BIOS parameter block

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In computing, the **BIOS parameter block**, often shortened to **BPB**, is a data structure in the volume boot record describing the physical layout of a data storage volume. On partitioned devices, such as hard disks, the BPB describes the volume partition, whereas, on unpartitioned devices, such as floppy disks, it describes the entire medium. A basic BPB can appear and be used on any partition, including floppy disks where its presence is often necessary, however, certain filesystems also make use of it in describing basic filesystem structures. Filesystems making use of a BIOS parameter block include FAT12 (except for in DOS 1.x), FAT16, FAT32, HPFS, and NTFS. Due to different types of fields and the amount of data they contain, the length of the BPB is different for FAT16, FAT32, and NTFS boot sectors.[1] (A detailed discussion of the various FAT BPB versions and their entries can be found in the FAT article.) Combined with the 11-byte data structure at the very start of volume boot records immediately preceding the BPB or EBPB, this is also called **FDC descriptor** or **extended FDC descriptor** in ECMA-107 or ISO/IEC 9293 (which describes FAT as for flexible/floppy and optical disk cartridges).

Contents

FAT12 / FAT16

DOS 2.0 BPB

Format of standard DOS 2.0 BPB for FAT12 (13 bytes):

Sector offset	BPB offset	Field length	Description
0x00B	0x00	WORD	Bytes per logical sector
0x00D	0x02	BYTE	Logical sectors per cluster
0x00E	0x03	WORD	Reserved logical sectors
0x010	0x05	BYTE	Number of FATs
0x011	0x06	WORD	Root directory entries
0x013	0x08	WORD	Total logical sectors
0x015	0x0A	BYTE	Media descriptor
0x016	0x0B	WORD	Logical sectors per FAT

DOS 3.0 BPB

Format of standard DOS 3.0 BPB for FAT12 and FAT16 (19 bytes), already supported by some versions of MS-DOS 2.11:[2]

Sector offset	BPB offset	Field length	Description
0x00B	0x00	13 BYTEs	DOS 2.0 BPB
0x018	0x0D	WORD	Physical sectors per track
0x01A	0x0F	WORD	Number of heads
0x01C	0x11	WORD	Hidden sectors (incompatible with DOS 3.31 BPB)

DOS 3.2 BPB

Format of standard DOS 3.2 BPB for FAT12 and FAT16 (21 bytes):

Sector offset	BPB offset	Field length	Description
0x00B	0x00	19 BYTEs	DOS 3.0 BPB
0x01E	0x13	WORD	Total sectors (incompatible with DOS 3.31 BPB)

DOS 3.31 BPB

Format of standard DOS 3.31 BPB for FAT12, FAT16 and FAT16B (25 bytes):

Sector offset	BPB offset	Field length	Description
0x00B	0x00	13 BYTEs	DOS 2.0 BPB
0x018	0x0D	WORD	Physical sectors per track (identical to DOS 3.0 BPB)
0x01A	0x0F	WORD	Number of heads (identical to DOS 3.0 BPB)
0x01C	0x11	DWORD	Hidden sectors (incompatible with DOS 3.0 BPB)
0x020	0x15	DWORD	Large total logical sectors

DOS 3.4 EBPB

Format of PC DOS 3.4 and OS/2 1.0-1.1 Extended BPB for FAT12, FAT16 and FAT16B (32 bytes):

Sector offset	BPB offset	Field length	Description
0x00B	0x00	25 BYTEs	DOS 3.31 BPB
0x024	0x19	BYTE	Physical drive number
0x025	0x1A	BYTE	Flags etc.
0x026	0x1B	BYTE	Extended boot signature (0x28 aka "4.0") (similar to DOS 4.0 EBPB and NTFS EBPB)
0x027	0x1C	DWORD	Volume serial number

FAT12 / FAT16 / HPFS

DOS 4.0 EBPB

Format of DOS 4.0 and OS/2 1.2 Extended BPB for FAT12, FAT16, FAT16B and HPFS (51 bytes):

Sector offset	BPB offset	Field length	Description
`0x00B`	`0x00`	25 BYTEs	DOS 3.31 BPB
`0x024`	`0x19`	BYTE	Physical drive number (identical to DOS 3.4 EBPB)
`0x025`	`0x1A`	BYTE	Flags etc. (identical to DOS 3.4 EBPB)
`0x026`	`0x1B`	BYTE	Extended boot signature (`0x29` aka "4.1") (similar to DOS 3.4 EBPB and NTFS EBPB)
`0x027`	`0x1C`	DWORD	Volume serial number (identical to DOS 3.4 EBPB)
`0x02B`	`0x20`	11 BYTEs	Volume label
`0x036`	`0x2B`	8 BYTEs	File-system type

FAT32

DOS 7.1 EBPB

Format of short DOS 7.1 Extended BIOS Parameter Block (60 bytes) for FAT32:

Sector offset	BPB offset	Field length	Description
`0x00B`	`0x00`	25 BYTEs	DOS 3.31 BPB
`0x024`	`0x19`	DWORD	Logical sectors per FAT
`0x028`	`0x1D`	WORD	Mirroring flags etc.
`0x02A`	`0x1F`	WORD	Version
`0x02C`	`0x21`	DWORD	Root directory cluster
`0x030`	`0x25`	WORD	Location of FS Information Sector
`0x032`	`0x27`	WORD	Location of backup sector(s)
`0x034`	`0x29`	12 BYTEs	Reserved (Boot file name)
`0x040`	`0x35`	BYTE	Physical drive number
`0x041`	`0x36`	BYTE	Flags etc.
`0x042`	`0x37`	BYTE	Extended boot signature (`0x28`)
`0x043`	`0x38`	DWORD	Volume serial number

Format of full DOS 7.1 Extended BIOS Parameter Block (79 bytes) for FAT32:

Sector offset	BPB offset	Field length	Description
`0x00B`	`0x00`	25 BYTEs	DOS 3.31 BPB
`0x024`	`0x19`	DWORD	Logical sectors per FAT
`0x028`	`0x1D`	WORD	Mirroring flags etc.
`0x02A`	`0x1F`	WORD	Version
`0x02C`	`0x21`	DWORD	Root directory cluster
`0x030`	`0x25`	WORD	Location of FS Information Sector
`0x032`	`0x27`	WORD	Location of backup sector(s)
`0x034`	`0x29`	12 BYTEs	Reserved (Boot file name)
`0x040`	`0x35`	BYTE	Physical drive number
`0x041`	`0x36`	BYTE	Flags etc.
`0x042`	`0x37`	BYTE	Extended boot signature (`0x29`)
`0x043`	`0x38`	DWORD	Volume serial number
`0x047`	`0x3C`	11 BYTEs	Volume label
`0x052`	`0x47`	8 BYTEs	File-system type

NTFS

Format of Extended BPB for NTFS (73 bytes):

Sector offset	BPB offset	Field length	Description
`0x00B`	`0x00`	25 BYTEs	DOS 3.31 BPB
`0x024`	`0x19`	BYTE	Physical drive number (identical to DOS 3.4 EBPB)
`0x025`	`0x1A`	BYTE	Flags etc. (identical to DOS 3.4 EBPB)
`0x026`	`0x1B`	BYTE	Extended boot signature (`0x80` aka "8.0") (similar to DOS 3.4 EBPB and DOS 4.0 EBPB)
`0x027`	`0x1C`	BYTE	Reserved
`0x028`	`0x1D`	QWORD	Sectors in volume
`0x030`	`0x25`	QWORD	MFT first cluster number
`0x038`	`0x2D`	QWORD	MFT mirror first cluster number
`0x040`	`0x35`	DWORD	MFT record size
`0x044`	`0x39`	DWORD	Index block size
`0x048`	`0x3D`	QWORD	Volume serial number
`0x050`	`0x45`	DWORD	Checksum

See also

- BPB formats in the FAT file systems
- exFAT BPB
- MDBPB (Microsoft DoubleSpace BPB)

References

1. Microsoft. *Microsoft Windows 2000 Server Operations Guide*. Microsoft Press.
2. Paterson, Tim; Microsoft (2013-12-19) [1983]. "Microsoft DOS V1.1 and V2.0: /msdos/v20source/SKELIO.TXT, /msdos/v20source/HRDDRV.ASM". Computer History Museum, Microsoft. Retrieved 2014-03-25. (NB. While the publishers claim this would be MS-DOS 1.1 and 2.0, it actually is SCP MS-DOS 1.25 and a mixture of Altos MS-DOS 2.11 and TeleVideo PC DOS 2.11.)

Further reading

- de Boyne Pollard, Jonathan. "All about BIOS Parameter Blocks". *Frequently Given Answers*. Archived from the original on 2016-04-18. Retrieved 2016-04-18. — a description of BPBs, from version 2.0 to version 7.0
- Christopher, Ken W.; Feigenbaum, Barry A.; Saliga, Shon O. (1990). "9: DOS Disk Usage". *Developing applications using DOS*. Wiley. ISBN 0-471-52231-7. — In the "processing the BIOS parameter block" section the authors describe the evolution of the BIOS parameter block from the MS-DOS version 2.0 BPB to the PC DOS version 4.0 BPB, and label each field with the DOS version that introduced it.
- Townsend, Carl (1989). "4: Disk organization and management". *Advanced MS-DOS Expert Techniques for programmers*. Howard M. Sams. ISBN 0-672-22667-7. — Figure 4.3 contains a diagram of the version 4.0 BPB and states that the layout of BPBs "is not defined by Microsoft and can vary with different vendors". At the time that the book was written, this was true. Microsoft first publicly documented the BPB structure in the OS/2 Developers' Toolkit.
- Verstak, Alex (1998-03-10). "FAT Boot Sector". Archived from the original on 2016-07-30. — Verstak reverse engineers the BIOS parameter block. The paper contains several errors. One such is its statement that "the presence of the EBPB in FAT32 is not documented by Microsoft". See:
  - Microsoft. "Chapter 10 - Disks and File Systems". *Microsoft Windows 98 Resource Kit*. — Microsoft documents a version 4.0 BPB and a new "FAT32 BIOS Parameter Block (BPB)" (a version 7.0 BPB) for DOS-Windows 98 that is "larger than a standard BPB", has an "identical structure to a standard BPB", but that also "includes several extra fields".
  - Microsoft. "Chapter 32 - Disk Concepts and Troubleshooting". *Microsoft Windows 2000 Professional Resource Kit*. — Microsoft documents extended BPBs on both FAT16 and FAT32 volumes. It also documents BPBs on NTFS volumes.
- Microsoft. "How NTFS Works". *Microsoft Windows Server 2003 NTFS Technical Reference*. Archived from the original on 2016-07-30. — The table "BPB and Extended BPB Fields on NTFS Volumes" describes BPBs

on NTFS volumes. The descriptions of several fields contradict those given in the Windows 2000 Resource Kit.

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- Paul, Matthias (2004-08-25). "NOVOLTRK.REG". *www.drdos.org*. Archived from the original on 2016-03-04. Retrieved 2011-12-17.
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- Bass, Wally (1994-02-14). "Cluster Size". *comp.os.msdos.programmer*. Retrieved 2006-10-14.

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