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## HOWGOZIT

Well, nearly two years since my last issue! That's a record that I'm not proud of. But let's just say that it was due to my mother's unexpected and prolonged health issues that prevented me from concentrating on anything more than small projects that I could leave hanging at a moment's notice and leave it at that. As these have finally stabilized, I hope to get more involved in Z-100 issues and pick up where I left off so long ago. Once again I find myself having to apologize. I am sorry.

I also have not finished my family room cabinetry projects (it really is like the last 18 months, I haven't accomplished a thing), so this will take my immediate attention. I've already bought the wood and Myra's cracking the whip to get it done - can't really blame her.

Last time I left you hanging about my CP/M project. As you may recall (though it has been quite awhile), I wanted to modify CP/M-Plus to work with our IDE Controller board. However, I have to relearn CP/M programming all over again - not that I was all that knowledgeable before. Anyway, I haven't given up on this and hope to restart this project as soon as my house work is completed.

## Setting IDE Autoboot

Way back in 2002, in issue #79, I published a new version of Appendix I (User Configurations) for the Z-100 User's Manual. Obviously, we didn't have a clue about IDE drives back then, so page I-5 was pretty basic about setting the Motherboard DIP switch (S101) for Autoboot.

Well, I was recently asked (actually several months ago) how to set the IDE Controller for autoboot. So I did some experimentation and found out.

As a review, you may recall that sections 0, 1, and 2 of this switch set the Autoboot Device:

| Section: 0 | 1 | 2 | |
|---|---|---|---|
| 0 (On) | 0 (On) | 0 (On) | 5" Floppy Boot (Int) |
| 1 (Off) | 0 (On) | 0 (On) | 8" Floppy Boot (Ext) |
| 0 (On) | 1 (Off) | 0 (On) | 5" Winchester Boot (Int) |
| 1 (Off) | 1 (Off) | 0 (On) | EPROM Device (Z-ROM v3+) |

Please make a pen and ink change to your copy of I-5 to include another line to this table:

1 (Off) 1 (Off) 1 (Off) IDE EPROM Device (Z-ROM v4+)

This setting will cause Autoboot to the Z-100 LifeLine IDE Controller.

Incidently, the setting of Section 2 is used for booting to the secondary device of each device type. For example, if the switch is set for a device that is NOT installed, the computer will report:

001 gives a secondary Z-207 Controller Error (5")
011 gives a secondary Z-217 Controller Error (HD)
101 gives a secondary Z-207 Controller Error (8")
110 gives a primary EEPROM Device Error (SCSI)
111 gives a secondary EEPROM Device Error (IDE)

## Choosing Picture Density

I'm often getting pictures from relatives and others that fill up my e-mail in-box with lengthy files that take forever to download and it was suggested that I make an attempt to explain picture density in simple, understandable terms.

As I thought that you might find this interesting and helpful, I hope you don't mind this rather oversimplified explanation of a complex issue.

To view any picture on paper or on a screen, everything is in dots per inch or pixels (dots of light on a monitor) per inch. For example, a newspaper picture, if you look up close, is just a bunch of dots. If you remember back in the Z-100's day, the text on a monitor's screen was also just dots. Back then each character was just a 5x7 matrix of dots. Well nothing has changed with the newer monitors - just the picture or character density has increased tremendously. An image on my 13" computer screen is just made up of about 100 dots or pixels per inch in each direction - up and down and across. High resolution monitors are much denser than even that.

Now, depending upon the setting of a camera, each picture could be several mega-pixels in density - and in memory space! For most computer screen purposes, this density is wasted. For example, for my 15" computer screen that only uses about 100 pixels per inch, the computer actually recalculates each picture to just fit on the screen and the extra resolution (anything over 100 pixels per inch) is just thrown away.

However, the other element to this is the printed picture or larger sports bar type flat screen monitors. At 100 characters per inch, a photograph would look very grainy (like a newspaper photo) and be unusable in someone's photo album. So this extra density is needed to print a photo at 1000 or more dots per inch. This is further complicated by the ultimate size of the display medium. For poster-sized photos, we would want more like 10,000 dots per inch (original photo size) because the paper may be 10 or more times in size. Likewise, displaying a picture on my computer screen versus the 50" or more) monitor in a bar. The higher the photo resolution (dots/inch), the better it will look on a larger display (be it screen or poster).

The memory necessary to contain this information is also a consideration. A picture of 1000x1000 dots or pixels), requires 1 megabyte of size and at 100 dots/inch would be best displayed on my computer screen measuring 10x10 inches. As we already discussed, it would not print well on 10x10" paper (today's printer can be set to do more than 1000 dots per inch!). A factor of 10 more in each direction would require 100 megabytes and print a great 10x10" picture.

Finally, the transmission of these photos becomes a major factor. Remember the dial-up days when transmission rates were measured in characters (bytes) per second? It would take days to transfer those larger density photos. Well, thankfully today's DSL connections are measured in megabytes per second; if it were 5 megabytes per second, our example would still take 20 seconds to transmit. This is why most internet providers place a size limit on e-mails.

Most popular photo editors provide a means to adjust photo sizes and even densities. For photos to be displayed on my computer screens (and web pages), I look to make the photos about 6" tall and adjust the density to 100 dots per inch (target size of 600 tall by 800 wide works great and requires about 480,000 bytes to transmit). Most programs these days reprocess any photo to display it at the largest manageable size on the screen without cutting anything off. Good old PAINT does not do this and stays with about 100 dots/inch; if the picture is too large, too bad - you only get to see a portion of the picture at a time. Outlook Express used to show pictures from others like this also - I'd have to save them and then display them with another program.

Incidentally, I love PhotoExpress for processing and displaying photos.

I hope this helps.

## IDE Compact Flash Testing and Availability

As most of you know, I set up Compact Flash cards for use with our Z-100 LifeLine IDE Controller Card for use in the Heath/Zenith Z-100 computer. Over the years I have prepared and tested dozens of units of various brands, including the Disk on Module (DOM) that plugs directly into the computer's IDE connector.

As an aside, while I had success for weeks with the DOM's, they never worked reliably in the customer's Z-100 and I finally had a failure just before shipping them out for the third time. For some unknown reason, they had problems being recognized reliably by the computer's DOS operating system. So they were no longer recommended as an option.

Nevertheless, until now, I've never had a problem with Compact Flash units, and some 512mb GigaRam units had me stumped. Windows 95 and 98 SCANDISK reports File Allocation Errors on my setup rig. Yet they work fine on the Z-100 and on other Windows computers, so I hesitate sending them back.

These smaller Compact Flash cards are becoming nearly as scarce as the MFM hard drives that they were to replace 20 years ago. And those that remain have always been expensive, but I've seen prices of $30.00 plus for used 512mb CF models! So it is only natural that you will try these house brands at reasonable prices. The reason for this report is to alert you to possible problems.

Before I go into my preparation and testing, let me describe my computer rigs.

I use a bare bones 486 PC clone running at 133 Mhz that is dedicated specifically for preparing the CF. It has no hard drive attached and uses only a Windows 95 or Windows 98 startup disk in floppy A. It also uses a CF card adapter attached to the primary IDE connector. This ensures that I don't accidentally erase a good IDE hard drive by mistake (from experience). I run FDISK to partition the CF according to the customer's needs and some of our Z-100 software cannot see partitions over 32mb in size so each CF must have at least one this size. I generally create 1-3 of these and any remaining space is left as one or two large partitions.

For example, a 512mb CF will generally have two 200mb partitions and three 30mb partitions. I run the Windows 9x FORMAT program and then SCANDISK. Finally, I copy the floppy disk contents to the various partitions and run SCANDISK again. This is where I had problems with the GigaRam 512 CF units, but I'll get into that more in a minute.

Next, I have several different H/Z-100 computers with MFM hard drive, various floppy drive configurations, and the Z-100 LifeLine IDE Controller Card. Here, I can test the CF units using the IDE-CF adapter of the customer's choosing under the same setup that they will ultimately use, then ship the IDE controller, IDE-CF adapter, and CF cards and other goodies to the customer.

I also have a Windows 98se computer for Z-100 LifeLine file storage and work (it is also using an IDE-CF adapter identical to the setup rig), two Windows XP computers for other projects (these have multiport memory card readers), and a Windows 8.1 computer for the internet.

So, if I have a problem with a Compact Flash, it can be tested under a variety of situations.

Now, let's discuss the GigaRam Compact Flash units from OEMPCworld.com. I bought three 64mb units and ultimately two 512mb units. Not a large sample of either, but I wasn't expecting problems.

The three 64mb units programmed and tested fine, but the first 512mb unit I tried had problems.

The first SCANDISK just after formatting the partitions, passed fine. However, after copying the files from floppy A:, the second SCANDISK reported that the 2 File Allocation Tables (FAT's) did not match. Further, if you let SCANDISK fix the problem, then everything gets messed up.

**Note:** Do NOT let SCANDISK fix these errors.

On a subsequent reformatting and file copy, I tried the disk in the WinXP computer. WinXP doesn't do SCANDISK, you must run Check Disk from the "Properties/Tools" menu. This reported no problems but if I attempted to read some of the files, the error: "File or Directory is corrupted and unreadable" would appear.

Upon reporting the problem to OEMPCworld, they recommended trying another, so I bought another and when it arrived, I tested it with identical results.

Rather then bore you with the details of subsequent testing, here is a summary of the results:

**Note:** On the WinXP computer, the only partition recognized on a 512mb CF is the primary 200mb one. The other extended partitions, 200mb, and three 30mb ones are not recognized. (More on this later.)

Reformatting this primary partition on the WinXP computer and copying some files to it, Check Disk showed no problems. However, returning to the Win98se test rig, SCANDISK still reported the two FAT's do not match. Without doing repairs, I returned to the WinXP computer and Check Disk still reported no errors and the files read fine.

I changed the IDE-CF adapter - same results.

I suspect that the newer computer systems did not use the second FAT and I believe that the H/Z-100 computer also does not use the second FAT unless the first is unreadable. Could the GigaRam 512mb CF still be used in the other computers?

Well it turns out that it can.

I reformatted the partitions again on the Win98se setup rig, ran SCANDISK, which reported no problems, and skipped the file copy and second SCANDISK steps. Taking the CF to the H/Z-100 directly, all copy operations proceeded fine, CHKDSK reported no problems and file compare operations between the various partitions proceeded fine.

Returning to the WIN98se setup rig, SCANDISK reported the usual problems with the FAT's. I also tried CHKDSK, and it listed several files with "Invalid Allocation Units, Files Truncated" errors.

Returning to the WINXP computer, only the first primary partition showed up, but Disk Check ran fine on this partition and the files were readable.

Now, the puzzler; trying the CF in another Win98se computer running Windows at 650Mhz, ALL the partitions were detected, and running Check Disk from "Tools", showed no problems with any of the partitions. Rebooting to the same Win98se Startup floppy disk I've been using, but in this machine, and running SCANDISK showed NO PROBLEMS! Same OS, same SCANDISK program, different computer running at different speeds. All files readable. File Compares (using our Z-100 FC utility from the DOS prompt) all fine.

The end result: Don't panic if SCANDISK reports FAT problems when preparing your Compact Flash. Just reformat the partitions and take it to the Z-100. I suspect you'll still have many good years without difficulty, and you can't beat the prices.

Returning to the WinXP computer not recognizing the extended partitions on the CF, I believe that this is because this computer is using a multiport memory readers and not a IDE-CF card adapter. Further, if you try using the Win98se Startup floppy in this XP computer, the CF isn't detected at all. The Compact Flash isn't being treated as a hard drive, but more like a USB drive.

**Availability of Compact Flash Cards:**
(As of 07/15)

While I'm only interested in testing the house brands of Compact Flash cards available, I included the prices of some of the more expensive brands for comparison purposes. Keep in mind that the operating speeds of the Z-100 and older PC's is such that the faster compact flash cards are not necessary and those with UDMA or PIA modes are unnecessary. (However, I do not know the differences in these modes. If someone does, please enlighten me.)

Also, I did no testing on 32mb sizes to save expense. I consider 32mb CF units as a waste for use in the Z-100, when for basically a few cents more you can have two 30mb partitions on the 64mb units. I also believe anything larger than 1gb is a waste on the Z-100, as there is no way you could ever use that amount of memory effectively and multiple smaller partitions become very unwieldy to manage effectively. That said, let's take a look at what is available.

Finally, please note that transfer rates vary greatly among brands and even among units of the same brand, and from what I can gather on the web:

40x = ~ 6mb/sec
80x = ~12mb/sec
100x = ~15mb/sec
150x = ~22mb/sec

Where ~ is 'roughly equivalent to'.

OEMPCworld.com, based in California, has a wide selection of SanDisk, Transcend, and GigaRam CF cards. It has quantity discounts on quantities over 10, and free shipping on orders over $20. However, it can be a little tricky finding the smaller units.

At the OEMPCworld website, in the left-most column, select "All Memory and Flash", then select "CF Compact Flash Memory Cards". Next select "CF Compact Flash Memory Card 12x - 100x", and select "Memory Under 40x" section.

| CF Size: | | GigaRam: (6mb/sec) | SanDisk: (15mb/sec) | Transcend: (12mb/sec) |
|---|---|---|---|---|
| 32mb | CF32 | $6.85 | $11.85 | $ --- |
| 64mb | CF64 | 7.35 | 16.85 | --- |
| 128mb | CF128 | 7.50 | 19.85 | 10.85 |
| 256mb | CF256 | 7.85 | 28.85 | 11.85 |
| 512mb | CF512 | 8.35 | 32.85 | 13.35 |
| 1gb | CF1024 | 8.50 | 34.85 | 17.85 |

Flash-Memory-Store.com, based in Illinois, only deals in memory cards. They offer free shipping on orders over $50.0. Some sizes, particularly those under 1gb, require a minimum order quantity of 50 units (vol50)! The OEM brand comes in two major sub-brands:

- Canon compatible (has transfer rates under 1mb/sec(6x)) and

- Samsung compatible (has transfer rates of about 16mb/ sec(100x)).

As the Samsung compatible more closely matches the other brands in transfer rates, the prices quoted are for Samsung compatible units. They also carry SanDisk, but nothing under 2gb.

To locate the Compact Flash units, look at the left-most column of their website. If you select the Compact Flash tab, it only shows the larger capacity CF cards. Instead, click on "List by Capacity CF" and then select "2gb and Lower CF Cards".

| CF Size: | OEM Brand: (16mb/sec) | Lexar Plat: (12mb/sec) | QMemory: (22mb/sec) |
|---|---|---|---|
| 128mb CF128 | (vol50) | - - - | - - - |
| 256mb CF256 | $12.95 | - - - | - - - |
| 512mb CF512 | 14.95 | - - - | - - - |
| 1gb CF1024 | 8.50 | 29.99 | 9.95 |
| 2gb CF2048 | - - - | 34.89 | 9.95 |

**Note:** The Lexar brand and OEM 1gb CF's have been discontinued at the Flash Memory Store.

Amazon.com carries odds and ends at various times. For example, the popular Kingston 512mb CF ranges in price from $24 to $50 (new) and $12 to $35 (used)! There were a wide variety of the popular SanDisk compact flash units in small sizes, but very expensive and without details, though most of the small sizes used 24x transfer rates - about 3.6mb/sec. There were also a wide variety of Edge Brand CFs at great prices, but most don't give any transfer rates. Likewise, some from Transcend and Lexar, but again without details. While I'm sure that the Z-100 would handle the slower transfer rates just fine, I'm not sure that I would want to try the slower or especially unlabeled compact flash units when there are much cheaper and warranted brands still available. So, good hunting.

**Compact Flash Testing Results:**

I received the various compact flash cards promptly and finally spent a few days running tests.

**Note:** I was disappointed when I got the CF units from the Flash Memory Store. I had ordered 1 CF of each size available, except I ordered two CF512 units - one Canon and one Samsung. As a result of the testing, it appears that they were both identical, and the speeds show they were both the Canon units. All but the Qmemory 1GB unit came without labels or any other kind of identification. It wasn't until I put them into a computer that I could tell the 256mb from the two 512mb units. I quickly made and put my own LifeLine labels on them. In short, this means that I got charged $3.00 more for one of the CF512 units. So, I cannot recommend the Compact Flash Store as a source. They are more expensive and, as we'll see in the tests, are not any better for our purposes.

**Testing proceeded as follows:**

As each CF unit already had one partition, using all available memory, I thought it best to see how they worked as shipped. So I began with testing each CF unit in my WinXP computer, using a multiport memory card reader, and shutting down between changing of the CF units. I had prepared two new directories, one containing 180mb of pictures and other files, including a directory structure with several subdirectories, and another with only 60mb of similar files and directory structure for the smaller CF units.

I then copied the entire contents of the larger directory that would fit on each CF unit, timing each copy operation to see how the speeds compared between units. I then deleted the entire contents and timed that and then copied the entire contents of the directory again. I would then use Check Disk under the tool bar to see how the copy operation fared. In every case, Check Disk was fine.

Copy Times by CF Unit:

| Qmem: | 1Gb | 512MbA | 512MbB | 256Mb |
|---|---|---|---|---|
| Unit Speed: | 150x | 6x | 100x | 100x |
| Filesize: | 180Mb | 180Mb | 180Mb | 180Mb |
| Load: | 42 sec | 5.3 min | 5.3 min | 48 sec |
| Del: | 8 sec | 1.7 min | 1.7 min | 12 sec |
| Reload: | 37 sec | 4.6 m(3) | 4.6 m(3) | 45 sec |
| Scandisk(4): | BadFAT | OK | OK | BadFAT |

| Gigaram: | 1Gb | 512Mb | 256Mb | 128Mb | 64Mb(5) |
|---|---|---|---|---|---|
| Unit Speed: | 80x | 40x | 40x | 40x | |
| Filesize: | 180Mb | 180Mb | 180Mb | 60Mb | |
| Load: | 63 sec | 63 sec | 2.7 min | 24 sec | |
| Del: | 10 sec | 16 sec | 57 sec | 3 sec | |
| Reload: | 40 sec | 59 sec | 2.7 min | 21 sec | |
| Scandisk(4): | BadFAT | BadFAT | OK | BadFAT | OK |

Some additional explanation is needed:

1) This is not an actual test of CF read/write speeds. We are including the file read time from the hard drive (for our purposes, a constant between tests), the throughput of the computer (similarly a constant), and then the write time to the device.

2) Notice the difference in load times, however. The first load requires the reading of the directory contents, whereas this information is remembered for subsequent operations. This is one of the reasons for always beginning each CF unit's test from bootup.

3) Notice the differences between the QMemory 512mb units from the others. It's pretty obvious that these units were both Canon (6x) models.

4) The last row shows the results of SCANDISK, which was run later on the Win98se setup computer, that we discussed at the beginning of this document.

5) The GigaRam 64Mb CF units were not included as these were working properly and I had no spare units for testing.

Next, I went to the bedroom Win98se computer to run SCANDISK on each CF unit again. Each time I swapped out CF units, I had to run AutoDetect in BIOS to properly detect the CF unit. Then I booted to the same floppy disk that I used earlier in the garage Win98se setup computer.

In every case, the CF unit passed without a problem. However, I also took the opportunity to track the time that SCANDISK took to do a surface scan of each CF unit (again, to compare CF speeds). In addition to tracking the time it took to scan the file space used, I also tracked the time it took to complete 25%, 50%, 75%, and 100% of memory scanned. The surface scan time was constant across the disk, so I only report the 100% time here.

| SCANDISK: | QMem 1Gb | Qmem512 | Qmem256 |
|---|---|---|---|
| File Space Used: | 1m+10s | 1m+32s | 1m+36s |
| 100% Surface Test: | 8m+41 | 4m+05s | 2m+08s |

| SCANDISK: | Giga 1Gb | Giga512 | Giga256 | Giga128(2) |
|---|---|---|---|---|
| File Space Used: | 1m+36s | 1m+35s | 1m+35s | 1m+33s |
| 100% Surface Test: | 8m+04s | 2m+44s(1) | 2m+05s | 3m+05s |

Obviously, the CF unit speed rating had nothing to do with the SCAN speed. However, we do need to note a few anomalies:

1) The Giga512 unit had been previously prepared and partitioned for use on the Z-100, using two 200mb partitions and three 30mb partitions. For all the tests above, we only used the first 200mb partition. This means that the surface test was completed on only 200mb.

2) While all the other CF units had 180mb of files on them, the Giga128 only had 60mb of files on it.

That completed my tests on the PC's, it was time to go to the Z-100. However, I needed clean CF units before going to the Z-100. I returned to the garage Win98se computer and reformatted each of the units to begin the tests. I did not repartition them.

However, before reformatting the Gigaram 128mb CF card, I tried it on my H/Z-100 to see if I could read the files. I had no problems. The files were all listed properly and I could read text files without difficulty.

However, ZDIR did have its usual problem listing false <vol> labels in the directories. This is a known problem with ZDIR. Other directory utilities don't have this problem, but then they do not display the volumn/disk labels, either.

The following test simply copies the entire contents (7,128Kb) on my Z-100's MFM hard drive (including the entire directory structure, by using **XCOPY**) to each of the clean CF units and compare the times that it took. Using the **XCOPY E: K:/E/V** command, all went well, without difficulty. For all the CF units, the times ranged from 2m+15s on the Qmem 1Gb unit to 2m+20s on the Giga 256mb unit. Obviously, CF speed was not much of a factor here. The limiting factor seemed to be the MFM drive read time and computer throughput time. The write time to the CF card had negligable impact.

I took one of the cards to the bedroom Win98se computer and all directories and files were read fine. No problems at all.

After reformatting them again, I copied the 60mb directory contents to the fastest CF card - the

Qmemory 1Gb unit. For the next test, I copied the 60mb files from the Qmem 1Gb unit to each of the other CF cards on the Z-100. This time the command was **XCOPY L: K:/E/V.**

Again, the operations went without a hitch and the results were nearly constant. The fastest time was an amazing 11m+54s on the GigaRam 1Gb unit; the slowest was the GigaRam128 at an equally amazing 12m+33s!

Wow. I thought for sure there would be a major difference here. As you watch the flickering LED lights on the IDE Controller Card, the reading operation barely made the LED dim, while the write LED had a definite on/off cycle. However, as we can see above, the limiting factor is still the Z-100 throughput. Running at 8Mhz, the Z-100 is the limiting factor and even the slowest CF unit has no difficulty keeping pace. I may try again without using the verify switch, but I don't suspect too much of a difference.

One final note, ZDIR did not have any difficulty reading the directories and files on the target CF unit without listing all the false <vol> labels. The DOS COPY, DEL, REN, etc. command utilities and other DIR utilities do not see these false <vol> labels.

I hope you find this information useful.

## All of this noise from such a little fan

The stock fan inside of the Z-100 power supply is a 12 volt DC Panasonic Panaflo FBP-08B12H with an airflow rating of 32.9 CFM (Cubic Feet per Minute). The acoustical noise rating is a stunning 39 dbA! While the stock fan moves a lot of air, it also sounds like a train engine in the process. The fan noise is probably the biggest complaint of the Z-100. Luckily, PC component mechanical specifications haven't changed much over the years. A standard 80x80x25 mm fan can be used as a drop-in replacement for the Panaflo with just a minor connector modification required.


## Z-100 Fan Replacement

The following article was posted to the internet at "Antediluvian Designs" on February 8, 2015 by Eric C. Neilson. The internet article has an abundance of helpful color pictures showing all stages of the replacement. So I recommend that you check out his great article at this link:

http://planemo.org/retro/z-100-fan-replacement-1/

As this article may have a limited time that it is available on the internet, Eric offered his permission for me to publish the text (with modifications due to the lack of photos) here. I'm sorry that I could not use the pictures (too costly for me to publish). But feel free to try the link above.

So, I hope you enjoy Eric's article, as follows:

My new fan of choice was a low-noise Noctua NF-R8 fan purchased from Coolerguys.com. The NF-R8 has an acoustical noise value of 17.1 dB(A) and an airflow rating of 53.3 m3/h (31.4 CFM). The airflow is close enough to be compatible and the noise level is 23 dbA less than the stock fan. 17.1 dB(A) is equivalent to a human whisper so this new fan should effectively cut fan noise to zero.

### Disassembly

**WARNING:** You're going to be opening up the power supply to replace the fan. There is serious shock risk even after the power cord has been disconnected. If you're not familiar with electrical safety procedures and working with power supplies in general, you might want to skip this project.

Ok, so you're willing to risk death for a quieter Z-100 (I know I was). The first thing you need to do is remove the power supply. The Z-100 Technical Manual walks you through how to disassemble the Z-100 one component at a time. You need to get the drive bay out before you can

remove the power supply but you don't need to remove the keyboard or S-100 card cage. With the drive bay out, you'll need to unplug three more power cables (two motherboard and the S-100 bus power cable). You will then unscrew some screws holding the unit to the base of the chassis and four screws in the rear. After that, the power supply should lift out easily.

Now that the power supply is out, you need to remove the sheet metal housing to expose the power supply internals. Remove the hex head screws only around the perimeter of this top cover, 8 in all. With the screws removed, the metal housing should lift off and you will be able to see into the power supply.

The fan connector is easily unplugged and the fan itself is held onto the back of the power supply by four long screws that are easily removed. Unplug the connector, remove the four screws and pull the old fan out.

The old fan has a green spring clip at each corner. Pull those off and save them. You also need to snip the connector from the old fan off. The Z-100 fan connector is the one non-standard part of this setup, so we're going to solder the old connector to the new fan before installing.

You also need to reuse the fan bracket/spacer ring from the old fan and put it back in place when the new fan is mounted. While you have the fan out, it's good idea to clean the case vents with a Q-tip and alcohol. Mine were full of gunk after 30 years.

Clip the wires on the old and new fans at the connectors and solder the old connector to the new fan so it will plug into the Z-100's power supply circuit board. Just solder red to red and black to black.

(Editor's note: The clip connector on the old fan can be disassembled fairly easily, enabling the wires to be soldered directly to the connector clips. Each connector clip is held inside the connector housing by a small offset tab. Simply press on the tab with a small flat bladed screwdriver as you pull each wire out the back of the housing. Remove the old wire by opening the crimp tabs on the clip and de-soldering. Resolder the new fan's wires to the clip and reinsert the clip into the housing. You may need to stretch the offset tab out a bit before re-insertion to that it will catch and hold the clip inside the housing. I suggest that you do one wire at a time to insure you don't swap red and black. - SWV)

Now you want to attach the green clips from the original fan to the new fan so the screws will have something to thread through. **Make sure to use the original screws**. Once the clips are in place, attach the new fan where the old one previously sat, remembering to have the Noctua logo facing outwards against the grill.

You're basically done at this point. Just put everything back together in reverse order and power up the system. You should feel air blowing **outward** from the case just like the original fan. If all went well, you now have a much quieter Z-100!

(Editors's note: The direction of air flow is more important than many may think. When the H/Z-100 first came out, there was quite a bit of discussion as to whether it was better to suck air into the power supply by using the fan as originally installed and as described here. Or if it were better to blow air into the power supply by reversing the direction of the fan mounting. Internal temperature measurements were even taken to prove their point. I forget the ultimate outcome, but I think that it came down to personal preference. Personally, I think that if the fan blew directly onto the internal components directly from the outside world, dust will build up faster and thicker on those components most critical to the heat (not good). For proof, just look at the dust built up on the wires just inside the front vent holes (behind the keyboard) of any well used power supply.)

The loudest device now in my Z-100 is the Winchester hard drive which makes a whining-like sound. It's about as loud as a typical PC so still very acceptable (I no longer drive my wife out of the room when I power up the Z-100 for some retro fun). The only way to remove the hard drive noise would be to completely replace the Winchester with a flash-based hard drive emulator attached to the S-100 bus - definitely worth considering for a future project since the hard drive isn't going to last forever.

In the meantime, enjoy your quiet Z-100.

Me, again. Thank you, Eric, for such a great article. The only thing missing was a source - at last check, the fan was available from **amazon.com** for $13.99, plus shipping.

## After 26 Years of LifeLine...

I owe everyone one remaining issue of this subscription to the *Z-100 LifeLine*. Those of you who have paid for additional issues beyond issue #126 will receive a refund check with this issue. As you can see from the last several issues, interesting topics to write about are scarce and constraints on my time preclude me from doing all the research necessary to write newsworthy articles.

This does not mean the end of the *Z-100 LifeLine*, however. As topics come up, I'll still publish additional (but obviously much smaller)

issues, but I'll cover the expenses myself.

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

Before mom's problems, I was in the middle of researching the hard drive 'stiction' issue -- again. I'm convinced that the non-spin problems of Seagate drives is hardware related and not from 'stiction', as reported by some. My 'stuck' drives will spin properly with changes to the drive's on-board controller. I was close to identifying the offending parts before mom's hip operation and after two years of interruption, I've still got drive parts scattered across one of my work benches! I want my workbench back and hope to resume my work soon!

My website and e-mail will all remain 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.

Finally, if any of you wish to write an article on any aspect of your Z-100 use, please send me a draft. I'll be happy to give constructive criticism and ultimately publish the article.

## Other News

Eric Neilson purchased Bill Adney's Z-100 last year, along with tons of manuals and software. As you may recall Bill Adney used to write articles for *'Remark'* and *'Sextant'* magazines and also wrote a few PC books over the years.

Eric is in the process of scanning and uploading the many manuals and software that Bill had collected.

The Z-100 manuals are located at:

http://planemo.org/retro/

## Closing

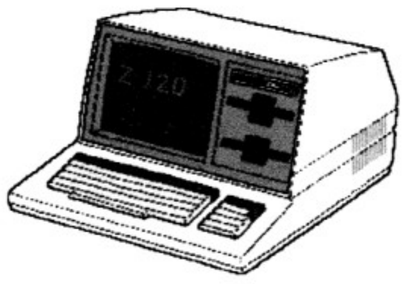
I hope to resume the CP/M project this fall. If you have a desire to assist, please reread the earlier two LifeLines discussing my CP/M escapades and let me know if there is anything that you need.

As you can see, this was another color issue. I've been using the Canon MG-5220 color ink-jet printer and the cost of color ink is no different from black. The biggest difference is in printing speed and ink bleed through, forcing me to use thicker paper and lighter ink. We'll see how this goes for this issue. Let me know what you think.

Cheers!!!

'Til next time,

happy computing!



**Z-100 LIFELINE**

*Supporting the H/Z-100 Community*

*Since 1989*

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