

# ZBIOS

## ***Introduction***

ZBIOS was written from the ground up for use in embedded applications. The design was focused on performance, quality and compatibility. The setup screen was skipped in favour of automatic hardware detection in order to better fit a typical embedded application.

A lot of development effort has been spent in reducing the BIOS start up time. The BIOS will not spend time showing fancy graphics or execute any unnecessary hardware tests and initializations. ZBIOS executes the mandatory POST (Power On Self Test) process but keeps the tests and initializations to a minimum.

The POST is executed differently during hard reset (power on or reset button) and soft reset (CTRL+ALT+DEL or CPU shutdown). When the BIOS starts from a hard reset the hardware needs to be fully tested and initialized since all hardware has been reset to there default settings. Starting the BIOS from a soft reset causes minimum POST processing as hardware is already tested and initialized from the last hard reset. ZBIOS thus excels in start up times during soft resets.

## ***Customization***

ZBIOS can be tailored for a customer platform upon request. The BIOS is very modular and the usual needs by a customer board can often be put together by the standard modules. The standard modules support the following features:

- ✓ Up to 2 IDE channels for hard drives, CD-ROMS etc. (i.e. up to 4 devices)
- ✓ 2 floppy drives (360KB, 720KB, 1.2MB, 1.44MB, 2.88MB)
- ✓ Emulated floppy drive in flash memory (same sizes as above)
- ✓ Emulated hard drive in flash memory
- ✓ Emulated floppy drive on CD-ROM (El Torito CD-ROM boot standard)
- ✓ Emulated hard drive on CD-ROM (El Torito CD-ROM boot standard)
- ✓ VGA graphics on either ISA or PCI bus
- ✓ Monochrome graphics on ISA bus
- ✓ Keyboard and/or display emulation on VT100 compatible terminal
- ✓ Keyboard (for boards equipped with keyboard controller)
- ✓ Mouse (for boards equipped with mouse capable keyboard controller)

The features above can be combined to fit most boards and custom features can be ordered on request.

## ***Boot process***

ZBIOS has very flexible boot options. The BIOS disk services API (INT 13h) support extended disk functions (41h – 50h) and implements the full El Torito CD-ROM boot standard.

The BIOS can boot from the following sources:

- ✓ Flash memory (emulated floppy or hard drive)
- ✓ CD-ROM (emulated floppy, hard drive or direct boot with no drive emulation)
- ✓ Floppy drive (360K, 720K, 1.2M, 1.44M, 2.88M)
- ✓ Hard drive (LBA and CHS translation supported)
- ✓ Expansion rom

Other tailor made boot sources can be added on request from customer.

## **Quality**

ZBIOS excels at the API-level. A good example is the implementation of INT 13h (disk) services. The API standard has always allowed reading, writing or verifying requests of up to 255 sectors but few BIOS implementations (if any) has been able to actually perform the request without errors. ZBIOS on the other hand can handle up to 255 sectors in one go without errors. This includes emulated disks (flash, CD-ROM) as well as the real floppy and hard drives. The BIOS evaluation kit includes the test program DISKTEST.COM in order to demonstrate this capability.

## **DISKTEST**

DISKTEST.COM is a good tool for evaluating the quality of the BIOS. The software demonstrates the strength of ZBIOS disk I/O and as a side effect the weakness of others BIOS. The program must be run from MS-DOS or a compatible operating system. 32-bit operating systems like WINDOWS will not suffice as it will not allow the software to execute low level BIOS calls.

The tool should be run from a DOS prompt by supplying a parameter telling the software the number of the drive to execute the BIOS disk test on. The parameter uses BIOS numbering (0 and 1 for floppy drives and 80 or above for hard drives).

The hardest test case for any BIOS is to transfer a large amount of sectors to or from floppy drives due to some hardware constraints imposed by the DMA chip . In order to test your BIOS capability in that area you can type disktest 0 followed by <ENTER>. This will execute the BIOS disk test on your first floppy drive. The test is a read only test so your diskettes data will remain unaltered by the test. A typical test run on ZBIOS is shown in figure 1.

DISKTEST will first read 256 sectors one at a time into a 128K buffer for reference. DISKTEST will then:

- ✓ read 1 sector and compare with reference sector
- ✓ read 1 track and compare with reference sectors
- ✓ read 1 cylinder and compare with reference sectors if sectors/cylinder < 127
- ✓ read 127 sectors and compare with reference sectors (64K – 1 sector)
- ✓ read 128 sectors and compare with reference sectors (64K)
- ✓ read 129 sectors and compare with reference sectors (64K + 1 sector)
- ✓ read 192 sectors and compare with reference sectors (96K)
- ✓ read 255 sectors and compare with reference sectors (128K – 1 sector)

Bios Disk Test Version 1.11 – Copyright (C) 2002, Zebor Technology

Checking diskette media type.

Loading 128K, 1 sector at a time, for reference.....

Reading 01h sector(s) : passed (AH = 00h, AL=01h), data matches reference

Reading 12h sector(s) : passed (AH = 00h, AL=12h), data matches reference

Reading 24h sector(s) : passed (AH = 00h, AL=24h), data matches reference

Reading 7Fh sector(s) : passed (AH = 00h, AL=7Fh), data matches reference

Reading 80h sector(s) : passed (AH = 00h, AL=80h), data matches reference

Reading 81h sector(s) : passed (AH = 00h, AL=81h), data matches reference

Reading C0h sector(s) : passed (AH = 00h, AL=C0h), data matches reference

Reading FFh sector(s) : passed (AH = 00h, AL=FFh), data matches reference

Figure 1

If the BIOS or comparison fails in any of the above tests the program will exit to DOS and display an error message. Some BIOS implementations will hang when testing the hard drive and reading more than 128 sectors at once. If your BIOS hang you will have to restart your board with either the reset button or a power off/on sequence. A typical test run on a floppy drive with some other BIOS is shown in figure 2. The very same BIOS hang when a read of 129 sectors was tried on a hard drive.

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Checking diskette media type.

Loading 128K, 1 sector at a time, for reference.....

Reading 01h sector(s) : passed (AH = 00h, AL=01h), data matches reference

Reading 12h sector(s) : passed (AH = 00h, AL=12h), data matches reference

Reading 24h sector(s) : passed (AH = 00h, AL=24h), data matches reference

Reading 7Fh sector(s) : failed (AH = 04h, AL=23h)

Figure 2

The BIOS in the above test managed to read an entire cylinder (all sectors of the track on both sides of the diskette) before it failed. Some will not be able to deliver more than one track at a time. ZBIOS will always manage to complete the test without errors as long as the media is okay.

## **Configuration**

ZBIOS is automatically configured. If your board is populated with non volatile memory the BIOS will save key data there in order to reduce start up time the next time you power on your board. Usually a real time clock on the board provides this type of memory.

ZBIOS will avoid full memory test as long as the boards memory configuration stays the same. If you add or remove memory the BIOS will detect the change, execute a full memory test and update the non volatile memory.

The same is true for floppy drives. As long as you do not add a floppy drive to your system the floppy drive types will be taken from the non volatile memory. When you add a drive the floppy type will be detected as long as there is valid media in the drive and the new configuration stored in the non volatile memory. The BIOS will not execute drive type detection for floppy drives it already knows about.

If you reduce the number of floppy drives you need to reset the volatile memory according to the BIOS manual for your board. The BIOS will then execute the floppy drive detection and update the non volatile memory with the new floppy disk configuration.

### ***Floppy drive detection***

The floppy drive detection needs only to be executed once for a typical system. The first time you insert media in the drive, the floppy drive type is detected and the configuration stored in non volatile memory.

In order to get the proper disk type saved you should insert a diskette with the largest media supported for the drive. If you have 720K diskette inserted in a 1.44MB floppy drive during drive detection the result will be that you can no longer use 1.44MB media with that drive. In order to correct this mistake you just have to instruct your BIOS to reset the non volatile memory, do a hard reset (power on or reset button) and have the proper media inserted.

### ***Board configuration***

BIOS configurations can be determined at start up time by reading jumper or switch settings from an input port on some boards. This includes general configurations as the boot order, CD-ROM boot enable/disable as well as more board specific settings like CPU speed, cache configuration etc. Consult the BIOS board manual to find out the settings available for your board.