

# EZ Drive™

## *Technical Bulletin*

## 1 What is EZ Drive?

EZ Drive is a hard drive utility, developed by StorageSoft, Inc., that is principally designed to partition and format IDE hard drives. In addition to setting up an IDE drive, EZ Drive also solves capacity barriers imposed by the system BIOS by installing the EZ BIOS Master Boot Record (MBR) code. EZ Drive is the program used to setup the hard drive and EZ BIOS is the boot code that is installed, if necessary, by EZ Drive.

## 2 How does EZ-Drive differ from DriveGuide?

Both EZ Drive and DriveGuide will setup an ATA hard drive. However, where DriveGuide utilizes a graphical interface, EZ Drive is strictly text driven (see the figures below and on the next page to view UI differences). Another area where these two utilities differ is DriveGuide contains a Guided Installation routine to assist users with the physical installation of a hard drive. EZ Drive is designed to partition and format ATA drive after it has been installed into a system. It contains no installation guide.

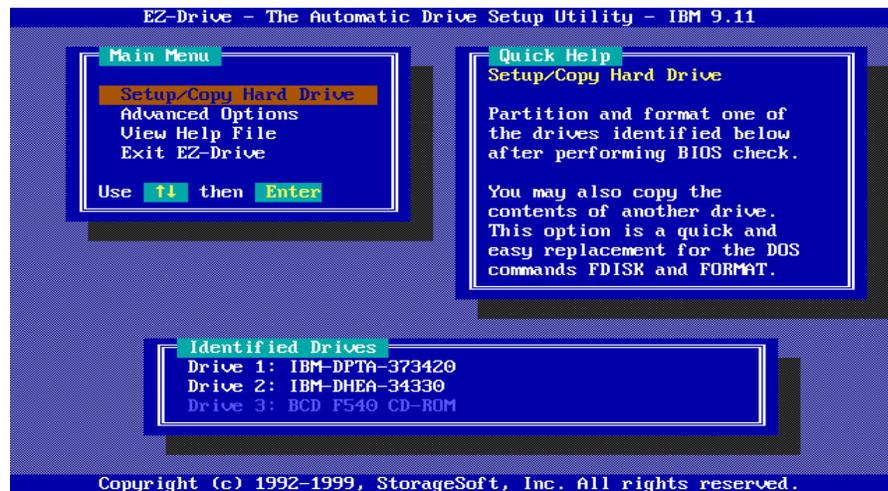


Figure 1 EZ-Drive UI

## 3 What is EZ BIOS?

EZ-BIOS is an Interrupt 13h (Int13) handler that resides in the boot sector of an IDE/ATA drive. EZ BIOS will control ATA hard drives during the boot process and while the system is running in DOS mode. While running Windows 95 or NT the hard drives are usually controlled directly by the OS and EZ-BIOS is bypassed. EZ-BIOS is installed and configured automatically by EZ-Drive if the system BIOS is unable to handle the total capacity of a drive being setup by EZ Drive. EZ-BIOS can also be manually installed, configured and uninstalled through EZ-Drive menu options.

**Note:** EZ-BIOS does not support hard drives on an Ultra ATA card. The BIOS on the Ultra ATA card should be able to handle the capacity of the attached hard drive, so EZ-BIOS is not necessary. However, EZ-Drive will still partition and format an ATA drive on an Ultra ATA controller.

## 4 How does EZ Drive determine if EZ BIOS is necessary or not?

Basically EZ-Drive compares the capacity reported by the hard drive to the capacity the system BIOS reports the drive as. If these capacity values do not match then EZ-Drive will install EZ-BIOS. The way this is accomplished is this, when EZ Drive loads it sends out an ATA Drive ID command to obtain drive information. The attached drive(s) will respond with a 256 word data string. During a partition and format routine EZ Drive derives the total capacity by looking at words 1, 3, and 6 and words 60 and 61 of the 256 word response for the drive being setup. If the drive is less than 8.4 Gig then the CHS values contained in words 1, 3, and 6 are used for total capacity. If the drive is greater than 8.4 Gig then EZ Drive uses the total addressable LBA sectors in words 60 and 61 to obtain total capacity. Once EZ Drive obtains the total capacity of a drive the program will send out an Int13 function 8, or an Extended Int13 Function 48 call to find out how the BIOS will handle the drive. If the BIOS capacity differs from the ATA Drive ID capacity then EZ Drive will install EZ BIOS to handle the drive that is being setup.

## 5 What are the components of EZ BIOS?

**EZ-BIOS MBR** - Resides at LBA (Logical Block Address) 0 on the hard drive. LBA 0 is Cylinder-Head-Sector Address 0-0-1. This code replaces the normal MBR and is loaded and executed by the system BIOS instead of the normal MBR. The EZ-BIOS MBR loads and executes the Int13 handler first and then the Regular MBR, both described below.

**Int13 Handler** - Resides at LBA 2 through 16 on the hard drive. This code, which is loaded and executed by the EZ-BIOS MBR, is divided into two parts. There is a non-resident portion that initializes the drives and hooks Int13, and a resident portion that handles the Int13 requests. The resident portion occupies the top 5k of lower memory, just below the VGA frame buffer, starting at 635k.

**Regular MBR** - Resides at LBA 1 on the hard drive. This code, which is loaded and executed by the EZ-BIOS MBR, is a clone of a regular DOS/Windows MBR. If there appears to be an existing MBR on a drive when EZ-BIOS is installed, that MBR may be moved to LBA 1 instead of installing this generic one. The function of this code is to locate, load and execute the DBR (DOS Boot Record) of the active partition.

## 6 What is the boot sequence of the EZ BIOS components?

1. The system BIOS uses it's own Int13 to load and execute LBA 0 of device 80h, which is usually the boot drive in a system. That sector contains the EZ-BIOS MBR.
2. The EZ-BIOS MBR uses the system BIOS Int13 to load and call the code in LBA 2 through 16, which is the EZ-BIOS Int13 handler. The resident portion starts at 635k and the initialization portion is below that. The memory location in the ROM BIOS data area that contains the number of kilobytes of conventional memory installed is decremented by 5k, which effectively protects the memory from being overwritten by the OS.
3. After the Int13 handler is initialized, EZ-BIOS is controlling the drive and the system BIOS is no longer used. Execution is returned to the EZ-BIOS MBR, still resident in lower memory, which then loads the Regular MBR in LBA 1 and jumps to it.
4. At this point the normal boot sequence proceeds with the Regular MBR loading the DBR, which loads IO.SYS and then loads COMMAND.COM and off we go.

## 7 Can EZ BIOS get overwritten if the EZ BIOS code doesn't load?

Yes it can. Generally this scenario occurs when a user boots directly from bootable floppy diskette and the OS modifies the MBR code at LBA 0. By booting in this manner the EZ BIOS code does not get a chance to load.

## 8 Is there any kind of safeguard that will keep EZ BIOS from being overwritten?

EZ Drive utilizes a feature called Floppy Boot Protection (FBP). FBP is an unusual mechanism that solves two problems. The first problem is this: when EZ-BIOS is installed on a drive it is because the system BIOS is not handling it properly; however, if the user boots directly to a floppy disk it bypasses the loading of EZ-BIOS from the hard disk. At that point the system BIOS is controlling all hard disks, some or all incorrectly. If the user were to access any files on the incorrectly handled drives there could be data corruption.

To get around this problem EZ-Drive make two copies of the partition table. If FBP is enabled the partition table in the normal position at LBA 0 has all partition types changed to type 55h which is an unknown partition type for any OS. The real unadulterated partition table is kept at LBA 1. If the user boots directly to a floppy disk, no partitions on the drive will be accessible through the OS, thereby preventing inadvertent data loss. When the user boots to the hard drive, or uses the Floppy Boot Procedure (described below) to boot to a floppy disk, then EZ-BIOS is loaded. EZ-BIOS will see that FBP is enabled and any requests to access LBA 0 will be redirected to LBA 1. This makes the real partition table visible to the OS and all drives are accessible.

The other problem that FBP solves is this: **When installing an Operating System, many times the MBR is overwritten with new code.** If weren't for FBP the OS would overwrite the EZ-BIOS MBR with it's own and then EZ-BIOS would never load. With FBP enabled however, the request to write the new MBR to LBA 0 would be redirected to LBA 1. Since the EZ-BIOS MBR chains to the MBR in LBA 1 after loading EZ-BIOS, this is exactly where the new MBR should go.

## 9 What is the Floppy Boot Procedure?

If the user wishes to boot to a floppy disk he or she must use the Floppy Boot Procedure in order to insure that EZ-BIOS gets loaded. This is the procedure:

1. Allow the hard drive to boot to the point where this message appears:  
"EZ-BIOS: Hold the CTRL key down for Status Screen or to boot from floppy..."
2. Press and hold the Ctrl key until the status screen appears.
3. Press the 'A' key.
4. Insert the floppy disk.
5. Press any key to boot to the floppy.

Following this procedure will insure that EZ-BIOS is loaded and controlling any hard drives that are set up for EZ-BIOS control. If this procedure is *not* followed, the ROM BIOS may be controlling some drives incorrectly and data loss could result.

## 10 What are the features of EZ BIOS?

**Large Drive Support** - Overcomes system BIOS limitations to handle the largest ATA hard drives currently available.

**Multi-Sector Transfers** - Speeds throughput by generating a single interrupt per multi-sector transfer rather than one interrupt per sector.

**Double Word Transfers** - Speeds throughput by transferring data 32 bits at a time over the PCI bus.

**Logical Block Addressing** - LBA is a method of accessing the drive using a single 32 bit sector number rather than separate Cylinder, Head and Sector numbers. EZ-BIOS uses LBA to access drives that support this method.

**Floppy Boot Protection** - Prevents data corruption by hiding the drive from the OS if the user boots directly to a floppy disk which bypasses the loading of EZ-BIOS and allows an incorrect system BIOS to control the drive.

**Extended Int13 Functions** - Allows access to drives over 8.4 GB if the OS utilizes the functions, which generally means Windows 95 or later.

## 11 EZ Drive version synopsis:

	5.00	5.02	8.01	8.02	9.00	9.03	9.04	9.06	9.11
Sets up a hard drive	X	X	X	X	X	X	X	X	X
Contains a safe boot from floppy feature	X	X	X	X	X	X	X	X	X
Has Advanced Options menu	X	X	X	X	X	X	X	X	X
Diskettes are self booting from the MHOS					X	X	X	X	X
Detects if BIOS will support the hard drive or not					X	X	X	X	X
Displays the status screen when control key is pressed				X	X	X	X	X	X
Migrates Disk Manager boot code to EZ BIOS					X	X	X	X	X
Removes Disk Manager's 63 sector skew						X	X	X	X
Can Backup and Restore boot track					X	X	X	X	X
Creates and Supports FAT32 partitions							X	X	X
Supports Interrupt 13 extensions for drives larger than 8.4 Gigs								X	X
Partitions hard drives on an UltraATA card.									X

## 12 Support Notes:

- Because of the change in code base in version 5.02u, users with an EZ Drive version prior to 5.02u must be updated to 5.02u prior to upgrading to a later version.
- The Floppy Boot Protection option in EZ Drive versions 5.00 and earlier is called 'NT Compatibility' and is disabled by default, which is the same as having FBP enabled in current versions.
- Restoring the boot code for EZ Drive versions 8.x and earlier is accomplished by typing EZ /MBR from the EZ Drive diskette at the DOS prompt. Western Digital's 9.x versions also use this convention because they requested the executable name remain EZ.EXE rather than switch to EZDRIVE.EXE.
- Restoring the boot code for the version 9.x series can be done in one of three ways:
  1. Booting to a DOS prompt, inserting the EZ Drive diskette, and typing EZDRIVE /MBR from the EZ Drive diskette.
  2. Booting directly to the EZ Drive diskette, selecting the 'Advanced Options', choosing the 'EZ BIOS Setup' option, then saying 'Yes' to the Install EZ BIOS prompt.
  3. Booting directly to the EZ Drive diskette, selecting the 'Advanced Options', then choosing the 'Backup Restore Track 0' option and restoring the latest backup.

The EZ /MBR or EZDRIVE /MBR command is also an effective method to upgrade the boot code from an older version to a newer version. This method will not setup the drive again, it only copies EZ BIOS.