Heath H-89/Z-90 Computer

With

Z67-IDE
Hard Disk System
Version 10

Developed By
Norberto Collado

Introduction

The H-89/Z-90 computers equipped with the Z67-IDE hard drive system are basically standard Heath computers with a couple of exceptions:
1. Instead of the standard Heath Boot ROM (part #: 444-142, Monitor 90), it is running the Magnolia Micro Systems Boot ROM (MMS-84C). The differences are discussed below.
2. [Optional] Instead of the standard two megahertz clock, it may be equipped with the Micronics Technology 2/4 MHz Speed Board.

The computer operation is essentially as presented in the Heath Manuals for either CP/M or HDOS operating systems. The primary difference is in the Boot process while running the monitor / boot loader routines in the MMS-84C ROM.

CPU clock speed is virtually transparent to the user and the computer simply runs twice as fast. For reading and writing to the H17 floppy disks, the operating system (BIOS.SYS for CP/M and device drivers for HDOS) have been modified to automatically drop the speed when needed and return it to 4 MHz when 2 MHz operation is no longer required.

When running the H-17 controller, the disk formatting programs for hard-sectored disks have been modified to adjust the clock speed automatically, as needed. The CP/M program FORMAT80.COM has been renamed to **FORMAT8R.COM** to indicate the revision. The HDOS INIT.ABS and INITAUTO.ABS programs have been set to 'System' status so that they do not display in a normal directory.   DOCOM scripts (**FORMAT.ABS** and **FORMAUTO.ABS**) are used instead to drop the speed and then run the formatting programs. The reboot of HDOS after the format operation returns the system to 4 MHz operation. In all other respects, the programs are unchanged in operation.

MMS-84C Monitor / Boot ROM

When power is applied, the initial prompt on the CRT is different. Instead of **H:** (the standard Heath monitor prompt), it will display **IDE:** (to indicate the Z67-IDE boot environment). The MMS ROM will auto-complete the commands like the Heath ROM. In the discussion below, auto-completed characters will be enclosed in parenthesis. When you must press the carriage return key, it will be indicated by <cr>.

B(oot) the computer
        Similar to the Heath ROM, one types:

            |
            | IDE: B(oot) D(D-)n<cr>
            |
where D designates the boot device and n designates the unit number.

For the H-17 hard-sector floppy disk controller boot, the device letter is B and the unit number is 0, 1 or 2.   B(oot) B(B-)1<cr>   would boot the second H17 drive

For the H-37 soft-sector floppy disk controller boot, the device letter is C and the unit number is 0, 1 or 2.   B(oot) C(C-)1<cr>   would boot the second H37 drive

For the Z67-IDE hard disk boot, the device letter is S and the unit number is 0 or 1.

B(oot) S(S-)1<cr>   would boot the second hard disk

Typing 'B' selects boot operation, the 'D'(evice) letter selects the boot device to use and 'n' selects the device number to read from. If a boot operation is performed with no disk in the selected device, the boot ROM loader program is installed into memory to perform the boot operation. Resetting the computer (Shift-Reset) does not clear the memory, so the loader program is still present for use with any other code entered using the Debugging Commands discussed below. For example, this process is used to create the loader program on the H-89 for use with the H8D disk image transfer system.

M(emory Test)

|
| IDE: M(emory Test)<cr>
|

Typing 'M', <cr> will perform a memory test. It will indicate the total memory in hexadecimal notation and the pass number. Errors are indicated by display of the address and bit number (1 through 8) that failed. Press Shift-Reset after the pass counter exceeds 80.

R(ate) - set baud rate

|
| IDE: R(ate -)x<cr>
|

Typing 'R' will set the baud rate for communication between the terminal and the computer. To set the rate, you will type one of the following letters in place of x above.

A=110, **B**=150, **C**=300, **D**=600, **E**=1200, **F**=1800, **G**=2000
H=2400, **I**=3600, **J**=4800, **K**=7200, **L**=9600, **M**=19200

The baud rate will be cleared to the switch set rate (on the Terminal Logic Board – S401) when the computer is reset (Shift-Reset).

T(erminal)

|
| IDE: T(erminal Mode)<cr>
|

Typing 'T' will set terminal mode to use with a device (remote computer) connected to the DTE port (330Q).   The DTE port is directly connected to the H-19 display and keyboard. Shift-Reset will end terminal mode.

V (ersion)

|
| IDE: V(ersion nn)
|

Typing 'V' will display the monitor ROM version number.

Debugging Commands:

All memory related commands use hexadecimal notation.
S(ubstitute)   -- enter data / alter data in memory
```
             |
             |  IDE: S(ubstitute )nnnn<cr>
             | aaaa  xx <cr>       ; leave value xx unchanged and go to next address
             | bbbb  xx  yy<cr>    ; change value xx to yy
             | cccc   xx  .        ; . (period) ends substitute operation
             |
```
Typing 'S' allows directly entering/altering memory data.   The starting address nnnn is entered and followed by a carriage return (<cr>).   The memory address is printed and followed by the current content in hexadecimal notation. Pressing <cr> only advances to the next memory location. Typing a new hexadecimal number followed by <cr> will enter the new value to that address. Typing . (period) will end the substitute operation.

P (rogram counter)
```
             |
             |  IDE P(rogram Counter )<cr>             ; display program counter value
             |      or
             |  IDE  P(rogram Counter )nnnn<cr>        ; set program counter to nnnn
             |
```
Typing 'P' <cr> will display the current program counter value. Typing 'P' followed by nnnn<cr> will set the program counter address to nnnn.

G(o) -- execute program
```
             |
             |  IDE:  G(o )<cr>            ; begin execution at program counter value
             |      or
             |  IDE:  G(o )nnnn<cr>        ; begin execution at address nnnn
             |
```
Typing 'G' immediately followed by <cr> with begin execution of code at the address in the Program Counter. Typing 'G' followed by nnnn will begin execution of code at the specified address (nnnn).

Z67-IDE Hard Disk System

The Z67-IDE controller may be either internal to the H-89 or external connected by a cable to the rear panel. For either installation method, the front panel controls are the same:
1. A boot system selector switch:
   - 15 Systems (0 to 14) with 2 GB CF cards
   - 30 Systems (0 to 29) with 4 GB CF cards
   - 60 Systems (0 to 59) with 8 GB CF cards
2. Two Write-Protect switches, the left switch for drive 0 and the right for drive 1.
3. A read/write activity LED.

Each boot system hosts two hard disks. The size of the disk is dependent on the installed operating system. Drive 0 can be used for either HDOS or CP/M. Drive 2 can only be used for CP/M.

An HDOS hard disk will consist of a 15 megabyte drive divided into eight partitions of 1.8 megabytes. Any of the partitions may be booted if the boot system has been installed (SYSGENed).
A CP/M hard disk will consist of 120 megabytes divided into fifteen partitions of eight megabytes. Any of the partitions may be booted if the boot system has been installed (SYSGENed).
When the system is first powered on, the Z67-IDE front panel LED will be lit while the system is initializing and will extinguish when initialization is complete.   After initialization, the boot system selector switch may be set for the desired system to boot.

(**ONLY CHANGE THE SELECTOR SWITCH WHEN THE SYSTEM IS RESET WITH IDE: PROMPT DISPLAYED ON THE CRT OR AFTER HDOS BYE COMMAND.**)

For normal use when working from a boot of the hard disk, the write-protect switches will be off. This will allow both reading and writing to the hard disk drive. When you are performing operations where a mis-typed command could affect files on the hard disk and this is **NOT** the intended operation, then the write-protect switch should be **ON** to prevent inadvertent changes. For example, you want to format a floppy disk. Mistyping the command could format the hard disk, wiping away all of your programs and data. Setting the Write-Protect switch to **ON** for the drive will prevent all writes to the disk and protect your programs and data. The hard disk can be read with the write-protect switch in the **ON** position, but writes are not allowed. Ensure the write-protect switch is set to **OFF** when you want to write to the hard disk.

Another useful technique is to write-protect all files on the boot partition (STAT *.* $R/O) or (STAT filename.ext $SYS if the operating system must have write permission for the file). This way, you will be protected from accidental erase commands or over-writing a system file.

> **Note: File Attribute Settings will not protect the hard disk from a format command.**

That is exactly why the write-protect switches are installed and need to be properly used.