

# DOS INT 21h - DOS Function Codes

The follow abridged list of DOS interrupts has been extracted from a large list compiled by Ralf Brown. These are available on any Simtel mirror (e.g. [sunsite.anu.edu.au](http://sunsite.anu.edu.au)) under the directory ms-dos/info/interNNp.zip

AH	Description	AH	Description
01	<a href="#">Read character from STDIN</a>	02	<a href="#">Write character to STDOUT</a>
05	<a href="#">Write character to printer</a>	06	<a href="#">Console Input/Output</a>
07	<a href="#">Direct char read (STDIN), no echo</a>	08	<a href="#">Char read from STDIN, no echo</a>
09	<a href="#">Write string to STDOUT</a>	0A	<a href="#">Buffered input</a>
0B	<a href="#">Get STDIN status</a>	0C	<a href="#">Flush buffer for STDIN</a>
0D	<a href="#">Disk reset</a>	0E	<a href="#">Select default drive</a>
19	<a href="#">Get current default drive</a>	25	<a href="#">Set interrupt vector</a>
2A	<a href="#">Get system date</a>	2B	<a href="#">Set system date</a>
2C	<a href="#">Get system time</a>	2D	<a href="#">Set system time</a>
2E	<a href="#">Set verify flag</a>	30	<a href="#">Get DOS version</a>
35	<a href="#">Get Interrupt vector</a>		
36	<a href="#">Get free disk space</a>	39	<a href="#">Create subdirectory</a>
3A	<a href="#">Remove subdirectory</a>	3B	<a href="#">Set working directory</a>
3C	<a href="#">Create file</a>	3D	<a href="#">Open file</a>
3E	<a href="#">Close file</a>	3F	<a href="#">Read file</a>
40	<a href="#">Write file</a>	41	<a href="#">Delete file</a>
42	<a href="#">Seek file</a>	43	<a href="#">Get/Set file attributes</a>
47	<a href="#">Get current directory</a>	4C	<a href="#">Exit program</a>
4D	<a href="#">Get return code</a>	54	<a href="#">Get verify flag</a>
56	<a href="#">Rename file</a>	57	<a href="#">Get/Set file date</a>

## AH = 01h - READ CHARACTER FROM STANDARD INPUT, WITH ECHO

Return: AL = character read

Notes:

- ^C/^Break are checked
- ^P toggles the DOS-internal echo-to-printer flag
- ^Z is not interpreted, thus not causing an EOF if input is redirected character is echoed to standard output

SeeAlso: AH=06h,AH=07h,AH=08h,AH=0Ah

## AH = 02h -WRITE CHARACTER TO STANDARD OUTPUT

Entry: DL = character to write

Return: AL = last character output

Notes:

- ^C/^Break are checked
- the last character output will be the character in DL unless DL=09h on entry, in which case AL=20h as tabs are expanded to blanks
- if standard output is redirected to a file, no error checks (write- protected, full media, etc.) are performed

SeeAlso: AH=06h,AH=09h

## AH = 05h - WRITE CHARACTER TO PRINTER

Entry: DL = character to print

Notes:

- keyboard checked for ^C/^Break
- STDPN is usually the first parallel port, but may be redirected under DOS 2+
- if the printer is busy, this function will wait

SeeAlso: INT 17/AH=00h

## **AH = 06h - DIRECT CONSOLE OUTPUT**

Entry: DL = character (except FFh)

Return: AL = character output

Notes: does not check ^C/^Break

SeeAlso: AH=02h,AH=09h

## **AH = 06h - DIRECT CONSOLE INPUT**

Entry: AH = 06h DL = FFh

Return:

- ZF *set* if no character available and AL = 00h
- ZF *clear* if character available AL = character read

Notes:

- ^C/^Break are NOT checked
- if the returned character is 00h, the user pressed a key with an extended keycode, which will be returned by the next call of this function
- although the return of AL=00h when no characters are available is not documented, some programs rely on this behavior

SeeAlso: AH=0Bh

## **AH=07h - DIRECT CHARACTER INPUT, WITHOUT ECHO**

Return: AL = character read from standard input

Notes: does not check ^C/^Break

SeeAlso: AH=01h,AH=06h,AH=08h,AH=0Ah

## **AH = 08h - CHARACTER INPUT WITHOUT ECHO**

Return: AL = character read from standard input

Notes: ^C/^Break are checked

SeeAlso: AH=01h,AH=06h,AH=07h,AH=0Ah,AH=64h

## **AH = 09h - WRITE STRING TO STANDARD OUTPUT**

Entry: DS:DX -> '\$'-terminated string

Return: AL = 24h

Notes: ^C/^Break are checked

SeeAlso: AH=02h,AH=06h"OUTPUT"

## **AH = 0Ah - BUFFERED INPUT**

Entry: DS:DX -> [buffer \(see below\)](#)

Return: buffer filled with user input

Notes:

- ^C/^Break are checked
- reads from standard input

SeeAlso: AH=0Ch

Format of DOS input buffer:

Offset	Size	Description
00	1	maximum characters buffer can hold
01	1	number of chars from last input which may be recalled OR number of characters actually read, excluding CR
02	n	actual characters read, including the final carriage return

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## **AH=0Bh - GET STDIN STATUS**

Return:

- AL = 00h if no character available
- AL = FFh if character is available

Notes: ^C/^Break are checked

SeeAlso: AH=06h"INPUT"

## **AH = 0Ch - FLUSH BUFFER AND READ STANDARD INPUT**

Entry:

- AL = STDIN input function to execute after flushing buffer
- other registers as appropriate for the input function

Return: as appropriate for the specified input function

Note: if AL is not one of 01h,06h,07h,08h, or 0Ah, the buffer is flushed but no input is attempted

SeeAlso: AH=01h,AH=06h"INPUT",AH=07h,AH=08h,AH=0Ah

## **AH = 0Dh - DISK RESET**

Notes: This function writes all modified disk buffers to disk, but does not update the directory information

SeeAlso: AX=5D01h

## **AH = 0Eh - SELECT DEFAULT DRIVE**

Entry: DL = new default drive (0=A:, 1=B:, etc)

Return: AL = number of potentially valid drive letters

Notes: the return value is the highest drive present

SeeAlso: AH=19h,AH=3Bh,AH=DBh

## **AH = 19h - GET CURRENT DEFAULT DRIVE**

Return: AL = drive (0=A:, 1=B:, etc)

SeeAlso: AH=0Eh,AH=47h,AH=BBh

## **AH = 25h - SET INTERRUPT VECTOR**

Entry:

- AL = interrupt number
- DS:DX -> new interrupt handler

Notes: this function is preferred over direct modification of the interrupt vector table

SeeAlso: AX=2501h,AH=35h

## **AH = 2Ah - GET SYSTEM DATE**

Return: CX = year (1980-2099) DH = month DL = day AL = day of week (00h=Sunday)

SeeAlso: AH=2Bh"DOS",AH=2Ch,AH=E7h

## **AH = 2Bh - SET SYSTEM DATE**

Entry: CX = year (1980-2099) DH = month DL = day

Return:

- AL = 00 successful
- FFh invalid date, system date unchanged

Note: DOS 3.3+ also sets CMOS clock

SeeAlso: AH=2Ah,AH=2Dh

## **AH = 2Ch - GET SYSTEM TIME**

Return: CH = hour CL = minute DH = second DL = 1/100 seconds

Note: on most systems, the resolution of the system clock is about 5/100sec, so returned times generally do not increment by 1 on some systems, DL may always return 00h

SeeAlso: AH=2Ah,AH=2Dh,AH=E7h

## **AH = 2Dh - SET SYSTEM TIME**

Entry: CH = hour CL = minute DH = second DL = 1/100 seconds

Return:

- AL = 00h successful
- FFh if invalid time, system time unchanged

Note: DOS 3.3+ also sets CMOS clock

SeeAlso: AH=2Bh"DOS",AH=2Ch

## **AH = 2Eh - SET VERIFY FLAG**

Entry: AL = new state of verify flag (00 off, 01h on)

Notes:

- default state at system boot is OFF
- when ON, all disk writes are verified provided the device driver supports read-after-write verification

SeeAlso: AH=54h

## **AH=30h - GET DOS VERSION**

Entry: AL = what to return in BH (00h OEM number, 01h version flag)

Return:

- AL = major version number (00h if DOS 1.x)
- AH = minor version number
- BL:CH = 24-bit user serial number (most versions do not use this) if DOS <5 or AL=00h
- BH = MS-DOS OEM number if DOS 5+ and AL=01h
- BH = version flag bit 3: DOS is in ROM other: reserved (0)

Notes:

- DOS 4.01 and 4.02 identify themselves as version 4.00
- MS-DOS 6.21 reports its version as 6.20; version 6.22 returns the correct value
- Windows95 returns version 7.00 (the underlying MS-DOS)

SeeAlso: AX=3000h/BX=3000h,AX=3306h,AX=4452h

## **AH=35h - GET INTERRUPT VECTOR**

Entry: AL = interrupt number

Return: ES:BX -> current interrupt handler

SeeAlso: AH=25h,AX=2503h

## **AH = 36h - GET FREE DISK SPACE**

Entry: DL = drive number (0=default, 1=A:, etc)

Return:

- AX = FFFFh if invalid drive
- AX = sectors per cluster BX = number of free clusters CX = bytes per sector DX = total clusters on drive

Notes:

- free space on drive in bytes is AX \* BX \* CX

- total space on drive in bytes is AX \* CX \* DX
- "lost clusters" are considered to be in use
- this function does not return proper results on CD-ROMs; use AX=4402h"CD-ROM" instead

SeeAlso: AH=1Bh,AH=1Ch,AX=4402h"CD-ROM"

## **AH = 39h - "MKDIR" - CREATE SUBDIRECTORY**

Entry: DS:DX -> ASCIZ pathname

Return:

- CF clear if successful AX destroyed
- CF set on error AX = error code (03h,05h)

Notes:

- all directories in the given path except the last must exist
- fails if the parent directory is the root and is full
- DOS 2.x-3.3 allow the creation of a directory sufficiently deep that it is not possible to make that directory the current directory because the path would exceed 64 characters

SeeAlso: AH=3Ah,AH=3Bh,AH=6Dh

## **AH = 3Ah - "RMDIR" - REMOVE SUBDIRECTORY**

Entry: DS:DX -> ASCIZ pathname of directory to be removed

Return:

- CF clear if successful, AX destroyed
- CF set on error AX = error code (03h,05h,06h,10h)

Notes: directory must be empty (contain only '.' and '..' entries)

SeeAlso: AH=39h,AH=3Bh

## **AH = 3Bh - "CHDIR" - SET CURRENT DIRECTORY**

Entry: DS:DX -> ASCIZ pathname to become current directory (max 64 bytes)

Return:

- CF clear if successful, AX destroyed
- CF set on error AX = error code (03h)

Notes: if new directory name includes a drive letter, the default drive is not changed, only the current directory on that drive

SeeAlso: AH=47h,AH=71h,INT 2F/AX=1105h

## **AH = 3Ch - "CREAT" - CREATE OR TRUNCATE FILE**

Entry:

- CX = [file attributes](#)
- DS:DX -> ASCIZ filename

Return:

- CF clear if successful, AX = file handle
- CF set on error AX = error code (03h,04h,05h)

Notes: if a file with the given name exists, it is truncated to zero length

SeeAlso: AH=16h,AH=3Dh,AH=5Ah,AH=5Bh

## **AH = 3Dh - "OPEN" - OPEN EXISTING FILE**

Entry:

- AL = access and sharing modes
- DS:DX -> ASCIZ filename

Return:

- CF clear if successful, AX = file handle

- CF set on error AX = error code (01h,02h,03h,04h,05h,0Ch,56h)

Notes:

- file pointer is set to start of file
- file handles which are inherited from a parent also inherit sharing and access restrictions
- files may be opened even if given the hidden or system attributes

SeeAlso: AH=0Fh,AH=3Ch,AX=4301h,AX=5D00h

## **AH = 3Eh - "CLOSE" - CLOSE FILE**

Entry: BX = file handle

Return:

- CF clear if successful, AX destroyed
- CF set on error, AX = error code (06h)

Note: if the file was written to, any pending disk writes are performed, the time and date stamps are set to the current time, and the directory entry is updated

SeeAlso: AH=10h,AH=3Ch,AH=3Dh

## **AH = 3Fh - "READ" - READ FROM FILE OR DEVICE**

Entry:

- BX = file handle
- CX = number of bytes to read
- DS:DX -> buffer for data

Return:

- CF clear if successful - AX = number of bytes actually read (0 if at EOF before call)
- CF set on error AX = error code (05h,06h)

Notes:

- data is read beginning at current file position, and the file position is updated after a successful read
- the returned AX may be smaller than the request in CX if a partial read occurred
- if reading from CON, read stops at first CR

SeeAlso: AH=27h,AH=40h,AH=93h

## **AH=40h - "WRITE" - WRITE TO FILE OR DEVICE**

Entry:

- BX = file handle
- CX = number of bytes to write
- DS:DX -> data to write

Return:

- CF clear if successful -AX = number of bytes actually written
- CF set on error - AX = error code (05h,06h)

Notes:

- if CX is zero, no data is written, and the file is truncated or extended to the current position
- data is written beginning at the current file position, and the file position is updated after a successful write
- the usual cause for AX < CX on return is a full disk

SeeAlso: AH=28h,AH=3Fh

## **AH = 41H - "UNLINK" - DELETE FILE**

Entry:

- DS:DX -> ASCIZ filename (no wildcards, but see notes)
- CL = attribute mask for deletion (server call only, see notes)

Return:

- CF clear if successful, AX destroyed (DOS 3.3) AL seems to be drive of deleted file

- CF set on error AX = error code (02h,03h,05h)

Notes:

- (DOS 3.1+) wildcards are allowed if invoked via AX=5D00h, in which case the filespec must be canonical (as returned by AH=60h), and only files matching the attribute mask in CL are deleted
- DOS does not erase the file's data; it merely becomes inaccessible because the FAT chain for the file is cleared
- deleting a file which is currently open may lead to filesystem corruption.

SeeAlso: AH=13h,AX=4301h,AX=4380h,AX=5D00h,AH=60h,AH=71h

## AH=42h - "LSEEK" - SET CURRENT FILE POSITION

Entry:

- AL = origin of move 00h start of file 01h current file position 02h end of file
- BX = file handle
- CX:DX = offset from origin of new file position

Return:

- CF clear if successful, DX:AX = new file position in bytes from start of file
- CF set on error, AX = error code (01h,06h)

Notes:

- for origins 01h and 02h, the pointer may be positioned before the start of the file; no error is returned in that case, but subsequent attempts at I/O will produce errors
- if the new position is beyond the current end of file, the file will be extended by the next write (see AH=40h)

SeeAlso: AH=24h

## AH=43 - GET FILE ATTRIBUTES

Entry:

- AL = 00h
- DS:DX -> ASCIZ filename

Return:

- CF clear if successful CX = [file attributes](#)
- CF set on error, AX = error code (01h,02h,03h,05h)

BUG: Windows for Workgroups returns error code 05h (access denied) instead of error code 02h (file not found) when attempting to get the attributes of a nonexistent file.

SeeAlso: AX=4301h,AX=4310h,AX=7143h,AH=B6h

## AH=43 - "CHMOD" - SET FILE ATTRIBUTES

Entry:

- AL = 01h
- CX = new [file attributes](#)
- DS:DX -> ASCIZ filename

Return:

- CF clear if successful, AX destroyed
- CF set on error, AX = error code (01h,02h,03h,05h)

Notes:

- will not change volume label or directory attribute bits, but will change the other attribute bits of a directory
- MS-DOS 4.01 reportedly closes the file if it is currently open

SeeAlso: AX=4300h,AX=4311h,AX=7143h,INT 2F/AX=110Eh

Bitfields for file attributes:

Bits	7	6	5	4	3	2	1	0
Description	shareable	-	archive	directory	vol. label	system	hidden	read-only

## AH = 47h - "CWD" - GET CURRENT DIRECTORY

Entry:

- DL = drive number (00h = default, 01h = A:, etc)
- DS:SI -> 64-byte buffer for ASCII pathname

Return:

- CF clear if successful
- CF set on error, AX = error code (0Fh)

Notes:

- the returned path does not include a drive or the initial backslash
- many Microsoft products for Windows rely on AX being 0100h on success

SeeAlso: AH=19h,AH=3Bh,AH=71h

## **AH = 4Ch - "EXIT" - TERMINATE WITH RETURN CODE**

Entry: AL = return code

Return: never returns

Notes: unless the process is its own parent, all open files are closed and all memory belonging to the process is freed

SeeAlso: AH=00h,AH=26h,AH=4Bh,AH=4Dh

## **AH = 4Dh - GET RETURN CODE (ERRORLEVEL)**

Return:

- AH = termination type (00=normal, 01h control-C abort, 02h=critical error abort, 03h terminate and stay resident)
- AL = return code

Notes:

- the word in which DOS stores the return code is cleared after being read by this function, so the return code can only be retrieved once
- COMMAND.COM stores the return code of the last external command it executed as ERRORLEVEL

SeeAlso: AH=4Bh,AH=4Ch,AH=8Ah

## **AH = 54h - GET VERIFY FLAG**

Return: AL = verify flag (00h=off, 01h=on, i.e. all disk writes verified after writing)

SeeAlso: AH=2Eh

## **AH = 56h - "RENAME" - RENAME FILE**

Entry:

- DS:DX -> ASCII filename of existing file (no wildcards, but see below)
- ES:DI -> ASCII new filename (no wildcards)
- CL = attribute mask (server call only, see below)

Return:

- CF clear if successful
- CF set on error, AX= error code (02h,03h,05h,11h)

Notes:

- allows move between directories on same logical volume
- this function does not set the archive attribute
- open files should not be renamed
- (DOS 3.0+) allows renaming of directories

## **AH = 57h - GET FILE'S LAST-WRITTEN DATE AND TIME**

Entry:

- AL = 00h (Get attribute)
- BX = file handle

Return:



- CF clear if successful, CX = file's time DX = file's date
- CF set on error, AX = error code (01h,06h)

SeeAlso: AX=5701h

Bitfields for file time:

Bits	15-11	10-5	4-0
Description	hours	minutes	seconds

Bitfields for file date:

Bits	15-9	8-5	4-0
Description	year (1980-)	month	day

## AH = 57h - SET FILE'S LAST-WRITTEN DATE AND TIME

Entry:

- AL =01h (Set attributes)
- BX = file handle
- CX = [new time](#)
- DX = [new date](#)

Return:

- CF clear if successful
- CF set on error AX = error code (01h,06h)

SeeAlso: AX=5700h

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*This page is maintained by [Barry Wilks](#).*