

# The BIOS 2 Gigabyte failure

## (The BIOS Bug)

### 1. The Problem

ATA drives with more than 4092 cylinders are causing failures on some systems. To date the following failures have been documented:

1. BIOS truncates the drive at 4095 cylinders. This failure is easily solved by the addition of a 3rd party driver. Boot capabilities of the drive are limited in a manner that requires the boot partition to reside in the first 4095 cylinders of the drive. Additional space is available for user access at run time.
2. BIOS truncates the drive at 1024 cylinders. Booting must occur within the first 1024 cylinders. See #1 for other comments.
3. Very evil wrapping BIOS. These BIOS's can display the correct drive parameters in SETUP, but they are characterized by using a value for cylinders modulo 1024 or 4096. This means that in all cases, if the drive returns a value of 4097 for cylinders the BIOS will use a value of 1 cylinder for the drive size. In many cases a 3rd party driver can solve this problem. In some cases a BIOS upgrade via an expansion card, or on the motherboard, may be necessary.
4. BIOS hangs during post. Some systems hang when a drive with more than 4092 cylinders is attached. Users on these systems have no recourse but to update their motherboard BIOS. The system halts before the SETUP interface can be accessed. My best guess is that this problem exists in at least 50% of all PENTIUM systems.

### 2. Today...

Phoenix, AMI, AWARD, Compaq, and others have all fixed the problems at various times and are now shipping BIOS that is fully functional. This means the problem only exists in the retail/upgrade market. The reason I am purposing a unified solution is that I believe the confusion which resulted from the 528MB barrier can be reduced. At 528MB the problem was mainly how to get passed the BIOS and make the full drive available to the OS. The 2 Gigabyte problem is an order of magnitude worse because it causes systems to become non-functional. The user really can't tell if the cable is plugged in backwards, a jumper is wrong, or the BIOS is hung. The hanging BIOS is a new phenomena that will not be the first point of interest when a user is installing a new drive.

### 3. A Possible Solution

I believe that a unified solution to the above stated problems is both useful and warranted. The main reason is that all of the purposed solutions for the retail market problems involve manipulating the ID Drive data. It is my feeling that this capability should be well defined for the following reason:

1. Future legacy issues can be documented and well understood.
2. Upgrade issues have a single resolution from the BIOS/Application stand point
3. A message is sent the retail community that a solution for the problem does exist.

#### 3.1 Manipulating the data

The drive must have two modes of operation. The normal mode works with systems that are in production today. I recommend that drive ship in the normal mode. The second mode truncates the information in ID Drive, but does not cripple the drives ability to access the full media. It would also be useful to have a set features command which switches a drive from truncated mode to normal mode. This allows BIOS software to detect a truncated drive and bring it back to full capacity without user intervention. The following sections describe the changes required for the truncating drive.

### **3.1.1 ID Drive Changes**

Word 1 of ID Drive (Logical Cylinders) must be limited to either 1023 or 4092. I would suggest 1023 because this makes the drive friendly to systems which have 528MB problems as well as systems with 2GB problems.

- Option 1. Word 54 of ID Drive (Current Logical Cylinders) will store the true number of cylinders available. This allows 3rd party drivers to easily access the drive by reading the true cylinder value.
- Option 2. Word 54 of ID Drive (Current Logical Cylinders) is the same as Word 1. This will force the BIOS services provider (Microhouse/Ontrack/...) to derive the number of cylinders using words 60-61. This also keeps BIOS's which look at word 54 instead of or in addition to word 1 functioning properly.

A bit in word 53 or 49 must be set aside to notify host software when truncation is enabled. I would suggest word 53 bit 2.

### **3.1.2 Command Changes**

Read/Write commands continue to allow access to the entire drive when truncation is enabled. However, some drives will may be in a truncating mode and attached to a system that does not require truncation. A Set Features command can be used to change the truncation mode of the drive. I would suggest that this feature be reset to truncation on a Power Down, but not on an SRST or other reset.