



A Professional Journal Exclusively for the Heath/Zenith Z-100 Computer

Z-100 LifeLine Web Site: <https://z100lifeline.swvagts.com>

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HOWGOZIT

By now you should have noticed that **WE HAVE a new Z-100 LifeLine Website and Email address!** Please make note of these.

COVID-19! I don't think that there is much out there that scares Myra and me more. We hope that all of you have been taking care and if you are still working and taking care of business for the rest of us, we thank you for your service. We especially appreciate those in the health care profession that are risking their lives daily to provide the best care they can for their patients.

Myra and I are doing our best to avoid being part of the problem. We shop for essentials once each week to get fresh fruit, milk, eggs, and the like, then return home to shower and change clothes. We wear our masks everywhere we go. The rest of the week we hide at home, call our family, and do the chores. The yard work continues constantly and my newest project has been documenting my garden plants and working on Z-100 projects - this issue's enclosure - **Z-100 Floppy Drives**.

The last issue introduced the DL4YHF2 Frequency Counter and Crystal Tester, as possible new, interesting additions to your test bench. This issue includes the procedures to construct a XR2206 Function Generator Kit for our test bench. I also added a new page to the Z-100 LifeLine website, **Inexpensive Test Equipment**, that will contain all the equipment that I have reviewed in the last few, and future issues.

I have some hand-held oscilloscope kits still on the shelf waiting to be added to our bag of tools, but I had to put off their construction to tackle the job of going through the growing number of floppy drives that I've collected over the years. As I was testing these out, I saw the need for

this issue's enclosure, which grew in size dramatically as I tackled each drive size and tried to remember how to get each new size to work properly under each Z-100 operating system. I hope you find this insert helpful.

IDE Controller NVsRAM Died

In the middle of April, I received an email request for help regarding the Z-100 LifeLine IDE Controller Board.

It seems that after a long period of inactivity, when he powered up his Z-100, it would no longer boot to his IDE controller. After some back and forth troubleshooting, we found that while he could reprogram the NVsRAM, when he powered down, the system would no longer boot again. We suspected a bad battery - the first report of one going bad.

We knew that these would not last forever. In fact, the manufacturer's specifications would only report that the battery would last greater than 10 years of inactivity (without computer power).

I have since researched this further, hoping that perhaps there was a means to recharge the battery when computer power was reapplied, but there is no such circuit to any of the NVsRAM real time clock (RTC) options available to us.

Actually, this came as no great surprise to us who developed the IDE Controller. But to incorporate all the features that we wanted - boot ability and real time clock, we only had a few options.

Charles Hett was the first to bring the situation to my attention and I published his article in issue #118 of the 'Z-100 LifeLine', "**ZIDE NVsRAM Description and Build Instructions**", in March 2010.

This article described a replacement NVsRAM alternative, should the battery die in our existing NVsRAM, and a direct replacement was not available. This project used an Alliance AS6C4008.

As of April 2020, these were still available from several sources for about \$5.00. However, this alternative required other parts, including an external battery, that would bring the cost to about \$20.00, required soldering capability, and would NOT contain clock capability - just a bootup capability, running programs stored in its memory.

Yes, there are also NVsRAM chips that do not require battery backup. These are pure memory banks that will retain their memory for years, without power. However, without power available, we would again have no clock capability. To retain a clock capability, there must be enough continuous power to run a clock oscillator. No oscillation - no clock.

With time of the essence, I sent out a general email alerting all my contacts of the situation. I'm repeating much of the information here for record purposes, including symptoms reported and the summary of help offered. It will also remind you of the procedures to reprogram your NVsRAM, if ever needed:

The NVsRAM on my IDE Controller doesn't seem to boot anymore. When I enter: <F4><S>, I get the error, "No System on EEPROM Board".

I was able to boot to the floppy, so I still have access to the board, but no drives E thru J.

I dug out my IDE Controller and had a similar experience, but the error I received was the more common, "The EEPROM is corrupt".

Here was the advice that I offered (He was using a Compact Flash as the IDE storage device):

Sometimes, a bit goes bad and the checksum doesn't come out correctly. Other times, it was an attempt to reprogram the NVsRAM and forgetting to do a checksum.

Were you trying to change the programming, perhaps trying to add or delete files?

Anyway, it does not matter. I placed a pair of files on the ZDOS4 partition, perhaps in a directory called \EPROM, or something similar, that has a few utilities to reprogram the NVsRAM to its original programming:

EPRDFILE.COM: This file, when run, will create an image file, EPTTEST.DAT, from the current programming of the NVsRAM. It can be run from within the ZDOS4 partition of your IDE device.

EPCFFILE.COM: This file, when run, will compare the current programming of the NVsRAM with the EPTTEST.DAT file, if you want to see how bad the NVsRAM was data-wise. It can be run from within the ZDOS4 partition of your IDE device.

EPWRFILE.COM: This file, when run, will take an image data file, EPTTEST.DAT, and reprogram the NVsRAM with

the contents of that file. However, it can **NOT** be run from within the ZDOS4 partition of your IDE device. You must boot to a hard drive or a floppy drive, containing the utilities and EPTTEST.DAT, then run EPWRFILE from that device.

EPTTEST.DAT: This is an image file created by another file, EPRDFILE, when I first programmed the NVsRAM.

Simply run the programming file with the command:

```
EPWRFILE{RETURN}
```

It will locate the EPTTEST.DAT (524kb) file and reprogram the NVsRAM automatically.

If you were trying to reprogram the NVsRAM with changed information manually, please reread the programming documents for the NVsRAM or contact me and I'll try to guide you through it.

While you are playing with it, I'm curious if the clock was still running correctly. Mine seems to be doing fine."

However, all did not go well...

That fixed things up, but then it was bad again after I turned off the computer. Is there a battery that needs to be replaced on the controller?

It turns out that the battery appears dead. After a power shutdown, the NVsRAM forgets everything and the clock is dead.

So, here we are. I've reread the documentation, which I don't consider very clear on the subject. It only states that:

- The battery remains disconnected until the first application of Vcc.
- The NVsRAM will maintain the data stored on the device for **10 years without power**.
- The Clock oscillator can be turned OFF by using our program, with the command:
ICLKSET OFF.

Note this will stop the clock, and greatly conserve power, but power is still used to preserve the memory contents. Further, I could find NO evidence that the NVsRAM contains any kind of recharging capability, so it does not matter if you have powered it up much in the past 10 years.

While the email continued, let's get back to real time, here, so that I may update the information contained in the remainder of the email.

Ok, it has been, or is nearing 10 years when we shipped most of the boards out. Have you shut off the clock oscillator with the above command?

I haven't, and I've been using the NVsRAMs longer than anyone else (I was first to get them). But that does not mean mine will last much longer.

Here is the situation in a nutshell. These NVsRAMs are about to expire. And, while they will still work for single power-on sessions, as soon as power is turned OFF, all programming is lost. You have to boot to a hard drive or a floppy, reprogram the NVsRAM, then use the NVsRAM to boot and access your IDE devices!

Further bad news, these NVsRAMs have been DISCONTINUED! Not really a surprise.

At the time, I only had a few extra NVsRAMs. I had NOT tested them, because that would turn ON the batteries, if they were not already, and I wanted to avoid additional power drain, until such time as they were sold to you. As each is sold, I will program them and ensure they work.

In May, I again checked around and ONLY DigiKey still stocked them. Elsewhere, Ebay listed a few from other suppliers, but who knows if they have been used, or for how long.

So, I have gone ahead and purchased the minimum order of 8 more from DigiKey, giving me about 12 extra, if they all work. The good news was that the 8 I received all had the same batch series number, so they should not have included any dud returns. These I will hold in reserve and make available **only** to known 'Z-100 LifeLine' IDE Controller owners for the cost of \$45.00 each, which includes shipping.

However, **I still desire your help.** I would love to get my hands on a bad one. I want to remove the cover and see what the inside has. The NVsRAM is a fairly large box and possibly the battery is a simple removable cell. If you ship me a bad NVsRAM, I will attempt to repair it with a new battery (it may have to be mounted externally) for the cost of parts and shipping. Don't send any money until I check it out and let you know your options.

As always, I'll publish the results and/or fix here.

IDE Controller Refresher

It has been quite awhile since we last discussed the Z-100 LifeLine IDE Controller Card, so I thought I might refresh our understanding of some of the finer points today. One of these was brought to mind from the previous discussion regarding the NVsRAM clock battery. So, first off, if you have not read that section yet, I recommend that you start there.

That article also discussed the primary programming option for reprogramming the NVsRAM, if such a case should become necessary. Remember where the recovery EPTEST.DAT file is kept.

And while on the subject of reprogramming the IDE Controller's NVsRAM, there are a few restrictions to be aware of.

When reprogramming the NVsRAM using EPTEST.DAT, the file on an IDE Device (CF card or IDE drive)

partition can **NOT** be used. You must use another boot device, such as an MFM or SCSI hard drive, or floppy drive to run EPWRFILE. If you attempt to run EPWRFILE from an IDE partition, the file will appear to reprogram the NVsRAM, and even reports "EPROM successfully written from image file", however, if you check the programming using EPCPFIL, you will find that the programming was NOT changed.

Note: Even booting to a ZDOSv4 floppy and changing to an IDE partition to run EPWRFILE will not work. This places those with only a 5" 48tpi floppy drive with no way to reprogram the NVsRAM, because the EPTEST.DAT file is too large to fit! They would need to use the complicated manual reprogramming method (See the IDE documentation or email me for the procedures).

Only those who have installed a 96tpi 5" drive, an 8" drive, or a 3.5" drive would have the room necessary to copy the NVsRAM utilities and the 524 Kbyte EPTEST.DAT file on a floppy disk. I highly recommend that you create an emergency backup bootable floppy disk that contains the NVsRAM utilities and the EPTEST.DAT file for reprogramming purposes.

Every purchase of the Z-100 LifeLine IDE Controller board included the bootable 5" floppy disk, "Z-DOS 4.06 IDE Controller Utilities" or "Z-DOS v4.06 For IDE Setup". This disk included all the files necessary for most NVsRAM functions, except the EPTEST.DAT files. These were placed on any IDE device that I may have programmed as a service to new purchasers of the IDE Controller.

If you did not receive any IDE device from me, you can still create your own EEPROM/NVsRAM Working Disk, as follows:

Create a spare bootable disk for whatever floppy disk system that you will be using; 8", 96tpi 5", or 3". I recommend creating this Work Disk, even if you are using another hard drive system, such as the normal MFM Winchester.

Locate the bootable 5" floppy disk, "Z-DOS 4.06 IDE Controller Utilities" (or similar) and copy all the following files to your new IDE Work Disk:

AUTOEXEC.BAT	CHKSUMEP.COM
COMMAND.COM	CONFIG.SYS
DRIVECFG.COM	EDLIN.COM
EPCPFIL.COM	EPRDFIL.COM
EPWRFILE.COM	EPROMPGM.BAT
FC.EXE	FLAGS.COM
FORMAT.COM	LOOK.COM
ICLKCAL.COM	ICLKREG.COM
ICLKSET.COM	ICLKTST.COM
LLIDEHD.EXE	SETLPS.COM
IO.SYS	MSDOS.SYS
README0.DAT	SHARE.EXE
XCOPY.EXE	ZDIR.COM

Locate the directories, EEPROM0 and EEPROM1 that I included on any IDE device that I programmed for you and copy the EPTTEST.DAT file from each directory to the new Work Disk (naming the EPTTEST.DAT file as EPTTEST0.DAT (for NO MFM drives) and EPTTEST1.DAT (with MFM hard drives).

Note: If you do not have these files, or cannot locate them, boot to the new Work Disk, or change the default drive to the drive your Work Disk is in, and run the command EPRDFILE. A new EPTTEST.DAT image file will be created from the current NVsRAM programming and saved to your Work Disk for future use.

With all the files mentioned above and both EPTTEST files, you should use about 1292 Kbytes of data.

To check the programming of the NVsRAM, just run the command EPCPFIL EPTTESTx.DAT, where x is 0 or 1 depending on whether you have MFM hard drives installed in the system.

To reprogram the NVsRAM, simply run the command EPWRFILE EPTTESTx.DAT, again where x is 0 or 1.

Next, I thought I'd give a quick summary of the preparatory programming of any IDE device that you may wish to attach to the IDE Controller card.

As an example, let me review the procedures to prepare the popular Compact Flash (CF) card for our use. I recently purchased three Gigaram 512mb CF memory cards from OEMPCWorld.com to program for a customer.

As you may recall, I have always maintained that larger cards are not necessary for use in the Z-100 for several reasons:

* Most Z-100 software applications cannot use partitions greater than 32Mb. This is because of the limited memory addressing capabilities of this early software. After all, who, at the time, would have thought it would be necessary to address more?

* While we can literally use drive letters A through Z, by the time you create a few of these 30Mb partitions, and divide the remaining memory into a few larger, say 100Mb partitions, it becomes more difficult to keep track of what software is installed where.

I really see a need of some partition listing utility, similar to DIR or ZDIR for listing directories and files. Right now, the partitions are only listed during bootup, and you need to write them down to remember them (or at least I do).

* Finally, who really needs more than a few hundred Megabytes for storage on a Z-100? It would really be tremendous overkill!

Note: Having said that, however, if you like some interesting figures, I recently had to copy the entire Z-100 LifeLine Software Library from one 512Mb CF card to another. My Z-100 was running with a V20 CPU at 8.00 MHz. I used the XCOPY /S/V command to copy all of drive P: to T:.. It took 72 minutes to copy (and verify) about 262 Mb in

16,207 files. Try that on the latest MFM hard drives!

So, anyway, I like 128, 256, and 512Mb Compact Flash cards and OEMPCWorld.com is a great, reasonably priced source of generic cards, such as their GigaRam brand. So far, these have worked well for me.

Let us go through the necessary procedures for preparing these 512Mb CF cards. Programming an IDE hard drive would be similar.

Note: You may recall that we never developed a utility to prepare IDE storage devices on the Z-100 (It was under development when our software expert, John Beyers, moved on). While these CF cards come prepared with one large partition, we must use a PC clone to create smaller partitions on the IDE device for efficient use in the Z-100.

Note: To prepare an IDE device, I am using an old PC clone using a Windows 95 or Windows 98 startup disk, to boot to DOS. However, the Microsoft version of FDISK had some difficulty creating the partition sizes necessary, so I use Free FDISK, which does the job properly. However, it also has a problem adjusting the size of the last partition (you need to make the last partition 2 or 3Mb less than the calculated size, or the partition has problems).

These limitations or issues may have been corrected in later versions, but Free FDISK works for me and I have not taken the time to try others. If someone has had success with later MSDOS versions, please let me know.

Note: The PC clone I'm using is a bare bones computer (no case, no hard drive, no Windows installation) with a 486 processor. All you need is a main board, power supply, keyboard, monitor, floppy drive and the IDE device to prepare (CF card adapter or IDE drive).

Note: Some, more recent computers have Compact Flash and other memory card readers already installed. These will **NOT** work. They are only meant to read (and maybe write) files from memory cards and do NOT simulate the full workings of an IDE drive.

Procedures to prepare a Compact Flash Card:

* Install the CF card in the IDE adapter.

Note: Never install or remove a CF card with power ON. It may cause damage to the card.

* Boot to DOS with a Win95 or Win98 startup disk.

* Change to a Free FDISK floppy and run FDISK.

* On 512Mb CF cards, I generally create the following partitions (Smaller cards would have fewer or smaller partitions):

- Delete PriDOS partition C: ~512Mb

This removes the existing large partition.

- Create PriDOS partition C: 30Mb
- Create PriDOS partition D: 30Mb
- Create PriDOS partition E: 30Mb

Note: As I recall, MSDOS FDISK only allows one Primary DOS partition and requires the rest of the devices memory be placed in the Extended DOS partition, which can be further subdivided into smaller partitions, by drive letter. Free FDISK will allow up to four Primary DOS partitions. If you want more partitions, the fourth primary DOS partition must be removed and a large Extended DOS partition created. The next step will create one large Extended DOS Partition, which will then be divided further.

- Create ExtDOS partition:

Make this partition 2-3Mb less than the size given by FDISK.

- Create Drive D: 100Mb
- Create Drive E: 298Mb

Note that the Primary DOS partitions that were D: and E: now become F: and G: automatically.

- Make partition A: active.
- Display partition info, with extended drives, if you wish to check if all went well.

* Restart the computer to recognize the new partitions on the IDE device.

- * Run FORMAT on each of these drives:

- FORMAT C: and name WP (~30Mb)
- FORMAT D: and name ZDOS4 (~100Mb)
- FORMAT E: and name PCPART (~298Mb)
- FORMAT F: and name CALC (~30Mb)
- FORMAT G: and name DATA (~30Mb)

* Run SCANDISK on each drive letter to ensure there are no glitches or errors. This is the only time you will be able to check the IDE device for memory errors using SCANDISK.

Note: SCANDISK (at least the WIN 95 and 98 versions) will cause errors with the File Allocation Tables (FAT) after files are copied to the partitions from a Windows computer. It will ask to fix these and fix filenames that are longer than 8 characters in length (DOS). Do **NOT** allow SCANDISK to fix FAT errors on any partition/drive. It is best to **NOT** use SCANDISK after copying files to a partition/drive.

You may have noticed that I used the label PCPART for the last huge partition. As I mentioned earlier, large CF cards are just too much space for most uses on the Z-100. But that the same CF card could be used on a PC clone with its own CF adapter installed. The extra space could be used by the PC.

Note: For some reason the drive letters get mixed up between FDISK, a PC, and the Z-100, so watch what the partition names are, before copying, moving or deleting files. Preparing the partitions with Free FDISK in the order given above, creates the same partition order (30, 30, 30, 100, and 298) on the Z-100.

ALL the drives can be seen on the Z-100 and any PC, making an excellent means of copying files between the PC and the Z-100. For example, you may recall, the new ZDOS versions are provided on CD-ROM. If you use the CD-ROM on a PC with a IDE/CF adapter, you could copy the files from the CD to the IDE CF and then use them on the Z-100. However, there is a catch...

While files can be placed on a partition by either the Z-100 or the PC, a PC using Windows uses longer directory and file names than DOS. The directory tree being used on the CD-ROM uses longer names because I have the entire Z-100 Library on a Windows PC, which makes it much easier to identify what files are where.

DOS computers shorten these longer directory and file names to the first six letters, then add a tilde (~), then a number, generally a 1. Subsequent files with the same first six letters then become 2, 3, etc.

Further, on the Z-100, DOS displays additional volume labels that contain the missing filename information. ZDIR shows these additional volume labels in the form:

```
AD.O.S.4.H. <vol>
AD.i.a.g.l. <vol>
AL.L.i.d.e. <vol>
AP.k.Z.i.p. <vol>
```

that make up additional lines in the directory.

If the floppy disk or CF partition is placed back in a Windows computer, the entire longer file names are regenerated and used.

CAUTION: These volume labels cannot be copied, deleted, or renamed by DOS (they are not seen). So, if a directory or partition containing these extra volume names is copied to another directory or partition, the volume labels are lost, and a Windows PC would no longer be able to generate the longer file names.

So, I recommend using the PCPART partition to store backup files, files to be used on a PC, or other non-daily uses. Files can be copied from it to the Z-100 partitions, such as installing WordStar or WatchWord from the PCPART partition to the WP partition, but be watchful of those long directory or file names.

Cheers,

Steven

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