

Note

If there is more than one device driver in the file, the last driver in the file must have the pointer to the next device header field set to -1

2.5.2 Attribute Field

The attribute field is used to identify the type of device for which this driver is responsible. In addition to distinguishing between block and character devices, these bits are used to give selected character devices special treatment. (Notice that if a bit in the attribute word is defined only for one type of device, a driver for the other type of device must set that bit to 0.)

Table 2.1
For Character Devices:

Bit	Value	Meaning
0	1	Device is console input (sti) device
1	1	Device is console output (sto) device
2	1	Device is nul device
3	1	Device is clock device
4-5		Reserved (must be 0)
6	1	Device supports 3 2 functions
7-10		Reserved (must be 0)
11	1	Device understands Open/Close
12		Reserved (must be 0)
13	1	Device supports Output Until Busy (OUB)
14	1	Device supports IOCTL control strings
15	1	Character device

Table 2.2
For Block Devices:

Bit	Value	Meaning
0		Reserved (must be 0)
1	1	Device supports 32-bit sector addressing
2-5		Reserved (must be 0)

Table 2.2 (continued)

Bit	Value	Meaning
6	1	Device supports 3 2 functions and Generic IOCTL function calls
7-10		Reserved (must be 0)
11	1	Device understands Open/Close/Removable Media
12		Reserved (must be 0)
13	1	Device determines the media by examining the FATID byte
14	1	Device supports IOCTL control strings
15	0	Block device

For example, assume that you have a new device driver that you want to use as the standard input and output. In addition to installing the driver, you must tell MS-DOS that you want the new driver to override the current standard input and standard output (the CON device). This is accomplished by setting the attributes to the desired characteristics, so you would set bits 0 and 1 to 1 (notice that they are *separate*). Similarly, a new CLOCK device could be installed by setting that attribute. (Refer to Section 2.10, "The CLOCK Device," in this chapter for more information.) Although there is a NUL device attribute, the NUL device cannot be re-assigned. This attribute exists so that MS-DOS can determine if the NUL device is being used.

Bit 13 for block devices affects the operation of the **Build BPB** (BIOS Parameter Block) device call. If set, it requires the first sector of the FAT *always* to reside in the same place. This bit has a different meaning on character devices. It indicates that the device implements the **Output Until Busy** device call.

The IOCTL bit (bit 14) has meaning on character and block devices. The IOCTL functions allow data to be sent and received by the device for its own use (to set baud rate, stop bits, form length, etc.) instead of passing data over the device channel as a normal read or write does. The interpretation of the passed information is up to the device but it *must not* be treated as normal I/O. This bit tells MS-DOS whether the device can handle control strings by using the IOCTL system call, Function 44H.

If a driver cannot process control strings, it should initially set this bit to 0. This tells MS-DOS to return an error if an attempt is made (via Function 44H) to send or receive control strings to this device. A device which can process control strings should initialize the IOCTL bit to 1. For drivers of this type, MS-DOS will make calls to the IOCTL input and output device functions to send and receive IOCTL strings.

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The IOCTL functions allow data to be sent and received by the device for its own use (for example, to set baud rate, stop bits, and form length), instead of passing data over the device channel as does a normal read or write. The interpretation of the passed information is up to the device, but it *must not* be treated as a normal I/O request.

The **Open/Close/Removable Media** bit (bit 11) signals to MS-DOS 3.x and later versions whether this driver supports additional MS-DOS 3.x functionality. To support these old drivers, it is necessary to detect them. This bit was reserved in MS-DOS 2.x, and is 0. All new devices should support the **Open**, **Close**, and **Removable Media** calls and set this bit to 1. Since MS-DOS 2.x never makes these calls, the driver will be backward-compatible.

The MS-DOS 3.2 bit (bit 6) signals whether the device supports logical drive mapping via Function 440EH (Get Logical Drive Map) and Function 440FH (Set Logical Drive Map). This bit also supports generic IOCTL functions via Function 440CH (Generic IOCTL for Handles) and Function 440DH (Generic IOCTL for Block Devices).

Bit 1 for block devices indicates the driver's ability to manipulate 32-bit sector addresses. If bit 1 = 1, 32-bit sector addressing is supported. If bit 1 is set, the sector number field of all requests is a DWORD added to the end of the request header. The old WORD length sector number should be -1.

The driver requests affected are

- BUILD BPD command 2
- INPUT/OUTPUT command 3, 4, 8, 9, and 12
- GENERIC IOCTL command 19

If bit 1 for block devices is 0, only 16-bit sector addressing is available.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
C	I			O					3			C	N	S	S
H	O			P					.			L	U	T	T
R	C			N					2			K	L	O	I

Figure 2.2 Attribute Word for Character Devices