Booting HDOS on the Z67-IDE

(by Ken Owen, updated 19 November 2013)

Well, it has been a long time coming, but we can now boot HDOS from the Z67-IDE! **Mr. Peter Hofmann gets the credit for breaking the log jam.** Since he was the Austrian Heath Representative, he had and shared a set of drivers that were made available to Heath representatives as an internal distribution. Once we figured out which drivers to use on the Z67-IDE, the project gained speed. **Mr. Glyn Firth was the first to hit pay dirt** by discovering that the FD67 driver would create a virtual 8" Floppy Disk on the Z67-IDE. His success just kindled the fire to work on getting the others to run. **There were hurdles, but none too high for the Great Norberto!**

If I understand the process correctly, **Norberto had to make some decisions when initially setting out to build the Z67-IDE.** Since he was using the Xebec specs which do not support the Parity bit and also since it was not used in the CP/M system he was planning to run, he elected to not enable the use of parity. **This kept the system simpler.** Later after designing the H-89 Z-67 replacement card, we discovered that it worked fine with the Z67-IDE, but would not boot the REAL Heath Z-67 unit. This resulted in a minor modification to the H-89 Z-67 replacement card circuitry to enable the correct parity output on the board to boot the original Heath Z-67 unit. Later still, when he developed the H8-Z67 card, he inadvertently omitted this last modification to the circuit to enable use of the correct parity output pin.

Mr. Glenn Roberts did some outstanding disassembly of the PREP.ABS program and discovered that it only needed about a half dozen bytes changed to let it properly address the Z67-IDE. With his revision to the program, we were able to run PREP170.ABS (or PREP174.ABS for soft sector systems) to perform low level formatting of the Z67-IDE, drive 0. Next, we began trying to do something similar to PART.ABS. This program was much more difficult to analyze! Glenn was working on it using the HUG Disassembler and I was working in parallel using Z80DIS, a CP/M disassembler. While the CP/M disassembler was totally unaware of HDOS programming conventions, it did understand Z80 code. I was able to trace through enough of the code to realize that all we needed was a patch to the specified device near the end of the program, changing it from SY: to DK: Using the HUG DUMP.ABS, I made this substitution and PART.ABS appeared to run with no problem.

Once the Z67-IDE was PREPed and PARTed, it was a simple matter to initialize the partition with HDOS - INIT.ABS and then SYSGEN the partition. I booted HDOS 2.0 on the first attempt on my H-89 running Norberto's Z-67 replacement card, but could not boot with the original Heath Z-67 card. Both Norberto and Glenn were able to run PREP and PART, but could not get HDOS to boot on the H8. Norberto did his magic – analyzing the data and discovering that he needed to implement the parity changes to the H8-Z67 card like he did on the Z-67 card for the H-89. **HDOS requires the parity bit.** Once we were on the parity trail, Norberto revised the Z67-IDE firmware to interface with the Heath PREP and PART utilities to properly perform the low level formatting on the H8 and H89. It now also boots with the original Heath Z-67 card.

We will put together a package for HDOS not very different from the CP/M packages. There will be a disk image of the **Z67-IDE PREP/PART Utility** including the drivers from Peter Hofmann. **Download** this disk using Les Bird's H8D Utility to create an H-17, single sided boot disk running at 9600 baud.

After updating to the latest Z67-IDE Firmware, verify or add a jumper to the Z67-IDE to enable parity so that HDOS will boot. By default, the Parity jumper is not installed. Refer to "Figure 13: H8/H89 Z67-IDE board components" at the following link for jumper setting:

http://www.koyado.com/Heathkit/Z67-IDE.html
(copy & paste in your browser if link fails to work)
Document = "H8-H89 Z67-IDE SASI TO IDE DISK CONTROLLER V1_7.PDF"

Next, you will need to decide which HDOS system(s) along with which enhancements you want to run. **I strongly recommend that for HDOS 2.0 you run the latest HUG device drivers and SysMod2.** This will allow you the maximum flexibility in adding or changing floppy drives on your system and SysMod2 will make the system easier to use with the short-cut commands and brief alphabetized directory displays for the many files you will eventually have on the disk. HDOS 3.02 incorporates both the enhanced drivers and equivalent command short-cuts.

HDOS INSTALLATION

HDOS was originally developed as a cassette, and later, a floppy disk booted operating system. During development, no one envisioned hard drives hosting many megabytes of storage. The file allocation system used 256 bytes for managing space allocation on the media. This served us well through the years we were using floppy disks. **When we put HDOS on the hard disk, there is no limit to how large the disk partition can be, but for efficient space allocation, it needs to be limited.** For a partition consisting of 4800 sectors (= 1.2 MB or 30 regions), the minimum allocation unit will be 20 sectors. A file consisting of a single byte will reduce the disk space by 20 sectors (5k). A file 21 sectors long will reduce disk space by 40 sectors (10k).

Since most of the HDOS programs are fairly small and to minimize wasted space, we are best served by a boot partition just large enough to hold the operating system and utilities that we frequently use. We can then have some larger partitions where we will save large files, such as assembly listings that can easily run to several hundred kilobytes. Here, the overhead is more easily justified.

HDOS will support up to eight partitions. Any or all of these partitions can be bootable. You can have one partition booting HDOS 2.0 and another booting HDOS 3.02. We will discuss this in more detail when we get to the PARTITIONING utility.

Prepare the Z67-IDE to Receive HDOS

The PREP and PART utilities are set to work on hard disk drive 0. **Install a dual CF card adapter or hard disk set as drive 0 (Master) into the IDE connector on the Z67-IDE to receive the HDOS system.**

RUNNING PREP:

Boot your Z67-IDE – PREP/PART Utilities disk.
At the HDOS prompt, type:

```
 _____________________________          {<cr> = carriage return or Enter}
|
| H:>PREP67 [port]<cr>                   [port] required if other than 170Q
| PROCEED?  (YES/NO) ?  YES<cr>
| PLEASE TYPE P TO PROCEED:  P<cr>
|
| INITIALIZE THE DISK...
|
| MEDIA TESTING IN PROGRESS...
| TESTING CYLINDER xxx
|_____________________________
```

The xxx will count up from 000 to 243 cylinders. It will test approximately eleven cylinders per minute running with a 2 MHz clock or about sixteen cylinders per minute with a 4 MHz clock.

When PREP completes, we are ready to PARTition the disk. This will go much better if you have made your decisions for the size of the partitions prior to beginning the process.

The original Z-67 Memorex Hard Disk had 2 ea. 8" platters, 2 sides, 4 heads, 244 tracks.
1 cylinder (region) = 4 {tracks / cylinder} * 40 {sectors/track} = 160 {sectors /cylinder}
The first region is reserved for system use, leaving 243 cylinders for the user.

Mr. Glenn Roberts disassembled the PREP utility and found that we can increase the number of heads to 6 to get an increase in the storage space by almost 50% (after adjusting for the increased size of the MAU). Everything still works the same, but now a cylinder is 240 sectors instead of 160. *{Adding more heads was not feasible due to the design of HDOS. If we increased the cluster size, the minimum allocation unit would increase, wasting space, and the HDOS file processing word size imposed limits on the number of sectors we could handle.}*

On the allocation map using six heads (3 platters), the total space is divided into regions on a grid. Each region represents 1 cylinder of 240 sectors. Multiply the number of regions by 240 to convert the space to sectors. Now, divide the number of sectors by 256 and round up to the next higher **EVEN** integer to get your minimum allocation unit (**MAU**) in sectors. Every file will consume an integer number of this unit. For example, if the desired space is 30 regions (= 7200 sectors or 1.8 MB):

30 {regions} * 240 {sectors / region} / 256 {allocation control bytes} = 28.125 {sectors / control byte}

We round up to the next higher **even** integer to get the MAU of 30 sectors or 7680 bytes. (This is summarized in a table included at the end of this document.)

Now we refer to the files that we will be putting on the disk and their sizes. Divide the file size by the MAU and, if not an integer, truncate the fraction and add one MAU. Total the adjusted file sizes to get the space that will be used. Subtract this from the partition size to see what is left for adding files to your system.

OK! Enough of the math, already! Now that you have a feel for how to evaluate the partition size, we will continue with the process of actually partitioning the space. In the steps that follow, we will be using approximately equal partitions of about 7200 sectors. You may choose differently.

When we run the PART utility, it will display a table depicting the disk space where the rows and columns are numbered in hexadecimal (0 through F). Each coordinate represents a region of 240 sectors (61440 bytes). The first region is reserved for system use. The remaining regions are addressed by row and column number and are available for your use by assigning them to a partition.

It is helpful to have a table of data similar to the one below before you start:

Table 1

Dev:NAMESys	Start	Stop	Vol #	Label	
DK0:HDOS0	A 01	–	1E	001	HDOS 2.0 System w/ SuperSysMod2
DK1:HDOS1	B 1F	–	3C	002	HDOS DATA 1
DK2:HDOS2	C 3D	–	5A	003	HDOS DATA 2
DK3:HDOS3	D 5B	–	78	004	HDOS DATA 3
DK4:HDOS4	E 79	–	96	005	HDOS DATA 4
DK5:HDOS5	F 97	–	B4	006	HDOS DATA 5
DK6:HDOS6	G B5	–	D2	007	HDOS DATA 6
DK7:HDOS7	H D3	–	F3	008	HDOS DATA 7

Partition Naming:

The partition names above are not what Heath envisioned for naming the partitions. Their idea was to name them by OS and occurrence number:

OS:	Occurrence #	
HDOS	0	; first “HDOS” system partition
HDOS	1	; second “HDOS” system partition
HDOS	2	; third “HDOS” system partition
HDOS	n	; nth “HDOS” system partition
CPM	0	; and similarly for other OS
CPM	1	
CPM	n	

When presented a menu for selecting the partition to boot (or specifying the partition in the boot command on H89/Z90), it would be in the form **OS;occurrence #**, (e. g. HDOS;0, HDOS;2 or CPM;n.).

The way the partitions are named in Table 1 above, each partition is seen as a different operating system. Each partition name is treated as an OS with an occurrence number of 0 (single occurance).

Heath supported three Operating Systems in their utilities – CP/M, HDOS and UCSD-PASCAL.

Using the Heath method, let's assume you had two bootable partitions named "HDOS", one for HDOS 2.0 on occurrence 0, and another for HDOS 3.02 on occurrence 1. Specifying "HDOS" with no occurrence number boots the first occurrence (0) for an operating system. Specifying no operating system boots the default partition (if specified) or displays a screen like the sample shown below:

```
-----------------------------------------------
|                    HEATH/ZENITH H/Z-67
|                    Software Boot Code (SBC) vers 1.0
|                    Boot Option(s) Menu
|
|          Operating systems:   Maximum Occurrence number
|                CPM            1
|                HDOS           4
|             UCSD-PASCAL       0
|
|                    Boot String?
|
-----------------------------------------------
```

Selecting HDOS;0 would boot HDOS 2.0, selecting HDOS;1 would boot HDOS 3.02 and UCSD-PASCAL would boot your Pascal system. Think about how you want to configure your system and make your choice for partition naming now because it will determine how you boot your system(s) after partitioning. You probably need to read ahead before making your decision.

Note: While the PART program supports creating partitions for an OS with multiple occurrences, I have not been able to get it to work with HDOS. I can only INIT and SYSGEN the first partition. INIT cannot find the other partitions.

For CP/M, everything works as described above. One would use the ASSIGN.COM utility to assign drive letters to the partitions. You would then FORMAT and SYSGEN the partitions using the assigned drive letter.

Running PART:

At the HDOS Prompt, type:

H:>PART67 [port]<cr> {[port] if not 170Q, <cr> = carriage return or Enter}

This will present the opening menu:

```
                    HEATH/ZENITH H/Z-67
            Hard Disk Partitioning Utility (PART) vers 1.0

          The main menu
A.        All CP/M.
B.        All HDOS.
C.        All UCSD PASCAL.
D.        Half CP/M, half HDOS.
E.        Half CP/M, half UCSD PASCAL.
F.        Half HDOS, half UCSD PASCAL.
G.        Third CP/M, third HDOS, third UCSD PASCAL.
H.        User-Defined Partitions.

Enter Selection ..... <G>?
```

If we were to use the Heath multiple occurrence method for partitioning the hard disk, we would select option “B”, All HDOS. Confirm that the region allocation is as requested and select “S” for Save to exit PART. Next, we re-run PART and we will again be presented with the menu above. This time we select option “H”, User-Defined Partitions. We will be presented the same map that we accepted on the first run with all regions assigned to OS “A” – HDOS.

Region Allocation Map:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	S	>A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
1	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
2	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
3	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
4	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
5	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
6	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
7	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
8	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
9	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
D	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
E	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
F	A	A	A	A												

Set (O)S, Set (P)artition, (D)isplay, (A)bandon, (S)ave? <D>

Now, we will sub-divide this HDOS partition into multiple HDOS partitions. First, we would select option “O” for operating system and then type the letter “A” to display HDOS as the operating system name. We would just press “Enter” to accept this operating system.

Next, we select option “P” to re-partition this OS. Let’s set 8 partitions of 30 regions. The first would then start “01” and continue to “1E”. This is already defined, so we would start by defining the second occurrence of HDOS by entering a starting region of “1F’ and ending region of “3C”. We would then enter “3D” as the next starting region with and end at 5A. Likewise, we would type:
“5B”,”78”, followed by “79”, “96”, and “97”, “B4”, and “B5”, “D2”, and finally “D3”, “F3”.

This will result in the following map:

Region Allocation Map:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	S	>A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
1	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	>A
2	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
3	A	A	A	A	A	A	A	A	A	A	A	A	A	>A	A	A
4	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
5	A	A	A	A	A	A	A	A	A	A	A	>A	A	A	A	A
6	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
7	A	A	A	A	A	A	A	A	A	>A	A	A	A	A	A	A
8	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
9	A	A	A	A	A	A	A	>A	A	A	A	A	A	A	A	A
A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
B	A	A	A	A	A	>A	A	A	A	A	A	A	A	A	A	A
C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
D	A	A	A	>A	A	A	A	A	A	A	A	A	A	A	A	A
E	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
F	A	A	A	A												

Set (O)S, Set (P)artition, (D)isplay, (A)bandon, (S)ave? <D>

We would select “S” for Save to exit PART.

The first partition will INIT and SYSGEN with no problem. Typing:

H:>Boot SS-0 will present the menu:

```
-----------------------------------------------------
|                    HEATH/ZENITH H/Z-67
|                    Software Boot Code (SBC) vers 1.0
|                    Boot Option(s) Menu
|
|              Operating systems:   Maximum Occurrence number
|                   HDOS                7
|
|                    Boot String?  HDOS;0
|
-----------------------------------------------
```

Typing “HDOS;0” as the Boot String will boot the first partition.

The only problem with this method is that I have not been able to INIT partitions 1 through 7 for HDOS. This procedure works properly when partitioning a disk for CP/M.

Instead, we will be using the partition naming method in Table 1 presented above. We need to choose option **“H”**, User Defined Partitions. This will present the Allocation Map with only the first region marked with **“S”**, meaning reserved for system use. All other regions will be marked with **“U”**, meaning unallocated and available for use.

```
Operating Systems:          Region Allocation Map:

S. System                     0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
U. Unallocated              +----------------------------------------------
A.                  0     : >S >U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
B.                  1     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
C.                  2     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
D.                  3     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
E.                  4     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
F.                  5     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
G.                  6     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
H.                  7     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
I.                  8     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
J.                  9     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
K.                  A     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
L.                  B     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
M.                  C     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
N.                  D     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
O.                  E     :  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U
P.                  F     :  U  U  U  U

Set (0)S, Set (P)artition, (D)isplay, (A)bandon, (S)ave? <D>
```

To begin, we select option **“O”**[psys], designate that it will be system **“A”** and named **“HDOS0”**. We will be returned to the previous screen where we will now select option **“P”**[artition], enter the starting region number **“01”**, the ending region number **“1E”**, and just press **“Enter”** when DONE. We will return to the previous screen where pressing **“Enter”**, to accept the default **<D>**[isplay], will display the updated MAP.

Region Allocation Map:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	S	>A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
1	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	>B
2	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
3	B	B	B	B	B	B	B	B	B	B	B	B	B	>C	C	C
4	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
5	C	C	C	C	C	C	C	C	C	C	C	>D	D	D	D	D
6	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
7	D	D	D	D	D	D	D	D	D	>E	E	E	E	E	E	E
8	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
9	E	E	E	E	E	E	E	>F	F	F	F	F	F	F	F	F
A	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
B	F	F	F	F	F	>G	G	G	G	G	G	G	G	G	G	G
C	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
D	G	G	G	>H	H	H	H	H	H	H	H	H	H	H	H	H
E	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
F	H	H	H	H												

In the chart above, the first partition is represented by letter **“A”**, begins with region **“01”**, ends with region **“1E”** and will have a minimum allocation unit of 20 sectors. The second is represented by letter **“B”**, begins with region **“1F”**, ends with region **“3C”** and also has a min. allocation unit of 20 sectors.

We **REPEAT** this procedure for each partition we wish to define.

When all partitions have been defined and no other changes are needed, we select **“Save”**. You will be prompted to designate a default boot partition. If you intend to boot multiple partitions, **leave it blank** and **just press “Enter”**. If you do not designate a default partition, when booting, you will be presented a list of the partition names to choose the partition to boot. **This is the only way to boot multiple partitions on the H-8 computer.**

When presented the menu below, type the Operating System to boot

```
-----------------------------------------------------
|                    HEATH/ZENITH H/Z-67
|                    Software Boot Code (SBC) vers 1.0
|                    Boot Option(s) Menu
|
|          Operating systems:   Maximum Occurrence number
|              HDOS0            0
|              HDOS1            0
|              HDOS2            0
|                 …
|              HDOS7            0
|
|                    Boot String?  HDOS1
|
-------------------------------------------------
```

In the example above, the Boot String “HDOS1” will boot the second partition, if SYSGENed.

If you have an H-89 or Z-90, you may want to choose as I did. Since I will normally boot HDOS 2.0 on partition 0, I designated “HDOS0” as the default boot partition. Then I boot with:

```
_____________________________
|
| IDE:  Boot SS-0<cr>
|_____________________________
```

The computer will boot partition 0 into HDOS 2.0.

If I want to boot partition 1 named “HDOS1”, I would boot with:

```
_____________________________
|
| IDE:  Boot SS-0:HDOS1<cr>
|_____________________________
```

The computer will boot the named partition into the installed OS.

Whether you designate a default partition or leave it blank, **this completes the partitioning process**. As you leave the program, you will have the option to print the ALLOCATION MAP or just exit. (See the Printer selection screen in the Appendices.)

Creating an HDOS Z67 PREP/PART Utilities Disk

We have an H8D image for this disk. You can download it using Les Bird's H8D program. *If you will be using the Z67-IDE system with an H37 floppy system, you will need to create a soft-sectored utilities disk using the next procedure "Creating a Soft-Sectored HDOS Boot Disk:".*

If you can't transfer files to an H17 disk, you can download the programs move them to an HDOS 2.0 boot disk. The files that you will need are:

PREP67.ABS	Hard disk preparation utility
PART67.ABS	Hard disk partitioning utility
HD67P170.DVD	Device drive for the hard disk at port 170Q.
HD67P174.DVD	Device drive for the hard disk at port 174Q
HD67P270.DVD	Device drive for the hard disk at port 270Q
HD67P274.DVD	Device drive for the hard disk at port 274Q

When PREP67 is run, it will default to port 170 (if no port is specified). If the hard disk is running at some other port address, it is run with the port number appended: (e.g. **PREP67 270**).

PART67 uses the hard disk driver file to access the disk and will not work until the appropriate driver has been copied to DK.DVD and the disk rebooted to activate the driver in the system.

Creating a Soft-Sectored HDOS Boot Disk:

If you will be running the H37/Z67-IDE drive combination, you will need a soft-sectored HDOS boot disk. This can be created on a computer that is configured with both H-17 and H-37 floppy drives.

Boot an H-17 HDOS system disk. Copy the H37.DVD and SETUNIT.ABS files from the HUG Soft-Sector Support Package to the H-17 Boot Disk and then copy H37.DVD as DK.DVD. **Reboot** to activate the new device driver.

If you are running the HUG SY.DVD that supports double sided and 80 track drives, we need to tell it that the H-37 controller will co-exist: Run "SET SY: DKH37"

Now run "SETUNIT DK: n" for the number of H-37 drives.
Configure the **physical** drive numbers: "SET DKx: SIDES n", "SET DKx: STEP nnn".
Reboot to activate the changes to the device driver.

Run "INIT" with the destination device = DKx: to create a soft-sectored target disk.
Run "SYSGEN" with the destination device = DKx: to create the soft-sectored boot disk.
Copy files to the soft-sectored disk to complete your system disk.

I recommend that everyone download and install MAPLE on both your H-17 and H-37 system disks. This will allow you to download and send files to HDOS via the COM port on your PC to add the new driver and support files for setting up the Z67-IDE.

Installing HDOS:

Boot your HDOS PREP/PART Utilities Disk. Ensure that the appropriate HD67Pxxx.DVD has been copied as DK.DVD. Reboot to activate the driver in the operating system.

Perform disk preparation and partitioning as described in the article above.

When the disk is PREPped and PARTed,
Boot your HDOS system disk. {<cr> = carriage return or Enter}

First, we need to **ADD THE NEW DRIVER** (HD67P170.DVD, HD67P174.DVD, HD67P270.DVD or HD67P274.DVD) for the Z67-IDE based on the port where the Z-67 card is installed and name it DK.DVD.

➔ (**Don't forget to reboot the disk before trying to use the new device driver!**) ←

Next, we must initialize the partition by running **INIT.ABS or INITAUTO.ABS** from the boot disk:

```
| H:> INIT<cr>
|
| This program will destroy all data on the disk.
| Proceed?  (YES/NO)  <NO> ? YES<cr>
|
| Destination Device <SY0:> : DK0:<cr>
| Dismounting all disks.
| Return when ready...
| Volume in the drive...
|
| Do you wish to Continue?  YES<cr>
| Volume Number (1 – 255)  001<cr>
| Volume Label:
| "my boot system"<cr>
|
```

The initialization process will list each sector as it is initialized.
When presented the "Sector:" prompt, just press return. (**Bad sectors were handled by PREP.**)
Use Ctrl-D once to change drives or twice to exit INIT.

INIT the remaining partitions to receive data.

SYSGEN the Boot Partition

Now, we are ready to **SYSGEN** the disk. Type:

```
|
| H:> SYSGEN <cr>                                  {<cr> = carriage return or Enter}
|
| Destination Device <SY0:> : DK0: <cr>
| Dismounting All Disks:
| Source on SY0: and press Return. <cr>
| Destination on DK0: and press Return. <cr>
|
| Press Return to reboot. <cr>
|
```

REPEAT this process using the appropriate system disk for other partitions that need to be bootable.

Reset your computer, and boot SS-0. If presented a list of partitions, type the name of the one to boot and press "Enter". Press the **SPACE BAR REPEATEDLY** until it detects the baud rate and boots.

Booting the Z67-IDE for use with H17 and H37 floppy disks

If you have both H17 and H37 floppy disks, you will probably want to repeat this procedure from a boot of the other disk type and **SYSGEN** a different partition to work with the second disk type.

I prefer using the H37 disks due to disk size and availability of the media. Therefore, I **SYSGEN** partition 0 from the H37 disk and partition 7 from an H17 boot with only the operating system and H17 specific utilities. I still have access to the many program on the H37 boot partition (now at SY1:) and all of the other partitions, just by adding 1 to the normal partition number.

During PART67, I use the following partition table:

Partition #	System	Start	End	
0	A	01	22	34 clusters, 8160 sectors, 2.04 MB
1	B	23	44	"
2	C	45	66	"
3	D	67	88	"
4	E	89	AA	"
5	F	AB	CC	"
6	G	CD	EE	"
7	H	EF	F3	5 clusters, 1200 sectors, 300 KB

Enjoy!!! -- Norberto, Peter, Glenn, Glyn, and Ken.

Known Issues:

Adding HDOS Boot Capability is still an evolving process (as of 19 November 2013) and some issues are yet to be totally resolved. There are issues with the PART program.

When running PART, define all of your partitions in one session as described in the Table above. If all of the partitions are defined in the initial session, everything works as expected. As it currently stands, we cannot re-run PART after the initial session to revise the partition table. Work is continuing to resolve this issue.

We have been unable to get the multiple occurrence method to work. PART creates the partitions, but INIT will not initialize any but the first partition.

Tested Systems:

H8/H89/Z90 H17/Z67-IDE or (Z67-IDE+)
H8/H89/Z90 H37/Z67-IDE or (Z67-IDE+)

Communications from the Z67-IDE serial port when running PREP on the HDOS hard drive:

```
H8/H89 Z67-IDE SASI TO IDE DISK CONTROLLER
Author: Norberto Collado - (C) Copyright, 2010-2011
EMAIL: norberto.collado@koyado.com
Version: V2.6
DATE: 06/30/2011 - 10:44 PM
SOURCE FILE: Z67_IDE10.ASM - HEX FILE: Z67_IDE10.HEX
* IDE CD/DVD ROM is not supported
HW/Settings:
 MicroController: DS89C430 @20MHz
 Baud Rate: 9600 8-N-1, FLOW CONTROL: NONE
 IDE CONTROLLER: 82C55AC-2
 SASI CONTROLLER: 8155H-2
 SASI INITIATOR ID: 0
 SASI TARGET ID: 1
 SASI DATA TRANSFER: ASYNCHRONOUS
 Z67 PARITY: ENABLED -> ODD
 Z67 RESET: 32us
 TOTAL RAM: 1K BYTES

Credit WHERE CREDIT Is DUE:
 http://www.pjrc.com/tech/8051/ide/
 http://www.pjrc.com/tech/8051/ide/wesley.html
 http://www.retroleum.co.uk/electronics-articles/an-8-bit-ide-interface/
 http://borntechi.com/ide.php
 http://www.gaby.de/gide/IDE-TCJ.txt
 http://www.repairfaq.org/filipg/LINK/F_IDE-tech.html#IDETECH_002
 QUIKDATA COMPUTER SERVICES, INC - HENRY E. FALE - PRESIDENT
 http://www.pjrc.com/tech/8051/ide/ Pauls 8051 Tools, Projects and Free Code

Detected SD/DD jumper OFF. Scanning for Master and Slave IDE Drives.

PLEASE WAIT... SCANNING IDE INTERFACE FOR IDE HARD DRIVE (0).
Model: SanDisk SDCFB-128
S/N:   X0804 20060519120337
Rev:   Rev 0.00
Cylinders: 980, Heads: 8, Sectors: 32


PLEASE WAIT... SCANNING IDE INTERFACE FOR IDE HARD DRIVE (1).
Model: TS2GCF133
S/N:   20110314    C61302A6
Rev:   20101110
Cylinders: 3884, Heads: 16, Sectors: 63


Target ID: 1 H8/H89-Z67-IDE SASI TO IDE DISK CONTROLLER
             Product revision level: V 1.1

Controller Ready to transfer data to/from IDE DRIVE 0 OR DRIVE 1.

DETECTED HDOS PREP67.ABS UTILITY. MEDIA TEST IN PROGRESS...

Controller Ready to transfer data to/from IDE DRIVE 0 OR DRIVE 1.
```

Printing the Partition Map

Printer	Baud
H-14	4800 – (A)
H-24/TI-810	4800 – (B)
H-34/LA-34	300 – (C)
H-44, H-54/1640, 630 R0	1200 – (D)
MX-80	4800 – (E)
H/Z-25	4800 – (F)

Which Printer is to be used?

If your printer is listed, note the selection letter. On the Z67-IDE Utilities Disk, copy the appropriate driver file as follows: (Assuming and MX-80 printer.)

Copy: LEX.DVD to LE.DVD. Reboot to activate the driver.

Make sure that your printer is set for the indicated baud rate and that it is connected to port 340 A of your H/Z-89/90. Press the letter key corresponding to the type of printer you use. PART begins printing the map immediately. Then it displays:

PART terminated - Changes in effect.

Minimum Allocation Unit versus Partition Size

(k-bytes)	(Sectors)	(k-Bytes)	Map Regions
			0
1	4	204.8	5
2	8	409.6	10
2.5	10	614.4	15
3.5	14	819.2	20
5	20	1228.8	30
5.5	22	1433.6	35
6.5	26	1638.4	40
7.5	30	1843.2	45
8	32	2048	50
9	36	2252.8	55
9.5	38	2457.6	60
19	75	4915.2	120
38	150	9830.4	240
