The Intech ATA Hi-Cap Support Driver
Important "Read Me" Document

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About This Software:

The ATA Hi-Cap Support Driver (file name: IntechATA6.kext) software was created to allow the use of extended capacity ATA drives (drives greater than 128 Gigabytes in size) on older (Pre-Mirrored Door) G4 and all G3 Macintoshes running MacOS X versions 10.2 and later. Without this software installed, any extended capacity drive which is connected to the native ATA bus on older Macintosh models will be limited to only 128 Gigabytes. Later model G4's and all G5's do not suffer from this limitation. The IntechATA6.kext ("kext" is short for "kernel extension") driver has no user interface of its own. Rather, it is installed and/or removed via the included installation software program.

Important Limitations:

Once the IntechATA6.kext software has been installed using the included "ATA Hi-Cap Installer" program and you have rebooted your computer, your extended capacity drive will now show up at its true size and all sectors will be accessible. However, there are several points that must to be kept in mind.

1) If you already setup your extended capacity drive as a 128 Gig, you'll need to backup your data and set it up again to get the full capacity.

2) If you boot from another source which does not have the Intech kext installed (such as an original OS X installation CD), the sectors which are located beyond the 128 Gigabyte boundary will not be accessible. This will result in i/o errors (see "Safe Partitioning" below to avoid such problems).

3) While you can safely boot from a drive which is greater than 128 Gigabytes in size, you CAN NOT SAFELY boot from a volume if ANY of its sectors are located beyond the 128 Gigabyte boundary. So if you plan to boot from this drive, you need to follow one of the following procedures listed in "Safe Partitioning".

4) Blue and White G3's. Among the problems present in the Ultra-33 ATA controller on the Blue and White G3 computer is the inability to do 48-bit addressing with any type of DMA writes. If you have this machine, you will need to connect your extended capacity ATA drive to the Multi-Word DMA bus (which is the same bus your CD/DVD ROM is connected to). Do not connect an extended capacity drive to the Ultra DMA bus. It will cause your computer to hang.

5) If your extended capacity ATA drive is your only bootable hard disk drive, it is currently not possible with this configuration to partition the disk for full capacity. Intech is currently working on a solution for single extended capacity ATA drive users and we hope to offer a solution very quickly. If this is your situation and you have already purchased this driver, please send an e-mail to our support staff so we can inform you of our solution just as soon as it becomes available.

Safe Partitioning:

If you plan to boot from a drive greater than 128 Gigabytes in size, or if you want to be able to boot from other sources which do not have the IntechATA6.kext driver software installed, you need to partition the drive in such a way as to minimize potential problems or confusion.

Safe Partitioning for MacOS X use only (and we mean only!):

If your machine is dedicated to running MacOS X exclusively, (running the MacOS 9 classic shell within MacOS X is not a problem), Intech recommends the following:

After installing the IntechATA6.kext and rebooting, run Disk Utility (from the "Applications:Utilities" folder). Create your bootable partition first. It can be up to 127.99 Gigabytes, but no larger. Allocate the remainder per your needs. If you need several partitions, we recommend partitioning the drive such that no single volume crosses the 128 Gigabyte boundary.

Here are two MacOS X only partitioning examples for a 250 Gig drive:

1) Simplest partition scheme - create a 127.99 Gigabyte volume and allocate the rest to a second volume.

2) More complex scheme - create two 50 Gigabyte volumes, a 27.99 Gigabyte volume, and allocate the rest to one or more volumes.

The important point here is that no single volume spans the 128 Gigabyte barrier. Note that in our more complex example the

first three volumes add up to exactly 127.99 Gigabytes (50 + 50 + 27.99).

Safe Partitioning for use under both MacOS 9 and MacOS X:

If you plan to boot your machine natively into both MacOS 9 and X, you will need to partition the drive under MacOS 9 using Intech's Hard Disk SpeedTools (a.k.a. HDST) product which supports extended capacity drives under MacOS 9. If you don't have this product, you can buy it directly from Intech's web site (http://www.speedtools.com). Once you have obtained HDST, boot your computer into MacOS 9 and do the following:

Run HDST. Create your MacOS X bootable partition first. It can be up to 131,071 Megabytes (about 127.99 Gigabytes), but no larger. Allocate the rest of the drive according to your needs. Because of the way MacOS 9 boots, however, you can put an MacOS 9 System Folder anywhere on the disk you want. So you may wish to put your MacOS 9 installation on a volume which is located past the 128 Gigabyte boundary.

Here are two HDST partitioning examples for a 250 Gig drive for users of both MacOS 9 & X:

1) Simplest partition scheme - create a 131,071 Megabyte volume and allocate the rest to a second volume.

2) More complex scheme - create two 50,000 Megabyte volumes, a 31,071 Megabyte volume, and allocate the rest to one or more volumes.

The important point here is that no single volume spans the 128 Gigabyte barrier. Note that in our more complex example the first three volumes add up to exactly 131,071 (50,000 + 50,000 + 31,071).

Important Questions and Answers:

Q: If MacOS X 10.2 (and later) supports extended capacity drives, why do I need this software?:

A. Not all Macs take advantage of this support. When Apple released MacOS X 10.2, support for ATA drives over 128 Gigabytes in size was added. (See http://developer.apple.com/technotes/tn2002/tn2053.html#HW000319) Many people presumed that this would enable them to finally upgrade their internal ATA drives to something much bigger. Unfortunately, many would be sorely disappointed (See http://docs.info.apple.com/article.html?artnum=86178).

Intech surmises that the reason Apple has prevented 48-bit support in all of their G3's and some of their G4's has to do with the way MacOS X boots. To boot from an ATA drive under OS X, a minimal ATA driver must be loaded from the Computer's boot ROM to begin reading the System files into memory and begin the booting process. At some point in this process, a newer, full-featured ATA driver will be loaded from a file off the disk and replace the driver which was used to begin the booting process. Since these older Macintoshes were manufactured prior to the widespread adoption of 48-bit capable drives, the Boot-ROM ATA driver does not support 48-bit addressing and, quite possibly, would not be able to access all the files necessary to boot the computer sufficiently to load the updated 48-bit capable driver. **The IntechATA6.kext driver software does NOT solve this problem**. See "Important Limitations" above.

Q: What happens if my extended capacity hard disk crashes and I need to boot from a disk repair utility CD which does not have your driver software?

A. If you boot from any CD or any other source which does not have our software, your Macintosh will only be able to access the first 128 Gigabytes of the drive. For this reason Intech strongly recommends you follow the "Safe Partitioning" guidelines above. If you do so, you will be able to boot from another source and retain every opportunity to repair your MacOS X boot volume.

Q: Why do some companies call it the "137 Gigabyte barrier" while Intech and others call it the "128 Gigabyte barrier"?

A. They are exactly the same barrier: 137,438,953,472 Bytes. It is simply based upon two alternative ways of defining "Gigabyte." Intech stays with the more traditional notion of defining size categories (Kilobyte, Megabyte, Gigabyte etc.) as 1024 times the size of the lower category . Thus one KIlobyte is 1024 Bytes, which translates very easily to two sectors (512 bytes per sector * 2 sectors = 1024 Bytes or 1 Kilobyte). Others prefer category multiples of 1000. Thus one Kilobyte is defined as 1000 Bytes or 1.953125 sectors. Using Intech's method 137,438,953,472 Bytes translates to 128 Gigabytes: 137,438,953,472 ÷ (1024 * 1024 * 1024). Using the other method, 137,438,953,472 Bytes translates to 137 Gigabytes: 137,438,953,472 ÷ (1000 * 1000 * 1000) = 137.44 Gigabytes. Keep in mind that there is no "right" or "wrong" definition, but we think the 1024 is more useful since it translates better between bytes and sectors. For detailed information on the math, see the "ATA Addressing Background" section.

Additional Technical Information:

ATA Addressing Background:

Every sector on a disk is accessed via a uniquely identified address, called a Logical Block Address (LBA for short). A "sector" is also called a "block" and the terms are used interchangably. Also, a sector on a fixed ATA hard disk always contains 512 bytes.

When the ATA (AT-Attachment) interface was being created back in the computer stone age, hard disk drives were much smaller than they are today. As a consequence, only 28 bits were reserved for identifying the beginning sector of data transfers in the reading and writing command data structures. This provided for an addressing capability up to 128 Gigabytes.

For those of you interested in the gory details, the math breaks down as follows. (If you're not interested in the math, please skip to the next paragraph.) The highest 28-bit number is hexadecimal FFFFFFF. This translates to 268,435,455 in decimal notation. Since zero is a valid LBA, this means there are 268,435,455 plus 1 or 268,435,456 maximum addressable sectors. Each sector contains 512 bytes so this means a total capacity of 137,438,953,472 bytes (268,435,456 * 512). Since there are 1024 bytes in a Kilobyte, 1024 Kilobytes in a Megabyte, and 1024 Megabytes in a Gigabyte you get the following 137,438,953,472 ÷ (1024 * 1024 * 1024) = 128 Gigabytes.

This original standard held through the first five major revisions of the ATA command set. This is a remarkable achievement, but, alas, even this forward looking standard has been overtaken by new disk drive technology. As a result, in early 2002, the sixth revision of the ATA standard (ATA-6) was adopted which contained a new addressing standard which allows up to 48 bits to be used for LBA addressing. This translates to a whopping 281,474,976,710,656 addressable sectors, or 128 Petabytes. (That's more than one million times bigger than the original 128 Gigabyte limit!) Note, however, that the ATA-6 specification required drives supporting 48-bit addressing to continue to support 28-bit addressing as well. There are important reasons for this, and of the resulting consequences on the Macintosh can be safely dealt with via our "Safe Partitioning" guidelines.

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