Norfolk, November 10 and 11th, 1990, and mentioned in the "*Z-100 Lifeline*", issue 10!

I had also spent hours searching through my "*Remark*" and "*Sextant*" Magazines, but never found any other reference to this unique Z-120 capability milestone. I thought it was earlier than 1990, and I thought there were some pictures, but in that same issue, Paul had included a picture of a color Proscan-equipped Z-100.

I'm surprised that I had remembered that small paragraph.

Anyway, this issue will document such an accomplishment the way it should have been done back then.

The architect of this fantastic accomplishment is Lee Jones, presently living in eastern Tennessee. He built the original Z-120 kit around 1985 while working for Motorola in Fort Lauderdale. He thinks the modification was done about 1988. He is still an active ham operator, call sign WB4JTR, if any of you would like to say "hi".

The computer had EasyPC, an UCI IBM-PC emulator, installed and used a CDR-317 22 MB Winchester hard drive system, split into MS-DOS, UCI and CP/M partitions.

The computer worked continuously until about 3-4 years ago when Lee noticed the Zenith side would no longer boot. The normal boot procedure was to power on or reset, wait for the UCI multi-boot screen, and type "Z" for Zenith or "I" for IBM. To access the CP/M, after pressing the "Z", he booted with the command, "B(oot){F3}:CP/M".

According to Lee, the primary symptom was a garbage display for the UCI multi-boot screen. You just had to type "I" in the blind and the garbage screen would give way to a normal PC-DOS boot-up. He didn't do any troubleshooting since the computer was completely unused.

Anyway, Lee sent me an e-mail asking if I knew of anyone in the area that might want his computer, and I jumped at the chance, thinking that this special computer needs to be fully documented for its historical significance - here...

Disassembling the Z-120

I have a policy of not trying to start a new computer acquisition, no matter how tempting, until I have checked the power supply for opens and shorts. Powering up a computer that hasn't been used in several years is just asking for power problems. So disassembly was the first order of business.

As you can see from the pictures, this computer was filled to the brim. In addition to sporting the UCI EasyPC system (which includes a daughter board for the motherboard, a separate speaker, and its own floppy disk controller) and CDR-317 hard drive system, it also had the UCI Easy I/O board providing an additional RS-232 serial port to the back panel, an unknown modem board, an 8087 co-processor board, and a FBE Research Company ZCLK calendar/clock module attached to the 68A21 peripheral interface adaptor IC (U114). The motherboard had 768k RAM and ran at 5 MHz.

And if this was not enough, the entire left side of the computer was filled with a heavily modified standard Z-120 power supply and all the video boards necessary to support a color CRT that just barely fit in the Z-120 chassis!

I could not believe what I was looking at!

The drive tower was packed with a Seagate ST-225 21Mb hard drive and a Xebec 4105 SCSI Host Adaptor, a standard 360Kb Alps DFC222B11A floppy drive, and a Canon MD5511-V6 dual high-density 5.25"/3.5" floppy drive. The Host Adaptor card was mounted under the lowest floppy drive.

The normal Z-120 small video driver board was replaced by a huge video processing system that was mounted on top of the power supply with a special lid that replaced the normal humped lid, and the fan was mounted inverted! The color CRT just fit under a small board attached to the top of this vertical processing board. Finally, a second fan was mounted to the computer's cover.

What was an engineering marvel! Further, I could not believe that the Z-100's normal power supply could support all of this!

I slowly, and very cautiously, disassembled the computer, taking many pictures as I went. After removing the top cover, as with the normal Z-120, the CRT and drive assembly was lifted off next. There were a few more wires than usual to disconnect, and the CRT needed to be guided carefully out from under the small board laying over it, but with two people, it was removed successfully.

From there, the disassembly was normal. I striped the Z-100 completely and began visually checking the power supply and various boards.

The power supply was full of dust - it had obviously been well-used. All the solder joints were fine and I installed another fan assembly to do the preliminary testing as I reassembled the computer - less the color video assembly.

I visually checked the motherboard on both sides, installing spare chips where the EasyPC board normally plugged in and left vacant sockets.

The first power tests were completed successfully with just the motherboard attached. Great!

Reassembly and Testing Begin

I reinstalled the motherboard and power supply (which was now configured as normal for a Z-120).

Next, I configured the motherboard with our latest v4.3 monitor ROM, a 9.4 MHz oscillator assembly, and the video controller board (also visually checked). The delay line was already a 100ns unit, perfect for 7-10 MHz operation. Using a temporary, external composite monitor, I powered up again and found everything working great. All ROM memory checks, including the video RAM, worked great at 9.4 MHz!

I reinstalled the UCI EasyPC system, less the Easy I/O board and the excess 8087 co-processor board. I consider the 8087 to be overkill, in that for the processing that I do, the 8087 is unnecessary. I have yet to see where the 8087 is helpful - maybe when using CAD or huge spread-sheets? Anyway, all tests were still successful.

From here on, however, the computer obviously missed Lee. It balked at every attempt to further check and repair. As you will soon see, nothing wanted to work properly.

I attached some drives and reinstalled the original v3.1 monitor ROM and changed the oscillator to run at 7.5 MHz. On power up, I could not get any video! Re-installed my v4.3 ROM - ok. Found that the v3.1 monitor ROM was the cause. I'll have to check its programming at another time. But I'll leave the new, later ROM installed.

I now had the system operational. Except for four groups of two or three garbage characters displayed about 4" apart in a box shape on the screen just before the EasyPC screen appeared, all looked great.

I found that in the Zenith mode, the hard drive would not boot, displaying "Error - unable to read boot code from partition. Type return to continue." However, the drive was accessible after booting to the floppy drive and using ASGNPART to assign the hard drive a drive letter.

ASGNPART 0: gave me the partition info:

ZDS	MS-DOS_3_1	30%	6637Kb
UCI	UCI	60%	13274Kb
CP/M	CP/M_2_2	10%	2211Kb

Default Boot: ZDS;MS-DOS_3_1

Booting to the IBM side also did not work - with nothing happening after typing "BW".

The only partition accessible was the CP/M partition, which came up with CP/M-85 Version 2.2.101, 03/10/83.

However, after booting to the ZDOS floppy, I could still see the contents of the ZDOS partition. First, I had to use the command ASGNPART ZDS E: to assign the drive letter E: to the ZDS partition. Then I could play with the E: drive normally. So the drive was working, but I just could not Boot to it. Looking at the .SYS files, all looked normal. And doing a file compare with the FC utility showed the files were the same as on my floppy working disk for ZDOS (Zenith's MS-DOS) v3.10.

However, as I continued playing with the hard drive, I began to get an increasing number of read errors. I was also getting seek errors while formatting drive B: (imaginary) from drive A:.

Running CHKDSK, it reported errors found, and there were 14 lost clusters found in one chain and 28672 bytes of disk space could be freed.

Suspecting an EASYPC board problem, I removed the EasyPC board and tried again. Formatting drive B: now worked fine. However, I could still not boot to the Zenith partition on the hard drive. Looking at the directory again, however, I found that MSDOS.SYS was still there, but listed as 0K! Somewhere along the line I had inadvertently screwed up the directory, and while the file was still there, according to CHKDSK as a lost chain, I could find no way to reload it.

For those that feel I could reload the system files using the SYS command, I tried, and got the error "Incompatible system size"! Remember, the directory shows MSDOS.SYS as 0K.

Anyway, to make a very long day's work a short story, I reformatted the partition and reloaded ZDOS v3.10 from scratch. The drive now worked flawlessly.

But, to check the UCI partition, I needed to reinstall the EasyPC board. Nope! Same issues as before. I replaced all the chips on the EasyPC board that I could, except for the three 74HCTLS373 chips, and tried again.

This time, I got the warning "Error in ROM U190". This was the V4.3 ROM, which had been working fine. I continued anyway. No Zenith hard drive boot, with the usual "Unable to read boot code". The PC boot still stalled after entering the "BW". But formatting floppies worked fine.

Rebooting the computer to try again, I got the error "Video RAM error. Chip U306", which I changed. I no longer got U190 ROM errors, which I had considered a fluke anyway.

I was still at 5 MHz, and replaced the three 74HCTLS373 chips with the 74LS373 chips from the motherboard. Success! Now everything worked fine! All hard drive partitions worked and formatting floppies worked!

So, a bad 74HCTLS373 was the culprit. Now, how fast can we go? Tried 7.5 MHz - no problem. Next I tried 9.4 MHz (I only have a few oscillators to try). Nope. I got an erratic UCI EasyPC screen.

I did not have any extra 74HCT373 chips. So I tried substituting 74ALS373 chips, but no luck. However, I found that 74F373 chips would work briefly, the time for one hard drive boot to each partition, but on the second attempt to repeat the set, I was back to the original symptoms.

Note: I have since found that you must do cold boots, i.e. Power-off Boots, when using EasyPC.

So, 9.5 MHz was a problem for the 373 chips on the EasyPC board. I left the 74F373 chips on the board and slowed back down to 7.5 MHz, where everything was operational again.

During all this, I also found that the ZCLK was not working. I had already replaced the battery before installation, as I found that the old one was completely dead. However, whenever I ran ZCLK 08 19 18 09 45, it responded with an error that it could not set the date. Then I remembered that it may be a Y2K problem. I recalled from many years ago that ZCLK had an issue with the dates after the year 2000.

I went back thru the LifeLines and found the issue addressed in issue #80, in the "ZCLK - Zclock

Package" article. For those that do not have access to that article, I repeat the software patch as a separate article in this issue.

That fixed the ZCLK issue in ZDOS. It was now working great.

Next, it was time to address the remaining floppy drive - the dual 5.25" and 3.5" high density unit, a Canon MD5511-V6. The only jumpers were to set S0 or S1 on each unit.

I would need to reinstall DiskPack, which I had lost when I had to reformat the ZDOS partition. I still had a copy of my own, but since we now had ZROM v4.3 and an operational IDE controller board, I had not used DiskPack in years.

Personally, I had always had problems with running DiskPack, especially for the dual HD drives. As I recall, the disks created were flaky or finicky. The formats were not completely compatible with other drives. But, more irritating, I then had another set of disks that needed to be stored separately from my usual library. It's easy to tell 3.5" disks from 5.25" disks, but rapidly identifying 5.25" dual density from high density was a pain.

Anyway, I wanted to get this drive to work in case some of Lee Jones' disks required it.

So I loaded and configured DiskPack per the directions. I had problems right off the bat. The 5.25" drive would not format to the desired density. And the 3.5" drive would not work at all! It seems the motor will not run on the 3.5" drive. The 5.25" drive formats fine but only gave me 1200Kb, instead of the desired 1600Kb.

I spent several days reading the DiskPack manual and searched the web for the drive's information. See the separate article on DiskPack. I finally gave up and installed two 360Kb drives in the drive tower.

Well, with all the issues with the EasyPC main board trying to work reliably with the CDR Controller and hard drive, the EasyPC board finally failed. Without the board installed, the hard drive worked fine, but with the board installed, all I could get was the hard drive was not ready.

Replacing the chips that I could had no affect and removing the few remaining non-socketed chips would be a massive salvage effort that may still not work, I finally gave up and installed a Gemini board.

This would involve changing the name of the PC-DOS partition, but it should not be difficult. I simply ran PART and renamed the UCI partition to GEMINI. The partition was recognized fine, but the problems with booting returned shortly after.

But about now, I began getting floppy boot problems on the Shugart SA455 360K drives that I had installed. Sometimes, floppy drive A: would not spin. Removing the floppy drives from the drive bay, I began testing floppy drives individually, and found the problem - a new one on me...

It seems that the bearings on drive A: were stiffening up, and even got a bit noisy. If I reinserted the floppy, the drive would spin fine, but as soon as the drive timed out and stopped spinning, sometimes it would not start spinning again when I tried to access the drive! Looking at the motor, you could actually see the drive forcing itself to move. DIAG could not get the drive RPM and would report an error.

I recycled that drive and tested all my other SA455 drives. I also tested all my Mitsubshi M4821 floppy drives and found two that would not report a speed. Adjusting the potentiometer soon had these in working order, but I never did get a third to work. Maybe all these old 5-1/4" drives have bearings that are drying out?

Finally returning two Mitsubshi M4821 drives to the drive bay, I was back to addressing the hard drive issues.

Fortunately, I have three CDR-317 controller boards and I tried each one. None would allow the hard drive to boot. But when I booted to the floppy drive and ran ASGNPART 0:, two would list the partitions correctly and even let me assign the drive letter E:, using the command, ASGNPART ZDOS E:, but any attempt to run ZDIR E:/a on the drive resulted in a read error.

DETECT would run, but ended with the error, "Bad sector count exceeded for this drive."

The third CDR-317 card would only give the error "Error - unable to read boot code from partition. Type RETURN to continue." I'll have to investigate this board further later.

Then I remembered another issue... To operate a hard drive reliably when running ZDOS v4.0x and ZROM v4.x, we must run PREP/p.

To make a long story (and long days of testing) short, I changed the ZROM to v2.9, but still had hard drive problems. Fearing that I had probably messed the drive up thoroughly by now, I ran the ZDOS v3.10 PREP on my now inoperable hard drive, and prayed. Thankfully, PREP ran successfully.

I reloaded the desired partitions using ZDOS v3.10 PART, and formatted each of them using ZDOS v3.10 FORMAT. So far, all successful.

Note: The CDR-317 does have a FORMAT ENABLE jumper, JJ2. Located at the top right edge of the board, this must be set to section A to do PREP,

and set to B for normal operation. Do **not** leave the jumper in the A position after PREP, as it may interfere with PREP on the PC-DOS partition.

However, the drama was not over...

According to the CDR-317 manual, you must use the Zenith PREP and PART. This was done. Then you must boot to PCDOS and run PART. However, PART v3.22 gives the error, "Error - can not communicate with the hard disk controller" after you press P to proceed.

Back to the Gemini and CDR manuals. I found that the CDR-317 manual was incorrect. It isn't PART that must be run, but the PC-DOS PREP command, to properly prepare the GEMINI partition for use.

The CDR manual also has a note to place the GEMINI partition first. Well, the GEMINI partition had been #2 before, but that was with EasyPC. In the past, I thought that I had used GEMINI as far as third or fourth.

Note: See the specific notes on Gemini and EasyPC use with the CDR-317 in their specific articles later in this issue.

These notes solved all my issues with the hard drive. I listed the GEMINI partition first at 20%, ZDOS3 second at 30%, ZDOS4 third at 40%, and CPM fourth at 10%. Doing cold boots between each evolution, that is, PREP, PART, and FORMAT, solved the "Can not communicate..." errors.

I loaded the respective software into each partition, except ZDOS4, without difficulty. No surprises, except that ZCLK no longer worked with PC-DOS. I'll have to investigate that further, later.

Next, I reconfigured to ZROM v4.3.

Note: Don't forget to change the J101 jumper from 0 to 1 to accommodate the larger ZROM chip.

I ran PREP/P to update the old hard drive with the new "PC" style boot record. Then I ran ASGNPART ZDOS4 E: and formatted the ZDOS4 partition with FORMAT E:/s/v. Finally, I loaded ZDOS v4.06.

Note: If you do not do a cold boot, when you try to run ASGNPART, you may see the error "This BIOS has no partitions to assign, run DRIVECFG to assign some". But DRIVECFG already lists four partitions for the hard drive, E: thru H:, on my system disks. Simply do a cold boot, then run ASGNPART to set the drive to E:, and, finally, run FORMAT E:/s/v normally.

I reinstalled the new video assembly on the power supply and reinstalled the internal CRT and drive tower assembly.

At power on, I was blown away with the color CRT! No blurriness that normally shows on the old green CRT or normal Zenith external monitors. The lettering was crystal clear, like our LED high definition televisions. Colors were vibrant.

However, the color bar display showed the black and white bars were reversed and the screen was black on white, meaning I had a white background.

Three switches, a push button, and two slides, were mounted at the base of the monitor assembly. The left-most push button switch did nothing. The center slide moved the CRT display left or right, and the right slide switch controlled brightness.

Both slide switches would show black interference pixels on the display from a dirty slide, but they were fine after setting and left alone.

But I had no clue what the push switch was supposed to do. My meter showed that it was always open, so I installed a slide switch in one of the unused plastic port covers on the back panel and tried again.

This switch changed the display from black on white to the normal Zenith screen of white on black! What a gorgeous display in either mode!

Note: With this internal CRT display, you can no longer attach a normal Zenith external monitor. The external monitor will not have vertical sync and will roll vertically. It took me several minutes to figure this out, but it turned out that the internal CRT uses positive sync and the external monitor uses negative sync. Remember, there are jumpers on the video board that can be set for either.

And the computer is now considered operational!

I tried to identify the small monitor that this video system could possibly come from. The numbers found on the small 4x4", inverted, horizontal board over the neck of the CRT were: "KD4004" and "TNP50914ZA".

The 8" high x 7.5" wide main board, mounted vertically on the left side of the computer had: "Model No. DT-H103" and "Chassis No. NMX-K104A"

The 6x4.5" horizontal board mounted to the power supply had: "PC-IBM S.P I/F" and "Apple III I/F" printed in boxes, identifying the I/F sections.

The 10" diagonal CRT had: "PRO.SVC.No. DT-H103-001", "Chassis #: NMX-K104A" and "S/N: KC4540115". I also found a partial number "??GX71X".

A web search for chassis #: NMX-K104A identified the monitor as made by Panasonic Corporation with an FCC ID of: ACJ928NMX-K104J dated 3/19/84. But I could not find any 9" or 10" displays on e-bay that had the same beige color slide switches.

UCI's Easy I/O Board

The UCI Easy I/O Board came in 2 configurations. As marketed, "The EasyI/O is for the EasyPC user who desires IBM compatibility for communication equipment such as modems, digitizers and other I/O devices. The Easy I/O is a S-100 board with either one or two IBM 8250 serial ports, one game port and clock calendar with battery back-up. Ports can be configured to switch between the 8250 ports and the Z-100 M2661 ports by software. Clock is operational in both Z-100 and PC modes. Utility software is provided for activating COM ports and clock calendar."

This circuit board had only the one serial port installed. I already have all the necessary parts to add the other circuitry, except the 2732 PROM for this board. I am also missing all the paperwork, and possibly some of the software necessary for the added features, for the Easy I/O board.

If you have a fully populated Easy I/O Board, could you please contact me at (828) 685-8924 or by email: z100lifeline@earthlink.net? Thanks.

EasyPC and the CDR-317

I found some notes in my CDR manual on using the Easy PC and the CDR-317 with Xebec Controller:

- In going to I mode, if there is only one hard disk drive, there will be a 45 to 60 second delay during which the IBM side tests to see if it can access the second drive in any way possible.

- If using two drives, both drives must have a UCI partition.

- Be sure that before using the I mode with the hard disk, the format enable jumper (JJ2) on the CDR317 controller is in the B (normal) position.

- On some computers, snow will show on the screen when accessing the hard disk in IBM-PC mode. It was unknown why, but rest assured that it did not affect the data. Some Z-217 systems have also shown this, and it has been seen on Z-100 systems that do not use a hard disk. The snow only seems to show when in 80 character monochrome mode in PCDOS. When using windows or some of the other programs which switch to graphics mode to run, the snow went away.

- The XEB1086 ROM on the CDR-317 Host Adaptor (S100 BUS board) had some speed improvements added. For some reason there were some Z100-UCI-CDR317 interfacing problems that are related to this ROM. The earlier version ROMs and the newer ROMs do not show this problem. Therefore, if you are using the XEBEC controller version of the CDR-317 package, be sure to use the XEB187 ROM when using the UCI EasyPC board set. If you are using the OMTI controller version, the OMT0187 ROM is to be used with the UCI board set.

Note: If you need the desired ROMs, check with me. I have several sets and may have what you need.

One final note: The XEBEC controller uses an enhanced ROM set from XEBEC with one added feature. The step rate for the controller is in **reverse** order of the other controllers:

STEP CODE: (in hex)	RATE: (In microsecs)
70	15 us
60	30 us
50	60 us
40	200 us
Any other #	3 ms

GEMINI and the CDR-317

The Gemini board also runs with the CDR-317, but with a few issues to be aware of:

- The 1.42 Gemini ROM set will not function properly with two hard disk drives installed. This problem is present with the CDR-317 and with the Zenith Z-217 Winchester controller.

- The Gemini partition cannot be larger than 18 megabytes. This well known problem is present with the CDR-317 and with the Z-217 controller.

- At 8 MHz, the Gemini partition should start near the front of the drive or the partition won't be recognized. With the CDR-317 controller, the partition needs to be closer to the front than with the Z-217 controller.

- There is only one known problem that is specific to the CDR-317 and the version 1.42 ROM set from Gemini. The problem stems from the two drive problem in the Gemini controller. Any time that the Gemini firmware recognizes that there may be a second drive in the system, there is a register that is not updated which leads to a not recognizable Winchester controller error if there is not a second drive present, or other errors if there is a second drive present.

When performing a power on (cold) boot with the Z-100 going to the IBM side, the Gemini board performs a Recal on each drive to determine if there is a drive present. This works fine for both the Zenith and the CDR controllers. After a CTRL-RESET (warm) boot, however, the Gemini firmware does not perform a Recal. It simply asks for the status of each drive to determine if it is there.

For some reason, the answer given back at this time from

the CDR-317 controller for each drive leads the Gemini controller to believe that there are two drives available. This situation is not handled correctly by the Gemini 1.42 ROMs. The Zenith monitor ROM and boot side does not have this problem because it always sends a set drive command to each drive to determine if a drive is present before doing any hard disk accessing, upon power up and upon resetting.

Note: Some CDR-317 instruction manuals listed the procedures to prepare GEMINI partitions as a separate sheet at the end. These instructions differ critically from the Gemini manual. The CDR instructions have you perform the PC version of PART after doing the Zenith versions of PREP and PART. This is incorrect.

You must still do the PC version of PREP, which creates the reserved Winchester area for the IBM PC mode. Use of the H/Z-150 PREP command affects ONLY the GEMINI partition and does not access, overwrite or otherwise destroy programs and data in all other defined H/Z-100 partitions. You need only use the PC PART if you wish to use more than one PC partition.

Until a new Gemini ROM set is available, to use the Gemini side of the system with the CDR-317, turn the computer OFF, then ON (cold boot), whenever a CTRL-RESET (warm boot) was to be performed. When the I is pressed, the Gemini monitor side will normally flash on the screen, a message recognizing that a Gemini partition was located on the hard disk.

Note: To be sure that the Gemini information in RAM is cleared, wait approximately 10 seconds before power on.

A new ROM set came available just before support for the Z-100 died. It alleviated the reset accessing problem and fixed most of the above problems with Gemini and CDR-317 or Z-217 hard disk interfacing. There are 5 ROM chips (U15, U20, U25, U27, and U39) to the Gemini 1800 set (version 1.42) and 4 ROM chips to the Gemini 226A set (version 6), where U20 is 2x the size and U25 is left vacant. The Gemini ROM set v.2.0-1 replaced just two of the chips (U15 and U27) to the above sets. They were labeled "**GEMINI-SV, V.2.0-1 U15**" and "**GEMINI-MV, V.2.0-1 U27**". The Gemini screen would display version "**2.0-1**" on it.

If anyone has these two chips, if you could send me the pair, or the binary code for these, I would be forever in your debt. I would be pleased to make these available to anyone for the cost of the chips and shipping. Thanks.

ZCLK Y2K Software Patch

ZCLK is not year 2000 compliant! Any attempt to change the year to anything after January 1, 2000, will result in an error "Could not set the system DATE". The problem was located in the FMTDAT routine of ZCLK.COM, which simply added 1900 to the two digits you enter for the year. In DOS, dates earlier than 1980 are invalid, therefore causing the error.

If you never intend to use a 1900 date again, a simple fix is to use DEBUG to change the 1900 to 2000 in ZCLK.COM. Search for the 1900 byte sequence with the command:

```
S0100 0600 81 C1 6C 07{RETURN}
```

and change to 81 C1 D0 07 (hex for 2000) using normal DEBUG procedures.

If you might need to still use 1900 dates, and since the source code is available, make the following changes to the FMTDAT: routine using EDLIN or other favorite editor. The routine is located at or around line 644 in EDLIN.

```
FMTDAT:  CALL FIXL       ;DO DAY
         MOV  DL,AL
;
         CALL FIX        ;DO MONTH
         MOV  DH,AL
;
         CALL FIX        ;DO YEAR
         MOV  CL,AL
         MOV  CH,AH      ;CX = 2 digit year.
         mov  BX,80      ;Valid years began
         cmp  CX,BX      ; in 1980.
         jb   FMTDAT1    ;If below 80, skip
         ADD  CX,1900    ; the add 1900.
         jmp  FMTDAT2
FMTDAT1: add  CX,2000    ; Else add 2000.
FMTDAT2: RET             ;Good until 2079.
```

Reassemble your new ZCLK.COM. The DEBUG fix is only good until the year 2079 - but still long after I'm gone. Someone else can work up a new fix by then!

Note: I have modified ZCLK (different ports for PC-DOS) to work in PC-DOS and it works fine with the EasyPC system. However, it will NOT work with the Gemini board, which uses the same PC ports. If someone has it working with Gemini's PC-DOS, please let me know. I'll have more info by next time.

DiskPack Corrections and Update

As you may recall, DiskPack was a popular floppy disk Device Driver produced in 1989 by William E. Flanagin and marketed by Paul F. Herman, Inc. DiskPack was a software package which allowed you to use all popular 8", 5-1/4", and 3-1/2" floppy disk formats on your Heath/Zenith Z-100 computer, including PC compatible formats. This included the standard Z-100 formats, as well as AT compatible 1.2 Mb 5-1/4" drives, and 720 Kb or 1.4 Mb 3-1/2" formats. Additional formats were also available, some of which provided even greater capacities.

The standard Z-100 floppy disk controller allowed up to four standard density drives and four high-density drives, for a total of up to eight floppy drives on each controller. And two controllers could be used.

Aside from the floppy drives and cables, no additional special hardware was required - all formats supported by DiskPack were provided using the standard Z-207 floppy disk controller already installed in your Z-100.

The system requirements for the Heath/Zenith Z-100 series computer were listed as:

- At least one standard Z-207 floppy disk controller card.
- Use of MS-DOS version 2 or above.
- One or more floppy disk drives and the appropriate cables.

The distribution disks contained the following files:

- DSKPAK.SYS Floppy disk device driver.
- DPCNFG.EXE Device driver configuration utility.
- DPFMT.COM Format utility.
- DPINFO.COM Format information utility.
- READ.ME Contains additional information.

Personally, I was never fond of DiskPack, but it provided a capability that was sorely needed at the time. I found the instructions somewhat baffling and the disks seemed somewhat flaky. Now, since the Barfield mod to the Z-207 and the newer ZROM monitor ROMs, PiskPack isn't as necessary as in the past.

However, that being said, DiskPack still gave the user a broader spread of unique disk formats that may be used, especially for strange distribution disks that were marketed at the time. If you find a need for this utility, I have copies available for $5.00.

DiskPack Hardware Installation:

The Z-207 floppy disk controller has two interface connectors used to attach floppy drives. The 34-pin interface is used to connect disk drives with an MFM recording mode transfer rate of 250K. The 50-pin interface is used to connect disk drives with an MFM recording mode transfer rate of 500K. This controller will support up to four disks through each interface.

The cabling required to connect drives to the controller is straight through ribbon cable if you are taking a 34-pin to 34-pin or 50-pin to 50-pin connector. If you are connecting a drive with a 34-pin drive connector to the 50-pin connector on the Z-207 controller board, however, a modified cable will be required. The original DiskPack pinout is described here:

50-pin Interface Connector:		34-pin Drive Connector:	Use Notes:
1	----------	1	Ground
10	To ground, such as pin-9 or 11.		
14	----------	32	Side One Select
16	----------	4	Z-207 does not use
18	----------	16	Motor On
20	----------	8	Index/Sector
22	----------	34	Drive Ready
26	----------	10	DS0
28	----------	12	DS1
30	----------	14	DS2
32	----------	6	DS3
34	----------	18	Direction Select
36	----------	20	Step
38	----------	22	Composite Write Data
40	----------	24	Write Gate
42	----------	26	Track 0
44	----------	28	Write Protected
46	----------	30	Composite Read Data

All odd number pins on both connectors are assumed to be ground. Other pins not shown are no-connection.

DiskPack Updates:

While the above cabling arrangements worked for the drives of the period - usually, newer drives came without the necessary assortment of jumpers to satisfy the requirements of DiskPack. So, let's address some of the possible issues.

Note: For greater detail, see the article "Floppy Drives for the Z-100" in the *"Z-100 LifeLine"*, Issue #22, of October 1992.

Of particular interest to us are these jumpers:

- DS0-DS3 Drive Select 0, 1, 2, or 3
  (May be marked as 1, 2, 3, or 4)

This set of jumpers is used to select the logical drive address. Use 0 or 1 for BIOS owned drives, and 2 or 3 for DiskPack controlled drives. BIOS owned drives are the normal floppy drives, that is, the two 5.25" drives on the 34-pin connector, and the two 8" drives on the 50-pin connector.

Note: There are no BIOS owned drives on a second Z-207 floppy disk controller, so all of these may be used with DiskPack.

- MS Motor On with drive select

This jumper causes the motor to be turned on when the drive is selected.

- RY/DC Ready/Disk Change on pin 34

Usually a pair of jumpers, one labeled "DC", and the other labeled "RY" or "RDY". Most later drives come configured to generate a disk change signal, as required by later model PC compatible computer systems. For use in the Z-100, however, the jumper "RY" must be used to generate a READY signal on pin 34 of the 34-pin connector.

- Density/Speed Select

Found only in dual-density drives, this is usually a set of several jumpers which tell the drive how to determine if the desired format is double-density or high density. Dual-density 5-1/4" drives will also have a jumper to tell the drive which speed (300 or 360 rpm) to use.

Usually, the drive can be jumpered to determine density and speed from the level of pin 2 on the 34-pin cable. The 3-1/2" drives may also allow density selection based on the media which is inserted.

In the Z-100, pin 2 on the 34-pin connector is not connected at the controller end. Using a dual-density drive for both densities will require that the controller be modified. So DiskPack is limited to using only one density or speed on dual density drives.

So, why are we worrying about all these jumpers? Well the later drives do not use most of them! We have to fake it! And that means the above cable must be modified.

If you know you want to use a drive without DS2 or DS3 jumpers under DiskPack, you will need to modify the cable so that the pins 30 (DS2) and 32 (DS3) on the 50-pin connector are attached to pins 10 and 12 on the 34-pin drive connector.

Note: If you wish to still also use the 8" floppy drives, the first 50-pin connector to those drives can still be used, if you modify the cable at the 34-pin connector. Remember to disconnect pins 26 (DS0) and 28 (DS1) on the 34-pin connector.

If the drive doesn't have any motor on jumpers, try it first to see if it works. This will be easy to tell, because if everything is okay, the motor will start spinning when the drive is selected. If the drive is set to turn on with a motor on signal (pin 16) this will not work if it is a high density drive connected to the 50-pin connector of the Z-207, since there is no motor on signal at this connector.

To fake a "motor on with select" jumper, it is possible to synthesize the signal by connecting a germanium 1N34 diode between the appropriate drive select pin of the 34-pin cable (pin 10, 12, 14, or 6) and the motor on pin (pin 16). Since the motor on signal is an active low signal, be sure the banded end of the diode is facing the drive select pin. Also, be sure to use a germanium 1N34, not a silicon 1N34. The voltage drop across a silicon diode is too large to allow an active low signal to be represented.

Note: It may be better to solder the diodes directly to the pins of the 34-pin connector on each drive being used instead of modifying the cable, so that the cable will not interfere with drives using the necessary jumper pins.

I have found that you must not connect pin 18 on the 50-pin connector to pin 16 (motor on) on the 34-pin connector if you must fake the motor on signal with a diode.

In order to work as a high-density drive in the Z-100, there must be a READY signal indicating when the drive is ready. This signal can be generated by most drives on pin 34 of the 34-pin cable. This pin is then mapped to the ready line (pin 22) of the 50-pin connector.

If the drive does not have a "RY" jumper, you can fake it by using a diode to synthesize a READY signal. This is done by connecting a germanium 1N34 from the drive select pin to pin 34, with the banded end toward the drive select. This causes pin 34 to be driven low (active) whenever the drive is selected.

These diodes may be better placed directly on the rear of the 50-pin connector, between the drive select pins and pin 22 (READY).

This solution may not work reliably in all cases with all drives. Since the READY signal is generated at the same time the motor is turned on (when the drive is selected), the drive obviously cannot be ready yet. Fortunately, this is not a problem if you are using the drive under DiskPack control, since DiskPack looks for a moving index hole to determine whether the disk is ready.

Finally, after days of trying to figure out why the high density drives were not working correctly - still suffering from the "Drive not ready errors" on the 3-1/2" drive and "the write errors" on the 5-1/4" drive, I found this little tidbit in the *"Z-100 LifeLine"*, issue #76, following the discussion on the Barfield modification to the Z-207 controller card:

"The modified Z-207 card will still work normally with earlier versions of DOS, and other operating systems like CP/M, but your dual density drives will not work correctly."

I wish I had been a little more specific as to what that meant back then. But perhaps my problems are with the modified card, which all of mine were.

If anyone with a working DiskPack with high density drives has any ideas on what I am doing wrong and could straighten me out, I sure would appreciate it. I'll pass your recommendations on, next time, here.

In any case, if you would rather not lay out the funds to go with an upgraded ROM and modified Z-207 controller card, but want to use one of those old hi-density drives sitting on the shelf, DiskPack is still a viable option.

Closing

Time has a way of speeding up for us old folk. And in spite of my desires to work on several Z-100 projects, I would start, then get interrupted by something pressing, and find months have passed before I can get back to a project. So, please forgive me for promising to continue working on my Z-100 work - and not getting it done.

Topics that I still wish to cover in the Life-Line, as time permits, include my work on CP/M and changes to the IDE Controller, the ZROM programming, and other Z-DOS v4 software issues.

I also want to research my problems with EasyPC, which is made more difficult because the chips on the boards are not socketed. I now have three sets of boards, but they all have problems. And I wish to get the Gemini PC-DOS to recognize the ZCLK.

My website and e-mail are all still active, so don't hesitate to contact me with issues. I will still maintain my entire stock of spare parts, books, magazines, and software. The Z-100 is still my second love (after Myra, of course) and I hope to remain active in making changes and keeping interest high in the Z-100 community.

'Til next time,
happy computing!

Cheers!!!

Z-100 LIFELINE

Supporting the H/Z-100 Community Since 1989

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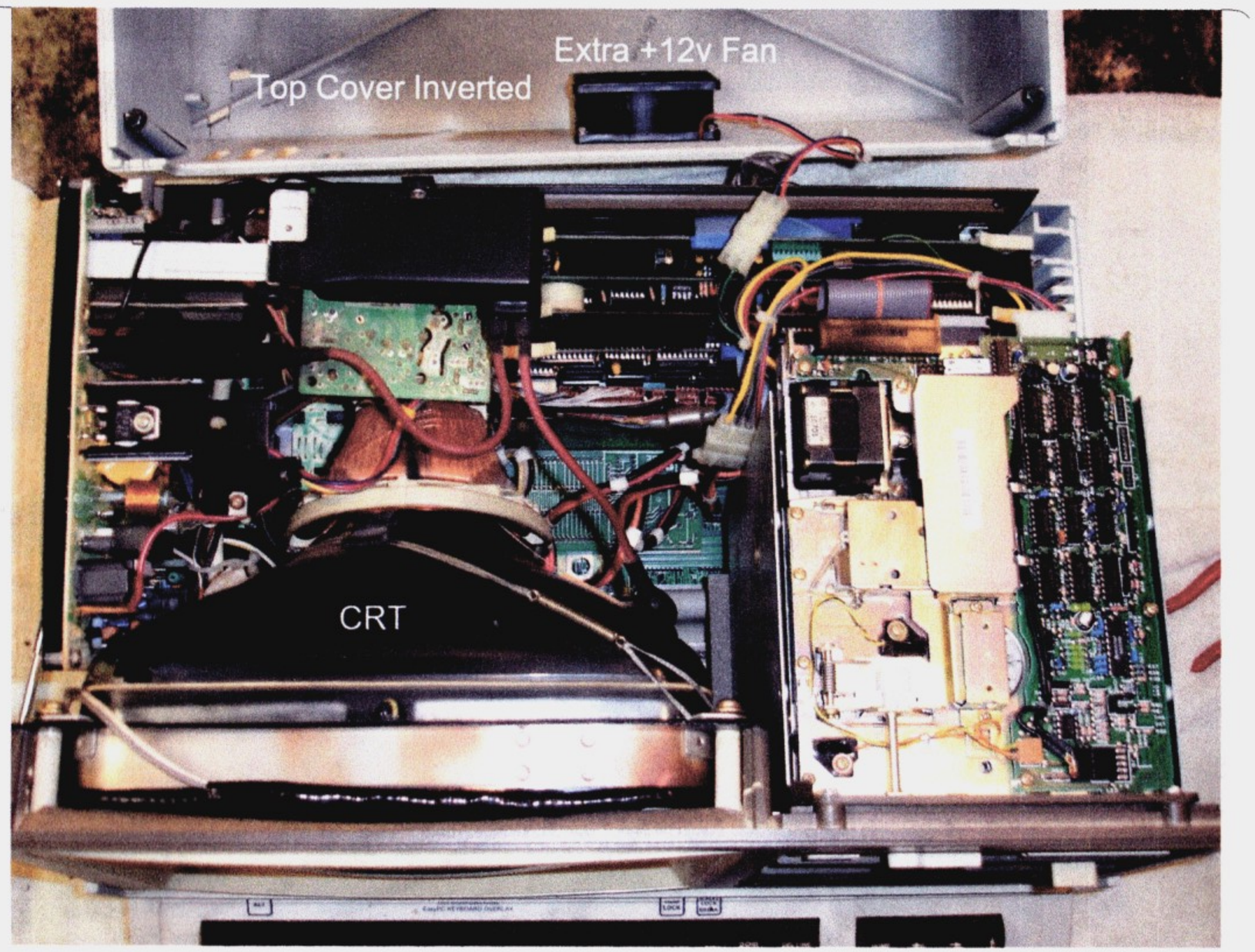
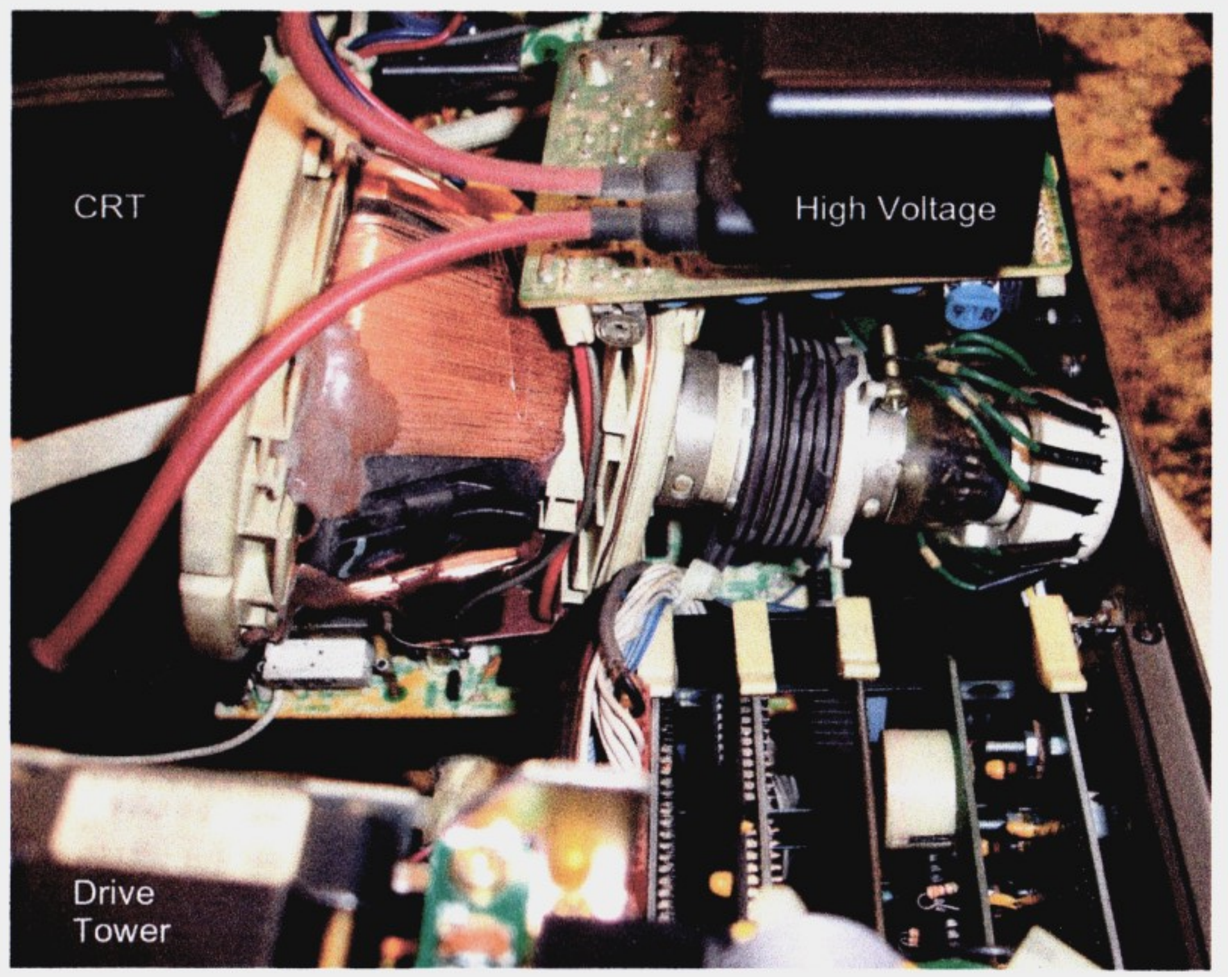
Don't forget our Z-100 LifeLine Web Site:
https://z100lifeline.swvagts.com


Zenith H/Z-120 All-In-One
Video system is a Panasonic
Chassis #: NMX-K104A
CRT #: DT-H103-001
Alps 360Kb Floppy Drive
Canon MD5511-V6
Seagate ST-225 Winchester Drive
w/o drive light
Video Mode
Horiz Posit
Brightness


Top Cover Inverted
Extra +12v Fan
CRT


Video Mode
Horiz Position Slide
Brightness Slide
RESET
F0
F1
F2
F3
F4
ESC


CRT
High Voltage
Drive
Tower

Z-100 video board replaced by Panasonic color processing system...

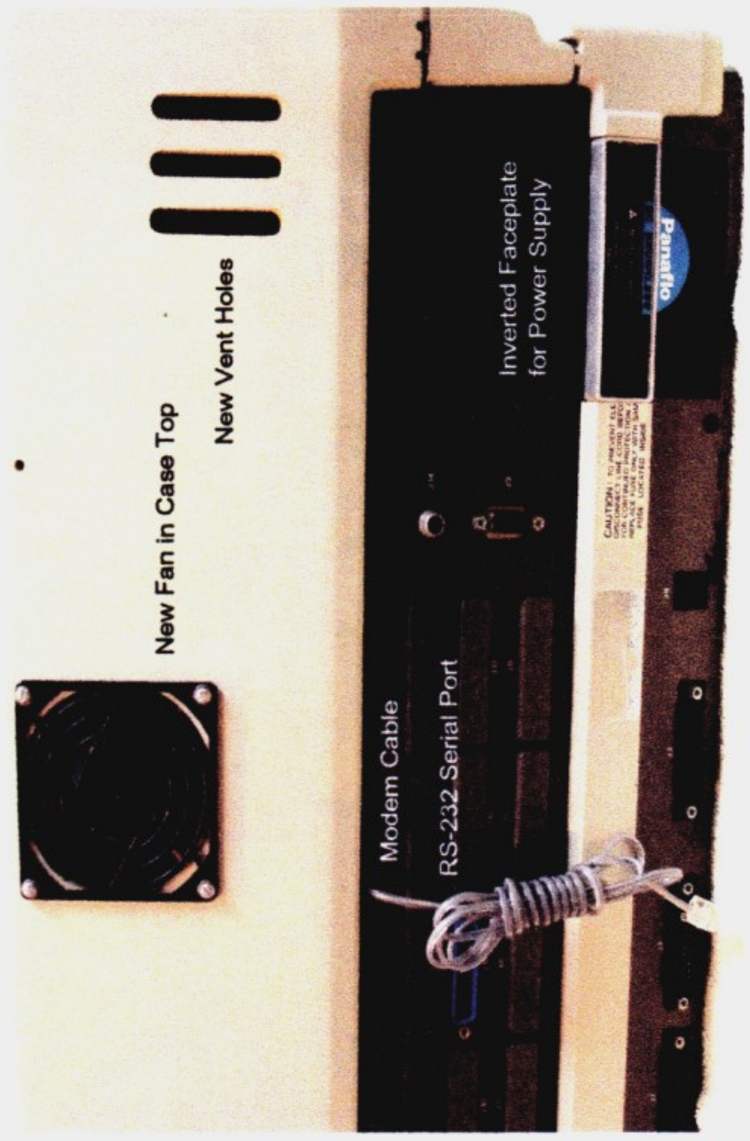
Dead mode switch removed

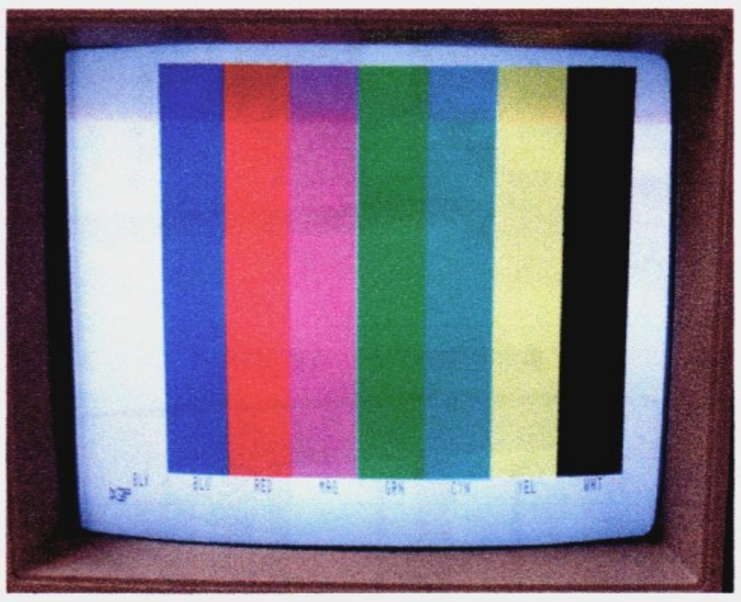
mounted to top of standard Zenith Power Supply.

ZCLK Board

Horiz Posit

Brightness





Twin 360Kb Floppy Drives

Seagate ST 225

CDR-317 Board

Z207 Floppy Board

New Video Mode Switch <---