



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

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HOWGOZIT

COVID-19 continues! And while the vaccine is being distributed, it does not appear that Myra and I will be getting it any time soon. Again, we extend our thanks to those of you on the front lines, taking care of business for the rest of us.

Myra and I are still doing our best to avoid being part of the problem. We shop for essentials once each week, 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.

My newest project has been experimenting with and documenting this Gotek Floppy Disk Emulator. It has taken many weeks of researching and testing as I tried every possible configuration that I could do in our Z-100, including its use with the DISKPACK floppy disk driver under ZDOS v3. So I hope you enjoy this issue and the inserts.

Status of Gotek Emulator Testing

I received my Gotek Floppy Disk Emulator, like the one pictured, and immediately began testing. I wanted to fully test and document the Gotek before confusing the issue with the various upgrades, especially the Firmware.

To begin, I installed a 4GB USB flash drive in my Gotek Floppy Disk Emulator and did the auto-format by powering up the unit while pressing both buttons. However, it completed only 26 partitions, out of the possible 1000 on the Flash Drive, then it stopped and returned to 000. Subsequent testing on an 8Gb USB Flash Drive showed that the Gotek would properly format all 1000 partitions on the unit, so there is some unidentified issue on the 4Gb unit. Not to worry, however, as I could still format the higher partitions manually and, if I included the system files, the Gotek would boot-up just fine.

While I was waiting for the Gotek emulator to arrive, I wanted to ensure my Z-100 testbed computer was fully operational, so I tested the motherboard RAM, video RAM, floppy controller and an assortment of drives using DIAG.

Running ZDOS v4, I was able to configure the Gotek 3", 135 tpi, 1.44Mb high density drive in DRIVECFG as unit 1 (Drive B:) and left the normal 360Kb, 48 tpi, 5" floppy drive as unit 0 (Drive A:). I began with the 192Kb, 5 MHz main board in my testbed computer and booted to my MFM 10Mb hard drive.

My first efforts to play with the Gotek drive started with running FORMAT B:/s/v on the first partitions, 000 and 001, and then I copied files



from some floppy disks - the DIAGnostics disk to B: (Partition 000) and HD utilities disk to B: (Partition 001).

Everything worked great and the Z-100 booted to both of these new B: drive partitions as a normal floppy would.

Next, I formatted (same FORMAT B:/s/v to make them bootable) Gotek disks 002 and 003. Format went well and they were bootable also.

However, when I tried to copy a floppy disk containing the IDE Controller Utilities, I began to get occasional seek errors reading drive A: or seek errors writing drive B: (How does a solid state drive give a seek error?), usually on the same files on subsequent attempts.

Over many days, I tried all kinds of solutions:

- Swapped out the floppy drive - from a Matsushita JA-551 to an IBM (Qumetrak 142) and back. The same files got the same errors (how weird is that?).
- Tried different disks - even those that worked fine earlier. Still got plenty of seek errors.
- Tried three different Z-207 Controllers and different cables. No change, and here's the rub... All DIAG tests on both normal floppy drives (A: drives) and Z-207 controller boards were fine. DIAG does not support 3.5" drives, so I could not run DIAG on the 3.5" emulated drive. Copying to/from the hard drive to/from the drives A: and B: are all fine. Copying from B: to A: works fine. The ONLY failures (the seek errors) occur when copying from A: to B:.
- Tried a second (768Kb RAM, 8 MHz) motherboard, hoping the faster speed might eliminate the errors.
- I tried a cable nearly 3' long, and even reversed it to put separation between drive A: and drive B:. I tried moving the floppy drive from the end (with the terminating resistor) to the middle. I've tried removing the terminator resistor while the normal drive was on the end. No difference. Even DIAG had no issues with drive A: without a terminating resistor while on the end of the cable.
- I physically separated the two drives eliminating possible noise. No difference.
- I noticed the tendency to have the seek errors at the same files, so I tried formatting and copying files to a new boot disk in drive A: from drive B:. While they copy fine to A: and from A: to the hard drive. I got plenty of read (A:) and write (B:) seek errors when attempting to copy from the new A: to the B: drive.

There was one more consistent, and most probably related, issue. With the system files on all these disks, I always get the question about overwriting COMMAND.COM at the start (as it should). I had been answering No, but have even tried Yes. Of interest is that occasionally after the first seek error and pressing {F} for fail, sometimes the copying will commence where

it left off, but most times, it stops the copy of any additional files. BUT a few times, it would restart by asking if I want to overwrite COMMAND.COM - again?

It should not be doing that. So I'm wondering if it may be confusing the FAT somehow?

I finally moved the Gotek to the 50-pin 8" interface of the Z-207 Floppy Controller and reconfigured the DRIVECFG utility to operate the Gotek as a 3", 135 tpi, 1.44Mb high density floppy drive D:. However, the seek errors continued.

After several more days with no progress, I started testing under ZDOS v3. This original Gotek can only emulate the 3" 135 tpi 1.44Mb floppy drives and these can only be run off the 50-pin 8" interface of the Z-207 Floppy Controller. So I had to install the **DiskPack** Floppy Disk driver to use the 3" emulator. All worked fine. **No COPY issues at all.**

For information on using DiskPack with the Gotek, please refer to this issue's insert, the "**Z-100 DiskPack User's Manual**".

As I tested everything I could think of, it was time to upgrade from the original firmware.

Probably, the most critical upgrade that you can make to the Gotek Floppy Disk Emulator is to the firmware. As we saw above, the original firmware has limited capability and the aftermarket firmware upgrades are considerably more powerful, adding much more capability and flexibility.

Presently, there are two firmware upgrades available that promise several improvements over the standard 1.44 Mb 3" drive emulator; the FlashFloppy Firmware upgrade (free) and the HxC Firmware upgrade (about \$12.00), both very similar, and supporting hundreds of computers, keyboards, music synthesizers, and computer controlled machines, such as textile or milling equipment. Both Firmware upgrades support:

- 3", 5", and 8" disks
- Single and double sided disks
- FM / SD, MFM / DD or HD densities
- 125, 250, 300, and 500 Kb/s Bit Rates
- 300 RPM, 360 RPM, and 600 RPM
- 128/256/512/1024/2048/4096 byte Sectors
- All track skew and sector interleaving
- Up to 255 tracks/disk
- And much more!

So I upgraded the Gotek to the free FlashFloppy Firmware and began my testing again. **ALL the COPY issues were now gone.** I completed my testing pretty much as I discussed above, and there were no issues at all! So, my seek errors appear to be from the original firmware.

However, that does NOT mean that all went well.

The new Firmware is a complete departure from the ideology and purpose of the original firmware. It was even difficult to compare the capabilities. After several weeks of reading and research, I think I finally got the differences figured out, but the learning curve was steep.

Both firmware upgrades treat the USB flash drive completely different from the Basic Gotek floppy disk emulator. Both were apparently developed by computer gamers for gamers, in that they concentrated on using compressed disk images of floppy disks to be installed in the Root directory of the USB flash drive. From there, each disk image was automatically placed into separate slots or partitions in the Gotek's USB flash drive, depending upon the disk size to be emulated.

These compressed disk images had several advantages:

- They could be easily created using Disk Imaging Software.
- They were in a compressed format, but could be played as if the individual game files were on a floppy disk.
- They could be sold or given away as groups of games for the Atari, Amiga, and other gaming computers.

These disk images made it possible to select a game (or a disk of files), by the USB flash drive's partition number on the Gotek emulator and play the game as though it were the original floppy disk. It required no further uncompressing nor manipulation.

Other advantages of the new Firmware were:

- Operation with a rotary encoder.
- Operation with a speaker for floppy disk sounds.
- Operation with an OLED display, displaying names of disks rather than just partition numbers.
- Operation with all common 8", 5" and 3" disk drive formats.
- Operation exactly as a floppy drive would, with files and folders.
- Flexibility, which was created through the use of additional files:
 - = FF.CFG, which configures the firmware to use the upgrades mentioned, and
 - = IMG.CFG, which sets the disk size parameters.

So, this issue's article, "**Gotek Floppy Emulator Firmware Upgrade**", is must reading for anyone contemplating the purchase of a Gotek Emulator. It discusses every aspect of downloading the free FlashFloppy Firmware, flashing the controller with the new Firmware, preparing the USB flash drive, and then its operation.

However, this isn't the end of the story...

A Brief Introduction to the OLED Upgrade

Really anxious to see how the display upgrade would look, I installed the OLED upgrade first. I also modified the case (should not have yet) for all the upgrades to be made, but after installing just the OLED display, I wanted to see how it worked.

First, out of curiosity, I tried the OLED in my new, second Gotek that still had the original firmware. As expected, the OLED did nothing. So, the old firmware has no capabilities for handling the OLED or probably even a rotary encoder.

I reinstalled the OLED back into the modified Gotek circuit board. Using the 8GB USB flash drive that I had used to back up files on the unmodified Gotek, all the OLED displayed was:

```
[DOS]
000/000 D:0
```

briefly; then changed to:

```
[..]
000/000 D:1
```

The buttons did not work (no surprise) since there is no FF.CFG file to define button use, but I had hoped they would still do something - NO.

I powered down and inserted the 4GB flash drive prepared on the PC for a 720K 3" drive. At power up, the OLED flashed the Firmware version:

```
FlashFloppy
v3.23
```

then the image file name:

```
ZFD720_0000
017/030 HFE D:0
(The D:0 was brief, then becoming T:00.0)
```

The buttons incremented as they should; right to increment ones, left to increment tens. OK

The files incremented to ZFD720_0001, then _0002, then _0024!? Not sure why.

Then numbers under the Image file name, also incremented; starting at 017/030, to 018/030, to 019/030, then 010/030, 011/030, etc, to repeat up to 019/030.

When it counted up to ZFD720_0030, it jumped back to _0000, because I only used 31 image files.

Ok, I can deal with this, but if I change the <VOL> name, will the OLED show that? NO.

Here's how that went...

After booting to ZDOS4, the OLED was blank. Because this USB flash drive was prepared as a 720Kb drive, I had to change DRIVECFG to use a

LowDen 3" 720K drive as B:. I rebooted again, and this time the OLED remained lit.

I ran FORMAT B:/s/v on partition 0000. That worked fine and the OLED display showed a flashing 'W' and changing Track and Head numbers. I used 'DOS4_BOOT' as the volume name, but there was no change to the OLED.

I copied the rest of the hard drive's Root directory to B: and created a \DOS partition on B:, then copied all the \DOS files to B:\DOS. All worked fine.

I booted to the Gotek (0000) and everything was great, EXCEPT the OLED display continued to only display the image file name.

Apparently, the ONLY way I would be able to change this would be to change the Image file name for each partition, ON THE PC!??

As I cannot see the USB's Root directory on the Z-100, I can not see how this could otherwise be accomplished - a MAJOR disappointment!

So, taking a break, I finished the hardware upgrade with the rotary encoder, since I have already made the case modifications, and thought further on this unexpected setback.

Well, I found the solution, but you will have to read the article to find the secret. I think you will enjoy it.

Conclusions:

The upgraded Gotek may be used to emulate up to 39 formats and smaller sized drives. While the Firmware Upgrade websites make a big deal about creating disk images, **you do not need to create a disk image, to back up a disk.** So, I have not addressed the creation of disk images of your old software, as it is outside the scope of my articles, at least for now. However, there is a lot of information at the firmware upgrade websites, and several other on-line sites to assist you.

Using blank images, you can create the number of partitions needed, or add them as needed by just adding additional blank disk images anytime in the future. I do recommend retaining a disk drive of each type for future use.

It is a shame that use of the upgraded Gotek has become so complicated, because in all other regards, the floppy emulator is working great.

Is it worth upgrading from the plain vanilla original version? Well, ultimately, I must highly recommend the firmware upgrade. The COPY seek errors were not found in the FlashFloppy Firmware, a solid, well-thought out, upgrade.

The OLED screen is also a welcome upgrade over a three digit number.

However, I recommend that you read the enclosed article before going out of your way to buy and install a rotary encoder or piezo speaker. It was very frustrating and ultimately, I could NOT get the rotary encoder to work properly. And while I did not install a speaker, I question the need to listen to floppy drive seek noises over the sound of the Z-100's noisy fan.

If you have any thoughts, please let me know.

DiskPack Floppy Driver

DiskPack was an early software package which allowed the use of all popular 8", 5" and 3" floppy disk formats on the standard H/Z-100, including PC compatible formats, such as the IBM AT compatible 1.2Mb 5" drives, and the 720Kb and 1.44Mb 3" formats. Aside from the floppy drives and cables, no special hardware was required - all formats supported by DiskPack were provided using the standard Z-207 floppy controller.

Once ZDOS version 4 was developed, which allowed the use of most popular drives in the Z-100 through the use of the DRIVECFG utility, the need for DiskPack virtually disappeared.

However, the development of a Floppy Disk Emulator, which uses a USB flash drive as the storage media to replace up to 1000 of the increasingly hard to locate 1.44 Mb 3.5" floppy disks, is intriguing for all of us.

But while use of an emulator under ZDOS v4 is easily accomplished, users of earlier DOS versions would have a more difficult time. All of a sudden, DiskPack becomes very relevant again, as an inexpensive option for these users.

System Requirements

In order to use the DiskPack driver and other programs, you must have a Heath/Zenith Z-100 series computer with at least one standard Z-207 floppy disk controller card. The driver requires ZDOS version 2 (Zenith's version of MS-DOS for the Z-100) or above. One or more floppy disk drives and the appropriate cables are needed.

Using ZDOS versions 2 or 3.

Under the newer ZDOS v4 and ZROM v4, any combination of common drives may be used without regard to the 48 tpi / 96 tpi DIP switch setting on the Z-207 Floppy Controller or type of drive, as the new DRIVECFG utility configures the system drives and modifies the IO.SYS directly. DiskPack could still provide the capability of handling less popular disk formats, however.

In issue #133 of the "Z-100 LifeLine", I introduced the Floppy Disk Emulator. The Floppy Disk Emulator uses a USB flash drive as the storage

media to replace up to 1000 1.44 Mb 3.5" floppy disks and is useful for transferring files from a PC without modern connectivity.

Almost any USB flash drive seems to work, but it should be 256Mb or larger for using the maximum capacity of the first model and 2GB for the later model. If the memory stick is smaller, the number of 1.44 Mb floppy partitions is reduced in each case.

The original Gotek emulator generally comes with firmware that ONLY supports the 3.5", 1.44 Mb MFM format. This means that this emulator is suitable for IBM/PC (and compatibles) using high density 3.5" floppy emulation only.

Pre-ZDOS v4, the Z-100 could only use standard density, 48 tpi, 5" drives OR 96 tpi, 5" drives on the 34-pin connector of the Z-207 Floppy Controller Card, depending upon the setting of section 0 of the DS1 DIP switch on the controller; set to 0 (On) for 48 tpi, and to 1 (Off) for 96 tpi operation.

Furthermore, **high density** media must use the 500K rate of the 50-pin interface (8" media). Therefore, **DiskPack would enable use of the new Floppy Emulator models on a standard, unmodified Z-100!**

And either of the Gotek Floppy Disk Emulator firmware upgrades promise several improvements over the standard 1.44 Mb 3" disk emulator (see the accompanying Gotek article).

So, while the standard ZDOS only supports the usual 5" and 8" drives, the DiskPack driver can own, and control, the other sized drives and formats that you may need or desire, with minimal expense.

But, there are some limitations to DiskPack:

- Difficulty getting the cabling correct:
 - Requires a special cable to change drive unit to 2 or 3 because the BIOS uses units 0 and 1 and most drives do not have DS2 or DS3.
 - The 50-pin Z-207 interface requires a Ready Signal, not available on most newer drives.
- Can NOT Boot to any drives not owned by the BIOS.
- Can NOT be used with any operating system other than ZDOS.

So, this issue's insert, "**Z-100 DiskPack User's Manual**", takes a much closer look at DiskPack and its capabilities. If you are still running ZDOS v2 or v3, and wish to try a Floppy Disk Emulator, you will need to use DiskPack. Mention this article and I would be happy to send you a bootable ZDOS v3 DiskPack disk for \$5.00.

Closing

We wish you and your families all the best in these trying Covid times. Keep your families safe and get vaccinated as soon as you can.

Spring is just around the corner!

'Til next time,
happy computing!

Cheers!!!



Z-100 LIFELINE

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