

Computer BIOS / POST Error Codes

Booting the Computer

When you first apply power to a PC type computer, it begins running a firmware program stored in non-volatile memory in a chip on the motherboard. Newer systems use UEFI or the Unified Extensible Firmware Interface, but older systems use the **BIOS** (or Basic Input/Output System) defined by IBM in the early 1980s. The firmware performs some power-on self-test operations and detects the processor and memory. It then initializes various programmable devices which may have their own firmware. If all that succeeds, a system with BIOS emits a single beep to indicate success. Any problems encountered along the way cause other audible codes. This page lists those possible error codes, which vary by manufacturer.

Only after this testing and initialization are completed can the system progress to loading and starting the full operating system. The stages of this operation are described below.

For much more on BIOS versus UEFI firmware and how the operating system boots and start services see my [Linux booting](#) page.

For multibooting Windows versus OpenBSD or other operating systems, see my [multiboot](#) page.

POST

The **Power-On Self Test** or **POST** first finds the CPU and then finds the memory.

Initialization

Start-up values are placed in programmable devices in this order: system board devices, then the video controller, then the I/O controller.

One Beep is Good

A typical BIOS on a system other than a laptop emits one beep when the POST and Initialization stages complete successfully. *Other audible codes indicate errors.*

At this point the video card should be initialized and you should see the BIOS logo and some narrative output on the display as it tests the system memory that it detected.

You will be told how to get into the BIOS setup, typically pressing `<Escape>` or `<Delete>` or `<F2>` or `<F12>` or some other key. Read and act quickly, as you have a rather short time to do this.

Hardware Inventory

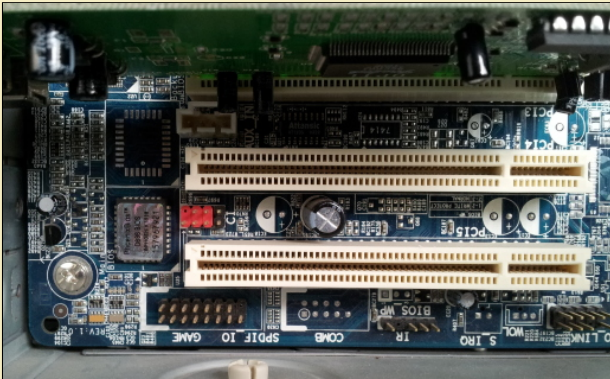
The output is visible for just a very short time, but you may be able to notice as it detected the I/O controllers, inventoried the PATA and SATA disks, and listed other hardware devices by IRQ and possibly address.

Booting the Operating System

The BIOS then inventories devices may have r



For those bootable one of those media with a valid boot block. This is the first 512-byte block on the media.



This boot block is the system-wide **Master Boot Record**. It carries out the first stage of loading the operating system from storage into RAM and starting it. [See the description of the operating system boot process for more details.](#)

A Phoenix BIOS chip is seen above and at right, near one corner of a system board next to the end of two unpopulated PCI bus slots.

BIOS POST Beep Error Codes

As mentioned above, one beep generally means that the POST and following stages found and initialized the CPU, memory, video and system board I/O interfaces. More than one beep means trouble, see the following tables.

No beep at all *might* mean that POST or the initialization failed. Or it might simply mean that no speaker is attached to the system board!

AMI / American Megatrends

American Megatrends was founded in 1985 and is headquartered near Norcross, Georgia, part of the Atlanta metropolitan area.

AMI	
Code	Description
1 short	<i>All is good!</i>
2 short	Parity error in the first 64 kbytes of RAM.
3 short	Memory error in the first 64 kbytes of RAM.
4 short	Memory error in the first 64 kbytes of RAM, plus a non-functional timer.
5 short	CPU error
6 short	Keyboard controller error.
7 short	CPU virtual mode exception error.
8 short	Read/write error on video controller memory.
1 long, 8 short	Video controller display/retrace error.
9 short	ROM BIOS checksum error. This may be caused by the CMOS battery running down.
10 short	CMOS shutdown read/write error. This is likely caused by the CMOS battery running down.
11 short	L2 cache error.

Phoenix Te [infolinks](#)

Phoenix Technology

goes through a series of tasks, writing a one-byte test-point error code to I/O port 0x80 at the start of each. For examples, 0x04 for the "Get CPU type" task, 0x0A for "Initialize CPU registers", 0x0B for "Enable CPU cache", and so on. Note that the tasks are not done in numerical order by error code.

If an error is encountered, the BIOS attempts to initialize the video display and write the current code at the upper left of the screen. It also generates a beep code from the test point error code by:

1. Break 8-bit error code into four 2-bit groups.
2. Add 1 to each 2-bit value, forming a sequence of four digits each in the range 1 through 4.
3. Emit that sequence of numbers as a series of beeps.

For example, "Test 8742 Keyboard Controller" is task 0x22, so:

```
0x22 = 00100010 --> 00 10 00 10 --> 0 2 0 2 --> 1 3 1 3
      convert to   break into   convert   add 1 to each,
      binary      4 pieces     to decimal  that many beeps
```

The following are among the possible Phoenix BIOS beep error codes:

Phoenix	
Code	Description
1	All is good!
1-1-3-3	CPU failure
1-1-3-4	CPU failure
1-1-4-1	CPU failure
1-2-2-1	Keyboard controller failure
1-2-2-3	BIOS ROM checksum error
1-3-1-1	DRAM memory refresh error
1-3-1-3	Keyboard controller failure
1-3-3-1	Memory failure
1-3-3-2	Memory failure
1-3-3-3	Memory failure
1-3-4-1	Memory failure
1-3-4-3	Memory failure
1-4-1-1	Memory failure
2-1-2-2	POST device initialization failure
2-1-2-3	BIOS ROM copyright notice error
2-2-3-1	Unexpected interrupt
2-2-4-1	Memory failure

Award

Award Software International existed for just a couple of years, from its founding in 1996 until it was absorbed in the Phoenix Technologies in mid 1998. On top of that, there were many versions of the Award BIOS and they were customized and supported by the system board manufacturers.

There were some codes that seemed to be fairly standard, shown below.

But seriously, if you have an Award BIOS then you have some old computing hardware. It's time to upgrade!

AWARD	
Code	Description
1 lon	
1 lon	

Repe

IBM

Speaking of antiquated hardware, **IBM** made PCs back in the early 1980s. Some early "PC compatible" hardware was designed by reverse-engineering, including the original IBM PC BIOS.









Original IBM BIOS Codes																																																					
Code	Description																																																				
1 long	<i>All is good!</i>																																																				
No beep, or continuous tone, or repeating short beeps	Loose card, low voltage or other basic electrical problem.																																																				
2 short	Initialization error. The error code will be displayed on the screen:																																																				
	<table border="1"> <thead> <tr> <th>Range</th> <th>Error is in...</th> </tr> </thead> <tbody> <tr> <td>100—199</td> <td>System board</td> </tr> <tr> <td>200—299</td> <td>Memory</td> </tr> <tr> <td>300—399</td> <td>Keyboard</td> </tr> <tr> <td>400—499</td> <td>Monochrome display controller</td> </tr> <tr> <td>500—599</td> <td>Color display controller</td> </tr> <tr> <td>600—699</td> <td>Floppy disk drive or controller</td> </tr> <tr> <td>700—799</td> <td>Math coprocessor</td> </tr> <tr> <td>900—999</td> <td>Parallel port</td> </tr> <tr> <td>1000—1099</td> <td>Second parallel port</td> </tr> <tr> <td>1100—1299</td> <td>Asynchronous communication port</td> </tr> <tr> <td>1300—1399</td> <td>Game port</td> </tr> <tr> <td>1400—1499</td> <td>Printer</td> </tr> <tr> <td>1500—1599</td> <td>Synchronous communication port</td> </tr> <tr> <td>1700—1799</td> <td>Hard disk or controller</td> </tr> <tr> <td>1800—1899</td> <td>XT expansion unit</td> </tr> <tr> <td>2000—2199</td> <td>Bisynchronous communication port</td> </tr> <tr> <td>2400—2599</td> <td>EGA/MCA system board video</td> </tr> <tr> <td>3000—3199</td> <td>LAN adapter</td> </tr> <tr> <td>4800—4899</td> <td>Internal modem</td> </tr> <tr> <td>7000—7099</td> <td>Phoenix BIOS chips</td> </tr> <tr> <td>7300—7399</td> <td>3.5" floppy disk drive</td> </tr> <tr> <td>8900—8999</td> <td>MIDI adapter</td> </tr> <tr> <td>11200—11299</td> <td>SCSI adapter</td> </tr> <tr> <td>21000—21099</td> <td>SCSI fixed disk and controller</td> </tr> <tr> <td>21500—21599</td> <td>SCSI CD-ROM</td> </tr> </tbody> </table>	Range	Error is in...	100—199	System board	200—299	Memory	300—399	Keyboard	400—499	Monochrome display controller	500—599	Color display controller	600—699	Floppy disk drive or controller	700—799	Math coprocessor	900—999	Parallel port	1000—1099	Second parallel port	1100—1299	Asynchronous communication port	1300—1399	Game port	1400—1499	Printer	1500—1599	Synchronous communication port	1700—1799	Hard disk or controller	1800—1899	XT expansion unit	2000—2199	Bisynchronous communication port	2400—2599	EGA/MCA system board video	3000—3199	LAN adapter	4800—4899	Internal modem	7000—7099	Phoenix BIOS chips	7300—7399	3.5" floppy disk drive	8900—8999	MIDI adapter	11200—11299	SCSI adapter	21000—21099	SCSI fixed disk and controller	21500—21599	SCSI CD-ROM
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Crypto: TLSv1.2 / ECDHE-ECDsa-AES256-GCM-SHA384

Viewport size: 1261 × 927
Protocol: HTTP/1.1



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