

# Exhibit 2

# The BIOS Companion

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**The BIOS Companion**

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chapter

## 1

# The BIOS

The instructions that turn a PC into a useful machine come in three stages; *application programs*, which are loaded by an *operating system*, which is loaded by a bootstrap loader in the BIOS.

BIOS stands for *Basic Input/Output System*, of which there are several in a PC; a good example is the one on the video card that controls the interface between it and the computer. However, we are concerned with the *System BIOS*, which is a collection of assembly language routines that allow programs and the components of a PC to communicate with each other at the hardware level. It therefore works in two directions and is active all the time your computer is switched on. Software doesn't have to talk to a device directly; it calls a BIOS routine which does the job instead, but these days the BIOS is often bypassed by 32-bit software anyway. In fact, there are moves afoot to place the BIOS functions into the operating system, starting with Power Management (see *ACPI*).

For the moment, though, the BIOS will work in conjunction with the *chipset*, which is really what manages access to system resources such as memory, cache and the data buses, and actually is the subject of this book, as all those advanced settings relate to the chipset and not the BIOS as such.

On an IBM-compatible, you will find the BIOS embedded into a ROM on the motherboard, together with hard disk utilities and a CMOS setup program, although this will depend on the manufacturer. The ROM will usually occupy a 64K segment of upper memory at F000 if you have an ISA system, and a 128K segment starting at E000 with EISA.

Older machines, such as 286s, will have two ROMs, labelled *Odd* and *Even*, or *High* and *Low* (they must be in the right slots), because of the 16-bit bus, but these days there tends to be only one—look for one with a printed label (older 386s sometimes had 4). The reason for getting away with one is because BIOS code is now copied into *Shadow RAM* (explained later), and not actually executed from ROM, but extended memory.

A *Flash ROM* allows you to change the BIOS code without replacing the chip(s). Flash ROM, or *programmable read-only nonvolatile RAM*, if you want to be posh, is similar in concept to an EPROM, but doesn't need ultraviolet light to erase it; instead, a 12v pulse is used.

Including the ROM space, the BIOS takes 256 bytes of low memory as a *BIOS Data Area*, which contains details about the Num Lock state, keyboard buffer, etc. DOS loads higher than this, so it's quite safe.

CHAPTER 1 THE BIOS

There are several types of BIOS because so many computers need to be IBM-compatible and the companies don't allow to copying, for obvious reasons. The BIOS worries about all the differences and presents a standard frontage to DOS in the same way that DOS takes care of operating the computer and provides a standard interface for application programs. PC and motherboard manufacturers used to make their own BIOSes, and many still do, but most tend to be based on code supplied by third party companies, the most well-known of which are Phoenix Technologies, Award Software, Microid Research (MR) and American Megatrends (AMI). However, all is not what it seems! Award Software owns Unicore (the upgraders), which in turn owns MR, which does the customised stuff. Phoenix also owns Quadtel.

**HOW OLD IS MY BIOS?**

Microsoft says that any earlier than 1987 are "suspect" for running Windows, and there is a list of *Known BIOS Problems* see page -227 later on. For IDE systems, the AMI BIOS must be later than 04-09-90, and for SCSI 09-25-88, as long as the SCSI card is OS220 compatible. For RLL and MFM drives, try 9-25-88 or later. The keyboard BIOS for AMI systems must be revision 'F'. If you want to check how old your BIOS is, the date is on the start-up screen, usually buried in the *BIOS ID String*, which looks a bit like this (121291 is the date in this AMI sample):

40-0201-BY6379-01101111-121291-UMCAUTO-04

Try also using **debug**:

-d f000:fff5 fffc

The AMI WinBIOS has a normal date on the startup screen. Otherwise, as you can see, you don't just get the date; many manufacturers include extras that identify the state of the chipset inside. For example, with the AMI Hi-Flex BIOS, there are two more strings, displayed by pressing **Ins** during bootup, or any other key to create an error condition.

**ACER ID STRINGS**

In the bottom left hand corner of the screen:

ACR89xxxxxxxxxxxxxxxxR03-B6

The first 2 characters after ACR identify the motherboard:

The last few are the BIOS revision.

8F	M3 (SCSI)	Altos 9000
89	M5	Altos 7000P
07	M7	Altos 900/M and 9000/M
1A	M3A	Altos 300
2F	M11A	Altos 900/Pro
24	M9B	Altos 9000/Pro
46	M9N	Altos 920 and 9100
05	X1B	Altos 19000

**AMI ID S**

The BIOS ID string is (1986-1990

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**ID STRING**

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