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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.

And speaking of the post office being too expensive, watch out for those employees that don't seem to know what they are doing. Twice, I've gone to mail LifeLines, like usual, only to be charged for large envelope rates - $1.21! "These are NOT large envelopes", I would have to explain, and they would correct the charge. So, a warning to the wise - watch out that you are not being overcharged when you send mail.

As I begin to write this, we've escaped our second downgraded hurricane in as many months. Once again the coastal areas were slammed, this time to the south, and east of us - the same areas that flooded out earlier, got hit with heavy rain again. Fortunately, we only received some rain. Mother Nature is wreaking havoc as the climate continues to warm... When will we wake up?

As I finish this issue, we were hit with 12" of snow, and I'm still waiting for a snow plow to clear the neighborhood streets. I also continue with my attempts to fix some of the issues mentioned last time, and I have a lot to pass on...

EasyPC Woes

As you may recall, I had given up on using the EasyPC system last time, and changed to a Gemini PC-emulator system. However, between Lee Jones' EasyPC system, one that would no longer boot in another Z-100 (the SmartWatch had died - but more on this later), and a third system that I had in a box, also with issues, I decided it would be worth my time to play with them some more.

Briefly, the symptoms for each system were simple.

First, one EasyPC main board would not do anything. I had replaced all the socketed chips, but it still would not work. I needed to socket most of the remaining chips, but being the cheap person that I am, I used a propane torch and got a little too close. Needless to say, that board is now toast. I did salvage the chips, however.

Well, one down. Let's try again.

The other two main boards seems to be fine, but the three video boards had issues. Two had an issue with sending video to my color C.Itoh monitor. The characters were slanted and/or torn, and unreadable in both native and IBM modes. Yet the display was fine on a Zenith ZVM-135 color monitor!

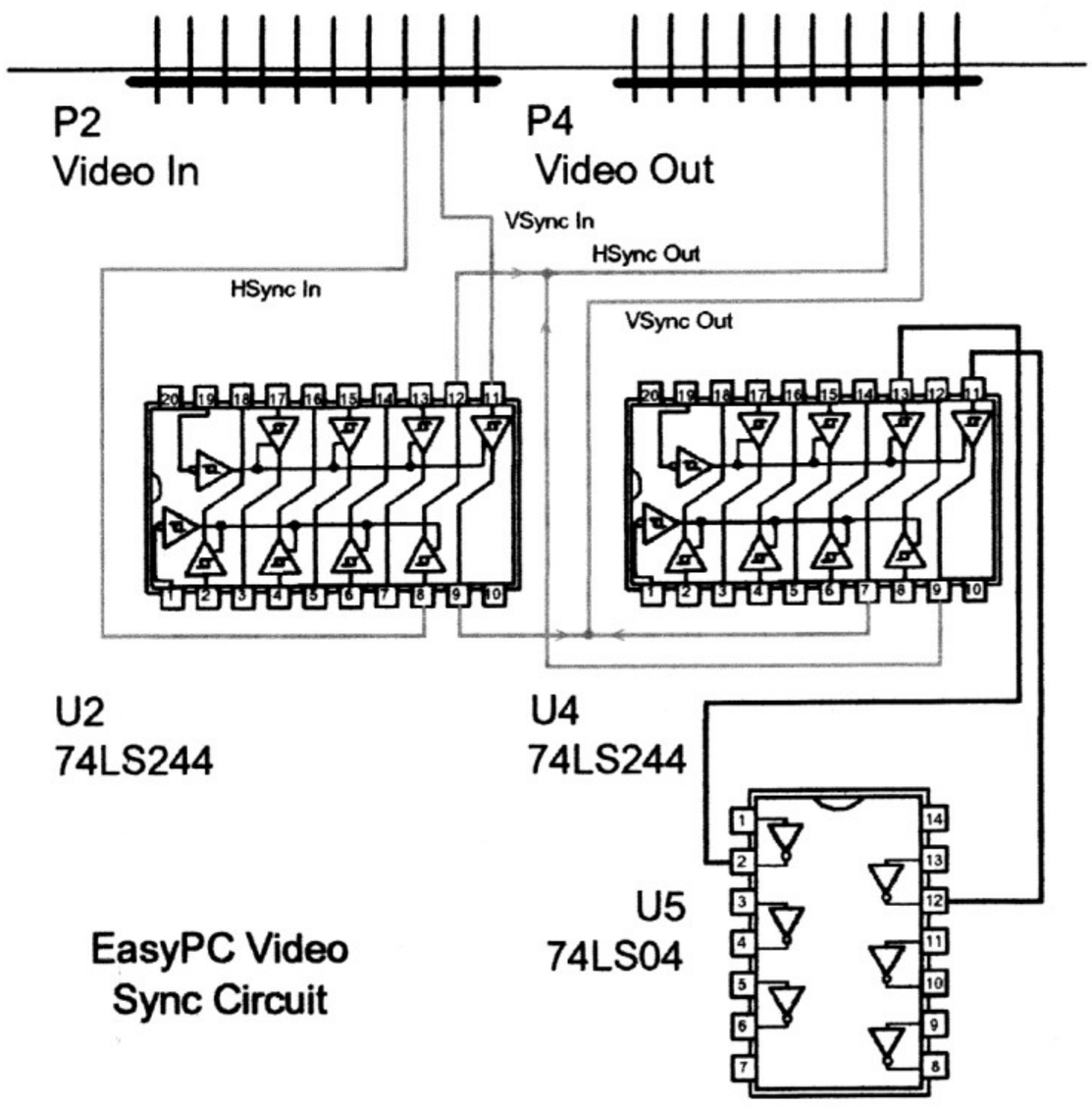
Let's take a brief look at how the EasyPC system displays the native versus IBM mode screens.

If you look at the EasyPC Video Board, you will see several connectors across the top. From the

left, P1 is the 4-pin composite signal from the Zenith video board. P2 is the 10-pin RGB connector and cable also from the Zenith video board. Next, a 2-pin connector and cable goes to the speaker. P3 is the 4-pin composite connector and cable that goes out to a composite monitor. P4 is the 10-pin RGB connector and cable that goes out to a color monitor via the DB9 cable connector at the back panel. Finally, P5 is a 5-pin connector used for the video deflection circuit board of the internal monitor in the All-in-one Z-120 computer.

In the Zenith mode, the video that comes from the Zenith video board simply passes in P2, through a 74LS244 buffer chip and out P4. So, how can this get garbled. Further, when displaying the EasyPC opening screen and during PC mode operation, the video is generated from the EasyPC video processing board and the Zenith video board isn't used at all - no video signal is present at P2.

Let's look at the circuitry...



EasyPC Video Sync Circuit

From the above you can see that the video in Zenith mode goes from connector P2 (IN) to connector P4 (OUT) via U2, a 74LS244 that acts as a switch. The same is true of PC video generated by the EasyPC video board, which goes through U4, another 74LS244 chip.

When pins 1 and 19 are low, or turned on, data is passed from that respective 74LS244 chip to the output connector P4. When one 74LS244 is turned on, the other is turned off (set high).

Checking the state of pins 1 and 19 of each 74LS244 chip in Zenith and in PC mode confirmed that the chips were indeed working fine. Rather than removing these chips using heat, I ground off the body of the chips from the pins, then removed each pin with a soldering gun. I replaced the chips with sockets, then placed new 74LS244 chips in the sockets.

Back in operation, the symptoms were the same as before. Before I panicked, I tried different 244 chips. Yep, depending upon manufacturer and chip type, the symptoms got better or worse. I got the best results with 74HCT244 chips in U2, and as I only had two of those, I placed 74ALS244 chips in U4. I video was now perfect on all monitors.

Note: Changing the jumpers on the Zenith Video Board to provide a positive sync to accommodate a PC-type monitor will only work for the Zenith native mode. The EasyPC Video Board has it's own means to provide positive sync, but it involves cutting two traces and soldering new wires. If you need the instructions, let me know.

This fix was tested at 5 and 8 MHz; and ZROM v2.9 and the latest v4.3.

The third video board had pink vertical lines through the EasyPC opening menu screen and white double dashed horizontal lines on the other PC screens. In native mode the screen was fine.

These EasyPC video boards only have a few socketed chips, so troubleshooting is a royal pain. I tried the obvious - changing the Video ROM, but this was no help.

However, I have seen enough bad video RAM chips on the Zenith video board to guess where I would first like to start on this board. There are 8 video RAM chips that I suspected right from the start. So, I resorted to my torch again. Sorry.

I wanted to save these RAM chips for further troubleshooting and I was doing 8 chips or more. Grinding or otherwise cutting out the chips would be time consuming and would possibly damage the board anyway.

Taking my time, and being very careful to only heat enough to loosen the desired chips, I managed to remove them without damage. I used a soldering gun and solder sucker to clear the empty solder holes, then installed new sockets. I ended up removing 10 chips, as those on the end were already loose from the heat.

I cleaned up the chips and reinstalled them in the sockets. Powering up, I found the symptoms had not changed. Swapping out the RAM chips found the bad culprit in short order - RAM chip U25.

And I was fully operational with the EasyPC.

GEMINI Woes

As we mentioned last time, 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 problems discussed last time 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 VER1 board (version 1.42) and 4 ROM chips to the Gemini VER6 board (also version 1.42), but U20 is twice 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.

The ROM sizes in the Gemini boards are all different, and serve different purposes, which I am still trying to figure out:

ROM:	Model:	Purpose:
U15	27256	Opening screen, Font, Keyboard setup, Help screen info
U20	27128	First half, Operational code
U25	27128	Second half, MFM-150 Monitor code
U27	2764	Error code
U39	2732	Unsocketed, unknown purpose, Unsoldered, code made no sense

Note: In the newer VER6 board, the ROMs are the same, except U20 (27256), replacing both U20 and U25.

I've played with the Gemini ROMs in the past, when I received a set of Beta chips from Mike Zinkow (now there's a shot from the past! I have not heard from Mike since he disappeared more than 20 years ago.)

Anyway, I never got them to work. And I've heard from no one regarding these two new ROM chips. So, I thought I would try again to make some sense of these chips and possibly even find the date code to modify the ROM to work with the ZCLK we mentioned last time.

I have 4 spare Gemini boards, but two suffer severe boot-up issues that I've failed to repair. Fortunately, the two operational boards are one of each board model, a REV1 and a REV6 board. And while I have two earlier individual ROMs (not a complete set), all of the rest of my ROMs were all for the version 1.42.

Before installation on the Gemini boards, I used my Pocket Programmer to read each ROM's code and saved the .BIN files to floppy disk.

I then ran DEBUG (yes, the Z-100 program works well on an old PC in a DOS window) on each file to see what text existed on each, and to study how the version 1.42 U20 & U25 chips were broken into half. As it turns out, the code was split, mid code. In fact, it was in the middle of a MOV instruction!

The code in the two chips exactly matched the code in the later, larger solitary U20 chip. Great! I used the Pocket Programmer again to split the Beta U20 code into the two chips necessary for the REV1 Gemini board.

After checking each board to ensure operation with their respective sets of v1.42 chips, I installed the beta set of ROMs in each Gemini board for testing.

Initial testing was great. Each board booted up fine in my test bed Z-100, showing the new version number and proper opening screen. The first thing I noticed was that the warm-boot (CTRL-RESET) opening screen now matched the cold-boot (power-up)screen with the large Gemini graphic. Nice.

Next, I tried 'Z'(Zenith) mode floppy and hard drive operations, (read, write, copy, etc.) which all worked flawlessly.

However, as soon as I pressed 'I' for the IBM mode, the troubles began. I soon found that the Winchester hard drive was having issues and on about 50% of the starts, I was getting the error:

```
+++ Error: Timer Interrupt Failure! +++
```

The other 50% of the time, Gemini could not set the Gemini hard drive partition as Unit 0, giving the errors:

```
Old "Gemini" partition found, but not
   installed on Unit 0.
Error Reading Winchester Unit 1
Error Reading Winchester Unit 2
Error Reading Winchester Unit 3
No "Gemini" partitions found,
   no IBM Winchester drives installed.
```

With a forty second delay for each line, as Gemini was looking for more drive partitions.

Whoa, say what?

Ok, back to the books. Fortunately, I also found a copy of the installation instructions that Mike had sent with the chips. I won't print them all, but here are the pertinent instructions:

GEMINI ROM SET V.2.0-1

- Gemini can now address more than one Winchester drive on the IBM side. Both drives must have a Gemini partition as described in the Gemini manual, but unlike earlier versions of the ROM set, the Gemini firmware does not get confused when communicating with the second drive.

- The power down needed when switching to the IBM side when running with the CDR317 Winchester Controller Package is not needed with this new ROM set.

- The I/O ports are now more compatible with IBM software, with mouse driver software able to be used. (Maybe it also fixed the ports for my ZCLK issue?)

Things That Are Not Changed With This ROM Set:

- The 18Mb physical limit for the Gemini partition on a Winchester drive is still there. If any piece of a Gemini partition goes over 18Mb physically on the drive, when using the partition on the Gemini side, it will wrap around to track 0 when trying to address the upper sections of the partition!

- The Zenith Z150 PREP must still be used on the IBM side to initialize the Gemini Winchester partition. If this is not done, as with the earlier versions, the IBM partition does not have all of the information needed to function correctly.

- After using PART on the IBM side with the Zenith Z150 version software, the computer still needs to be turned off and on.

Gemini Installation:

- If you are using a Winchester drive on the IBM side, back-up all of the files on some medium. **The new ROM set uses a different cluster factor for the IBM side, which means that the Gemini partition will have to be re-initialized on the IBM side.**

- If you are using a Winchester drive, go to the I mode and check that the screen flashes the message that the Drive(s) are recognized by the Gemini software. With this new ROM set, the Zenith side does not have to change, but **the IBM side needs to be re-initialized, partitioned, and formatted.** The IBM side initialization still takes an extremely long time.

Problem: But my installation, while recognizing the old "GEMINI" partition, won't set it as unit 0 so that I can run the PC version of PREP, PART, or FORMAT!!

When I try to run any of those utilities, all I get is the error:

Can not communicate with the Winchester Controller.

OK, let's address these errors one at a time. First thing to notice... There should be two chips, NOT three. Mike must have been trying to do something to the ROMs. Let's remove the new U20, and reinstall the old U20, or U20 and U25 on the REV1 board.

Bingo, the Timer Interrupt error no longer appeared. I'll need to play later with that one.

But all my testing could not get around the second error - recognizing the "GEMINI" partition, at least long enough to do a PREP on it.

Here's what I tried:

Swapped out both boards on the same computer. Both gave identical errors - so the split ROM is working.

Changed the Z-217 data separator card and controller cards, separately and together.

Tried PREP from all versions 2 and 3 of PC-DOS.

While the idea of having to do a PREP/p for Z-DOS v4 was somewhat later than the Gemini production, I tried it anyway... improperly (ran it from the hard drive). OOPS! Now all the drive would do is make a thumping noise when being accessed! Damn!

Who said that using PREP/p would be harmless?

My 80Mb (46Mb, because I only used 5 of the 9 heads) Seagate ST-4096! It took 8 hours to rectify (PREP, PART, and reprogram with ZDOS3 and ZDOS4, CP/M-85 and CP/M-Plus, and, eventually, PC stuff) that poor beast!

So... tried another, more disposable, 11Mb Miniscribe, while using the Gemini board installed, thinking it may have some affect while preparing this drive... Nope.

I even installed a CDR-317 controller and prepared the drive again with that... Nope.

Mike must have made some changes to the original ROMs, for some reason. I'll continue to play with them and report back.

Meanwhile, if anyone has a working pair of these two new ROM 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 PC-DOS Software Patch

As I mentioned last time, 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". We fixed the ZCLK issue in ZDOS last time.

This time I wish to pass on the fix for PC-DOS. Yes, it works great for EasyPC, but the Gemini PC-emulator does not recognize the clock, even though it supposedly uses the same PC ports.

So, first lets cover the code changes to a PC version of ZCLK and call it ZCLK-PC.COM.

The ZCLK distribution disk includes the source code as ZCLK.ASM. Open this in your favorite editor. I personally use a PC-clone for all my assembly work because of the ability to open many windows at the same time, but doing the work on a Z-100 will work also. It's just a bit harder.

First search for the variable ZPIA. Or toward the top of the file in the definitions look for:

```
ZPIA    EQU   0E0h
ADATA   EQU   ZPIA+0
ACTL    EQU   ZPIA+1
BDATA   EQU   ZPIA+2
BCTL    EQU   ZPIA+3
```

These are the four IO ports to the 68A21 Peripheral Interface Adaptor (PIA) IC (U114) on the Z-100 motherboard, where the ZCLK is located.

In PC-DOS the base port to the PIA is 378h (a word value) rather than the 0E0h (a byte value) listed. Ordinarily, and after the following code changes, the ZPIA equate would be the only number to change. But, if this were all we did and tried to assemble the code, we would get 23 severe errors; specifically, error A2050: value out of range.

Let us see what is happening:

The first instance of problems is in the ACCESS routine:

```
ACCESS: IN    AL,ADATA
        OR    AL,00000011b
        OUT   ADATA,AL
```

See the error?

ADATA is now 378h, which is a word value, rather than a byte (0E0h) and will not fit in AL! Hence the out of range error.

We must correct the error by using something similar to:

```
ACCESS: PUSH DX          ; Save any DX value
        MOV  DX,ADATA    ; Get the port#
        IN   AL,DX
        OR   AL,00000011b
        OUT  DX,AL
        POP  DX          ; Set previous DX
```

And we need to do this for each use of the new port number. Let's do another, in the same ACCESS routine:

```
        MOV  AL,11111110b
        OUT  BDATA,AL
```

Change this to:

```
        PUSH DX
        MOV  DX,BDATA
        MOV   AL,11111110b
        OUT   DX,AL
        POP   DX
```

Yes, you can probably get by using less PUSH DX and POP DX lines, but with a CALL routine in between uses, things could get ugly unless you either save DX each time, or ensure the CALL routine does not use DX for something. I did not bother looking.

So, I leave it as an exercise for you to do the rest. You have to search for each use of ADATA, ACTL, BDATA, and BCTL to find them all.

Reassemble your new ZCLK-PC.COM. Change the name back to ZCLK when you copy the file to your PC-DOS disk. Remember, I have not gotten this to work with the Gemini PC-emulator, but it works great with EasyPC.

Note: While we are on the subject of ZCLK, I have found a source for all the parts of the original ZCLK except the variable capacitor, but I did find a close match. I have created a new circuit board, with silk screen and solder mask, that I'll call ZCLK2, using the same ZCLK circuitry and have been testing three boards for weeks. It uses a ribbon cable to stay clear of any EasyPC or Gemini installation. Of important note, the battery is a single external CR2032 3v lithium cell, so it is easily replaceable. (I also tried a similar 3v cell, the CR2025, but it was slightly thinner and slightly smaller in diameter. It would not make a reliable contact in these battery holders.)

By rough calculations, complete with shipping, I should be able to sell the *"Z-100 LifeLine"* ZCLK2 for cost: $55.00. If you are interested, please let me know.

SmartWatch Battery Mod Update

As you may recall, back in issue #124 of the *"Z-100 LifeLine"* Charles Hett wrote the article: *"Substitute Backup Battery for Dallas Semiconductor DS1216E Smartwatch"*.

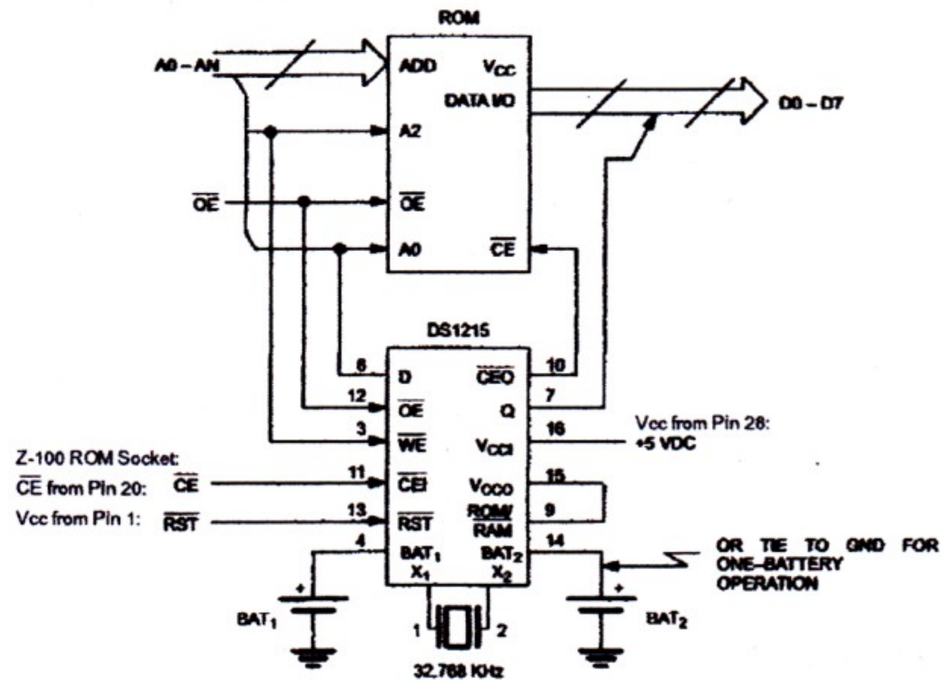
I tried Charles' fix on a dead SmartWatch I had removed from an EasyPC Z-100 installation when I needed another EasyPC system to play with. I wrote about the EasyPC system in the last LifeLine.

The battery was completely dead and the SmartWatch would not allow my testbed (just a set of spread-out circuit boards without a case) Z-100 to power up to the hand prompt.

So, I completed Charles' mod, but the SmartWatch would still not allow me to power up to a hand prompt (no beeps).

So, in the event you were experiencing a similar issue with your SmartWatch, I did some additional research:

ROM/TIME CHIP INTERFACE Figure 4



The DS1216E SmartWatch module uses the DS1215 clock chip on a circuit board that is installed under the Monitor ROM at U190 on the motherboard in the Z-100. All the pins are connected directly from the ROM IC through the SmartWatch module to the Z-100 socket at U190, except Pin 20. Pin 20 is the Chip Enable (CE) line.

In simple terms, the SmartWatch module intercepts any Chip Enable (CE) signal from the Z-100, reads the data to see if the clock is needed or if the data is meant for the ROM chip, then issues its own Chip Enable (CE) signal to the ROM if the clock was not being addressed.

It appears that this communication was not happening in my SmartWatch, in spite of the fresh battery.

Looking at the circuitry above, my resistance reading all checked out except at Pin 14 of the DS1215 chip. The note for Pin 14 reads "or tie to gnd for one-battery operation". Well, on my SmartWatch, Pin 14 was NOT tied to ground. Apparently, there was a second battery (also dead) installed in this SmartWatch module.

Note: Since then, I have found a second SmartWatch module, and it did indeed have the image of a second battery in the epoxy back.

Again studying the circuitry, if I just tied Pin 14 to ground, that would also disconnect the second battery from any possibility of charging current (grounded at both ends), so I soldered another wire from Pin 14 to Pin 8 (ground) on the DS1215 SmartWatch.

The SmartWatch now allowed me to power up and the clock was now operational. I hope you find this helpful.

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 a lengthy list of time consuming projects. Most pressing, I'm presently working on the Beta version of the Gemini ROMS. I'd love to resolve the Gemini issues and get it to recognize 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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MTR-ROM v4 & Z-DOS v4 Software
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