# **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. <u>sunsite.anu.edu.au</u>) under the directory ms-dos/info/interNNp.zip

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

# \*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

# **ODE OF A PROPERTY OF A PARACTER 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

## 

Entry: DL = character to print

Notes:

- keyboard checked for ^C/^Break
- STDPRN 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

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

Entry: DL = character (except FFh)

Return: AL = character output

Notes: does not check ^C/^Break

SeeAlso: AH=02h,AH=09h

## **CAH = 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

# **OVER 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

# **CAH = 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"

# **C**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		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			

# **♦**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"

# **OCH - 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

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

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

SeeAlso: AX=5D01h

# **CAH = 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

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

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

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

## **OVER 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

# **CAH = 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

## **OVER IT 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

# **OVER IT SAME AND SET 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

# **OAH = 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 o)

#### 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:CX = 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
- Windows 95 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

# 

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"



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



### Entry:

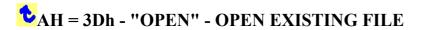
- CX = file attributes
- DS:DX -> ASCIZ filename

### 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



## 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

# **TACK OF THE OF**

## 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



### 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



### 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

# **ONLY OF THE ATTRIBUTES**

## Entry:

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

#### Return:

- CF clear if successful  $CX = \underline{\text{file attributes}}$
- 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

# **CANOLITIES OF A 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



## Entry:

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

# **CAH = 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 -> ASCIZ filename of existing file (no wildcards, but see below)
- ES:DI -> ASCIZ 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

# **CAH = 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

## Entry:

- AL =01h (Set attributes)
- BX = file handle
- $CX = \underline{new time}$
- $DX = \underline{\text{new date}}$

### Return:

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

SeeAlso: AX=5700h

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