

# Windows Batch Scripting

This book describes the Microsoft-supplied command interpreter on Windows NT, Windows XP, Windows Vista, Windows 7 and later, which is `cmd.exe`.

## 1 Introduction

This book addresses 32-bit Windows commands applicable to modern versions of Windows based on the Windows NT environment. It does not address commands that are specific to DOS environments and to DOS-based operating systems, such as Windows 95, Windows 98, and Windows Me, whose Microsoft-supplied command interpreters are in fact DOS programs, not Win32 programs.

You can find out which version of `cmd.exe` you are running using the `VER` command.

This book first describes using the Windows NT command interpreter, how it receives, parses, and processes commands from users. Then it describes various commands available.

To find a list of all MS-DOS commands and a definition for all of them, open the command prompt on all Microsoft/Windows computers, and type `help`. To find out about a particular command, type the name of the command followed by `"/?"`.

The subject of this book is also known as “batch programming”, even though “batch” refers not only to batch files for MS DOS and Windows command interpreter. Other subject terms include “batch file programming”, “batch file scripting”, “Windows batch command”, “Windows batch file”, “Windows command line”, “Windows command prompt”, and “Windows shell scripting”.

## 2 Using the Windows command interpreter

### 2.1 How a command line is interpreted

The parsing of a command line into a sequence of commands is complex, and varies subtly from command interpreter to command interpreter. There are, however, four main components:

**Variable substitution** A command line is scanned for variable specifications, and any found are replaced

with the contents of those variables.

**Quoting** Special characters can be quoted, to remove their special meanings.

**Syntax** Command lines are developed into a sequence of commands according to a syntax.

**Redirection** Redirection specifications are applied, and removed from the command line, before an individual command in a sequence is executed.

#### 2.1.1 Variable substitution

Command lines can contain variable specifications. These comprise a `%` character followed by a name. The name is ended by a second `%` character, except in special cases such as the batch file parameters `%1`, `%2`, and so forth.

Variable specifications are replaced with values. The value used to replace a variable specification is as follows:

- For variable specification names that match the names of environment variables, the replacement is the value of the named environment variable. For example: `%PATH%` is replaced by the value of the `PATH` environment variable.
- For variable specifications that name batch file parameters (i.e. that are non-negative decimal numbers), the replacement is the value of the parameter taken from the arguments with which the batch file was invoked (subject to any subsequent modifications by the **SHIFT** command). For example: `%2` is replaced by the value of the second batch file parameter.

**Special names** Some variable names are not visible using `SET` command. Rather, they are made available for reading using the `%` notation. To find out about them, type “help set”.

Special variable names and what they expand to:

Links:

- [Windows Environment Variables at ss64.com](http://ss64.com)
- [Command shell overview at Microsoft](http://microsoft.com)

### 2.1.2 Quoting

To prevent the metacharacters that control command syntax and redirection from having their special meanings, quoting is used. This takes two forms:

- Although they don't process quotation marks, in command arguments, specially themselves, but simply pass them along as-is to the commands executed, command interpreters *do* recognise when quotation marks (") surround metacharacters. The & metacharacter does not have its usual effect on command syntax if it is within a pair of quotation marks.

e.g. The command line `echo "&"` will invoke the **ECHO** command passing it the three characters "&" as its command tail, rather than split the command line in twain at the & character as would occur if the character were not within quotation marks.

- The “escape” character (always a ^ in Microsoft’s CMD) used in front of a metacharacter also prevents that metacharacter from having its usual effect on command syntax. The “escape” character itself is stripped from the command line before it is passed to the command actually being invoked.

e.g. The command line `echo ^&` will invoke the **ECHO** command passing it the character & as its command tail, rather than split the command line in twain at the & character as would otherwise occur.

### 2.1.3 Syntax

Command lines are developed into a sequence of commands according to a syntax. In that syntax, *simple commands* may be combined to form *pipelines*, which may in turn be combined to form *compound commands*, which finally may be turned into *parenthesized commands*.

A simple command is just a command name, a command tail, and some redirection specifications. An example of a simple command is `dir *.txt > somefile`.

A pipeline is several simple commands joined together with the “pipe” metacharacter—“|”, also known as the “vertical bar”. The standard output of the simple command preceding each vertical bar is connected to the standard input of the simple command following it, via a pipe. The command interpreter runs all of the simple commands in the pipeline in parallel. An example of a pipeline (comprising two simple commands) is `dir *.txt | more`.

A compound command is a set of pipelines separated by conjunctions. The pipelines are executed sequentially,

one after the other, and the conjunction controls whether the command interpreter executes the next pipeline or not. An example of a compound command (comprising two pipelines, which themselves are just simple commands) is `move file.txt file.bak && dir > file.txt`.

The conjunctions are:

**&** The simplest conjunction. The next pipeline is always executed after the current one has completed executing.

**&&** A positive conditional conjunction. The next pipeline is executed if the current one completes executing with a zero exit status.

**||** A negative conditional conjunction. The next pipeline is executed if the current one completes executing with a non-zero exit status.

A parenthesized command is a compound command enclosed in parentheses (i.e. ( and )). From the point of view of syntax, this turns a compound command into a simple command, whose overall output can be redirected.

For example: The command line `( pushd temp & dir & popd ) > somefile` causes the standard output of the entire compound command `( pushd temp & dir & popd )` to be redirected to *somefile*.

### 2.1.4 Redirection

Redirection specifications are applied, and removed from the command line, before an individual command in a sequence is executed. Redirection specifications control where the standard input, standard output, and standard error file handles for a simple command point. They override any effects to those file handles that may have resulted from pipelining. (See the preceding section on command syntax.) Redirection signs > and >> can be prefixed with 1 for the standard output (same as no prefix) or 2 for the standard error.

The redirection specifications are:

**< filename** Redirect standard input to read from the named file.

**> filename** Redirect standard output to write to the named file, overwriting its previous contents.

**>> filename** Redirect standard output to write to the named file, appending to the end of its previous contents.

**>&h** Redirect to handle *h*, where handle is any of 0—standard input, 1—standard output, 2—standard error, and more.

**<&h** Redirect from handle *h*.

Examples:

- `dir *.txt >listing.log`
  - Redirects the output of the `dir` command to `listing.log` file.
- `dir *.txt 2>NUL`
  - Redirects errors of the `dir` command to nowhere.
- `dir *.txt >listing.log 2>&1`
  - Redirects the output of the `dir` command to `listing.log` file, along with the error messages.
- `dir *.txt >listing.log 2>listing-errors.log`
  - Redirects the output of the `dir` command to `listing.log` file, and the error messages to `listing-errors.log` file.

Links:

- [Redirection at ss64.com](#)
- [Using command redirection operators at Microsoft](#)

## 2.2 How a command is executed

(...)

## 2.3 Batch reloading

The command interpreter reloads the content of a batch after each execution of a line or a bracketed group.

If you start the following batch and change “echo A” to “echo B” in the batch shortly after starting it, the output will be B.

```
@echo off ping -n 6 127.0.0.1 >nul & REM wait echo A
```

What is on a single line does matter; changing “echo A” in the following batch after running it has no impact:

```
@echo off ping -n 6 127.0.0.1 >nul & echo A
```

Nor have after-start changes have any impact on commands bracketed with ( and ). Thus, changing “echo A” after starting the following batch has no impact:

```
@echo off for /L %%i in (1,1,10) do ( echo A ping -n 2 127.0.0.1 >nul & REM wait )
```

Ditto for any other enclosing, including this one:

```
@echo off ( ping -n 6 127.0.0.1 >nul & REM wait echo A )
```

## 2.4 Environment variables

The environment variables of the command interpreter process are inherited by the processes of any (external) commands that it executes. A few environment variables are used by the command interpreter itself. Changing them changes its operation.

Environment variables are affected by the `SET`, `PATH`, and `PROMPT` commands.

To unset a variable, set it to empty string, such as “set myvar=”.

The command interpreter inherits its initial set of environment variables from the process that created it. In the case of command interpreters invoked from desktop shortcuts this will be Windows Explorer, for example.

Command interpreters generally have textual user interfaces, not graphical ones, and so do not recognize the Windows message that informs applications that the environment variable template in the Registry has been changed. Changing the environment variables in Control Panel will cause Windows Explorer to update its own environment variables from the template in the Registry, and thus change the environment variables that any *subsequently invoked* command interpreters will inherit. However, it will not cause command interpreters that *are already running* to update their environment variables from the template in the Registry.

### 2.4.1 COMSPEC

The COMSPEC environment variable contains the full pathname of the command interpreter program file. This is just inherited from the parent process, and is thus indirectly derived from the setting of COMSPEC in the environment variable template in the Registry.

### 2.4.2 PATH

The value of the PATH environment variable comprises a list of directory names, separated by semi-colon characters. This is the list of directories that are searched, in order, when locating the program file of an external command to execute.

### 2.4.3 PATHEXT

The value of the PATHEXT environment variable comprises a list of filename extensions, separated by semi-colon characters. This is the list of filename extensions that are applied, in order, when locating the program file of an external command to execute.

An example content of PATHEXT printed by “echo %PATHEXT%”:

- .COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC

By adding ".PL" to the variable, you can ensure Perl programs get run from the command line even when typed without the ".pl" extension. Thus, instead of typing "mydiff.pl a.txt b.txt", you can type "mydiff a.txt b.txt".

Adding ".PL" to the variable in Windows Vista and later:

- setx PATHEXT %PATHEXT%;.PL
  - If you use "set" available in Windows XP, the effect will be temporary and impacting only the current console or process.

Links:

- [Windows Environment Variables at ss64](#)
- [Making Python scripts run on Windows without specifying ".py" extension at stackoverflow](#)

#### 2.4.4 PROMPT

The PROMPT environment variable controls the text emitted when the command interpreter displays the prompt. The command interpreter displays the prompt when prompting for a new command line in interactive mode, or when echoing a batch file line in batch file mode.

Various special character sequences in the value of the PROMPT environment variable cause various special effects when the prompt is displayed, as in the following table:

Links:

- [prompt at ss64](#)
- [prompt at Microsoft](#)

## 2.5 Switches

Most Windows commands provide switches AKA options to direct their behavior.

Observations:

- Switches most often consist of a single-letter; some switches consist of a sequence of multiple letters.
- Switches are preceded with a slash (/) rather than, as in some other operating systems, with a minus sign (-).
- Switches are case-insensitive rather than, as in some other operating systems, case-sensitive.
- If a command from another operating system is ported to Windows (such as grep), it usually retains the option conventions from the original operating system, including the use of minus sign and case-sensitivity.

Examples:

- dir /?
  - Displays the help. This option is provided by many commands.
- dir /b /s
  - Lists all files and folders in the current folder recursively. Two switches are used: b and s.
- dir /bs
  - Does not work; switches cannot be accumulated behind a single slash.
- findstr /ric:"id: \*[0-9]\*" File.txt
  - Unlike many other commands, findstr allows the accumulation of switches behind a single slash. Indeed, r, i and c are single-letter switches.
- dir/b/s
  - Works. In dir, removing whitespace between the command and the first switch or between the switches does not make a difference; thus, does the same as dir /b /s.
- tree/f/a
  - Does not work, unlike tree /f /a. In tree, separation by whitespace is mandatory. Nor does find/i/v work.
- dir /od
  - The switch letter o is further modified by a single letter specifying that ordering should be by date. The letter d is not a switch by itself. Similar cases include dir /ad and more /t4.
- dir /B /S
  - The switches are case-insensitive, unlike in some other operating systems.
- sort /r file.txt
  - Sorts the file in a reverse order.
- sort /reverse file.txt
  - Sort allows the switch string to be longer than a single-letter.
- sort /reve file.txt
  - Sort allows the specified switch string to be a substring of the complete long name of the switch. Thus, does the same as the above.
- sort /reva file.txt

- Does not work, since “reva” is not a substring of “reverse”.
- `taskkill /im AcroRd32.exe`
  - Taskkill requires a multiletter switch name for `/im`; shortening to `/i` does not work.
- `java -version`
  - Java, which originated in the environment of another operating system family, uses the minus convention for its switches AKA options.
- `grep --help`
  - If GNU `grep` is installed, it requires multi-letter switches to be preceded by two dashes.

## 2.6 Error level

Commands usually set error level at the end of their execution. In Windows NT and later, it is a 32-bit signed integer; in MS DOS, it used to be an integer from 0 to 255. Keywords: return code, exit code, exit status.

The conventional meaning of the error level:

- 0 - success
- not 0 - failure
- The error levels being set are usually positive.
- If the command does not distinguish various kinds of failure, the error level on failure is usually 1.

Uses of the error level:

- It can be tested using `&&` and `||`; see also `#Syntax`.
- It can be tested using `IF`.
- The value can be accessed from `ERRORLEVEL` variable.

Examples:

- `dir >NUL && echo Success`
  - The part after `&&` is executed only if the error level is zero.
- `color 00 || echo Failure`
  - The part after `||` is executed only if the error level is non-zero, whether positive or negative.
- `color 00 || ( echo Failure )`
  - Multiline bracketing works as well.

- `echo %ERRORLEVEL%`
  - Displays the error level without changing it.
- `if %errorlevel% equ 0 echo The error level is zero, meaning success.`
- `if %errorlevel% neq 0 echo The error level is non-zero, meaning failure.`
- `if errorlevel 1 echo The error level is >= 1, meaning failure via positive error level.`
  - Does not cover failure via negative error level. Note the “>=” part: this is not the same as `%errorlevel% equ 1`.
- `exit /b 1`
  - Returns a batch file, setting the error level to 1.
- `cmd /c “exit /b 10”`
  - In the middle of a batch file or on the command line, sets the error level to 10.
- `(cmd /c “exit /b 0” && Echo Success) & (cmd /c “exit /b -1” || Echo Failure)`
  - As above, showing the error level is indeed affected.
- `(cmd /c “exit /b 0” & cmd /c “exit /b 1”) || Echo Failure`
  - The error level of a chain created by `&` is the error level of the last command of the chain.
- `cmd /c “exit /b -1” & if not errorlevel 1 echo Would-be success`
  - The “if not errorlevel 1” test, which might appear to test for success, passes on negative numbers: it tests on “not error level >= 1”, which is “error level <= 0”.
- `set myerrorlevel=%errorlevel%`
  - Remembers the error level for later.
- `set errorlevel=0`
  - To be avoided: overshadows the built-in `errorlevel` variable. Ensures that subsequent accesses via `%ERRORLEVEL%` return 0 rather than the actual error level.
- `cmd /c “exit /b 0” if 1 equ 1 ( cmd /c “exit /b 1” & echo %errorlevel% )`
  - Displays 0, since `%errorlevel%` gets expanded before `cmd /c “exit /b 1”` gets executed.

Links:

- [Error level at ss64](#)

## 2.7 String processing

Getting a substring of a variable by position and length:

Before running the following examples, ensure that `%a%` equals "abcd" by running this:

- `set a=abcd`

The examples:

- `echo %a:~0,1%`
  - Result: a
- `echo %a:~1,1%`
  - Result: b
- `echo %a:~0,2%`
  - Result: ab
- `echo %a:~1,2%`
  - Result: bc
- `echo %a:~-1%`
  - Result: bcd
- `echo %a:~-1%`
  - Result: d
- `echo %a:~-2%`
  - Result: cd
- `echo %a:~0,-2%`
  - Result: ab
- `echo %a:~0,-1%`
  - Result: abc
- `echo %a:~1,-1%`
  - Result: bc

Testing substring containment:

- `if not "%a:bc=%"=="%a%" echo yes`
  - If variable a contains "bc" as a substring, echo "yes".
  - This test is a trick that uses string replacement, discussed below.
  - This test does not work if the variable contains a quotation mark.

Testing for "starts with":

- `if %a:~0,1%==a echo yes`
  - If variable a starts with "a", echo "yes".
- `if %a:~0,2%==ab echo yes`
  - If variable a starts with "ab", echo "yes".

String replacement:

- `set a=abcd & echo %a:c=%`
  - Result: abd
- `set a=abcd & echo %a:c=e%`
  - Result: abed
- `set a=abcd & echo %a:*c=%`
  - Result: d
  - The asterisk only works at the beginning of the sought pattern; it does not work at the end or in the middle.

See also the help for `SET` command: `set /?`.

Splitting a string by any of " ", ",", and ";":

```
set myvar=a b,c;d
for %%a in (%myvar%) do echo %%a
```

Splitting a string by semicolon, assuming the string contains no quotation marks:

```
@echo off set myvar=a b;c;d set strippedvar=%myvar%
:repeat for /f "delims=;" %%a in ("%strippedvar%")
do echo %%a set prestrippedvar=%strippedvar% set
strippedvar=%strippedvar:*=%% if not "%prestripped-
var:=%"=="%prestrippedvar%" goto :repeat
```

## 2.8 Command-line arguments

The command-line arguments AKA command-line parameters passed to a batch script are accessible as `%1`, `%2`, ..., `%9`. There can be more than nine arguments; to access them, see how to loop over all of them below.

The syntax `%0` does not refer to a command-line argument but rather to the name of the batch file.

Testing for whether the first command-line argument has been provided:

```
if not %1===- echo Argument one provided if %1-
===- echo Argument one not provided & exit /b
```

A robust looping over all command-line arguments using `SHIFT` (for each command-line argument, ...):

```
:argactionstart if %1===- goto argactionend echo %1
& REM Or do any other thing with the argument shift
```

```
goto argactionstart :argactionend
```

A robust looping over all command-line arguments using **SHIFT** without modifying %1, %2, etc.:

```
call :argactionstart %* echo Arg one: %1 & REM
%1, %2, etc. are unmodified in this location exit /b
:argactionstart if -%1===-- goto argactionend echo %1
& REM Or do any other thing with the argument shift
goto argactionstart :argactionend exit /b
```

Transferring command-line arguments to environment variables:

```
setlocal EnableDelayedExpansion REM Prevent affect-
ing possible callers of the batch REM Without delayed
expansion, !arg%argno%! used below won't work. set
argcount=0 :argactionstart if -%1===-- goto argactionend
set /a argcount+=1 set arg%argcount%=%1 shift goto
argactionstart :argactionend set argno=0 :loopstart set
/a argno+=1 if %argno% gtr %argcount% goto loopend
echo !arg%argno%! & REM Or do any other thing with
the argument goto loopstart :loopend
```

Looping over all command-line arguments, albeit not a robust one:

```
for %%i in (%*) do ( echo %%i )
```

This looks elegant but is non-robust, maltreating arguments containing wildcards (\*, ?). In particular, the above for command replaces arguments that contain wildcards (\*, ?) with file names that match them, or drops them if no files match. Nonetheless, the above loop works as expected as long as the passed arguments do not contain wildcards.

Finding the number of command-line arguments, in a non-robust way:

```
set argcount=0 for %%i in (%*) do set /a argcount+=1
```

Again, this does not work with arguments containing wildcards.

The maximum possible number of arguments is greater than 4000, as empirically determined on a Windows Vista machine. The number can differ on Windows XP and Windows 7.

In passing arguments to a batch script, characters used for argument separation are the following ones:

- space
- comma
- semicolon
- equal sign
- tab character

Thus, the following lines pass the same four arguments:

- test.bat a b c d
- test.bat a,b,c,d
- test.bat a, b, c, d
- test.bat a;b;c;d
- test.bat a=b=c=d
- test.bat a b,c,;=d

Yes, even the line with “a b,c,;=d” passes four arguments, since a sequence of separating characters is considered a single separator.

To have a space, comma or semicolon in the argument value, you can pass the value enclosed in quotation marks. However, the quotation marks become part of the argument value. To get rid of the enclosing quotation marks when referring to the argument in the script, you can use %~<number> described in #Percent tilde.

Links:

- [Parameters / Arguments at ss64](#)
- [Escape Characters, Delimiters and Quotes at ss64](#)
- [Using batch parameters at Microsoft](#)

## 2.9 Wildcards

Many commands accept file name wildcards--characters that do not stand for themselves and enable matching of a group of filenames.

Wildcards:

- \* (asterisk): any sequence of characters
- ? (question mark): a single character other than a period (".") or, if part of a sequence of question marks at the end of a maximum period-free part of a file name, possibly zero number of characters; see examples for clarification

Examples:

- dir \*.txt
  - Matches Myfile.txt, Plan.txt and any other file with the .txt extension.
- dir \*txt
  - The period does not need to be included. However, this will also match files named without the period convention, such as my-file.txt.

- `ren *.cxx *.cpp`
  - Renames all files with `.cxx` extension to have `.cpp` extension.
- `dir a?b.txt`
  - Matches files `aab.txt`, `abb.txt`, `a0b.txt`, etc.
  - Does not match `ab.txt`, since a question mark followed by a character other than a question mark or period cannot match zero characters.
  - Does not match `a.b.txt`, since a question mark cannot match a period.
- `dir ????.txt`
  - Matches `.txt`, `a.txt`, `aa.txt`, and `aaa.txt`, among others, since each question mark in the sequence followed by a period can match zero number of characters.
- `dir a???b???txt???`
  - Matches `a.b.txt`, among others. While the last question mark sequence is not followed by a period, it is still a sequence at the end of a maximum period-free part of a file name.
- `dir ???????.txt & @REM` eight question marks
  - Matches the same files as `*.txt`, since each file also has a short file name that has no more than 8 characters before `.txt`.

Quirk with short file names: the wildcard matching is performed both on long file names and the usually hidden short 8 chars + period + 3 chars file names. This can lead to bad surprises.

Unlike shells of some other operating systems, the `cmd.exe` shell does not perform wildcard expansion (replacement of the pattern containing wildcards with the list of file names matching the pattern) on its own. It is the responsibility of each program to treat wildcards as such. This enables such things as `ren *.txt *.bat`, since the `ren` command actually sees the `*` wildcard rather than a list of files matching the wildcard. Thus, `echo *.txt` does not display files in the current folder matching the pattern but rather literally displays `*.txt`. Another consequence is that you can write `findstr a.*txt` without fearing that the `a.*txt` part gets replaced with the names of some files in the current folder. Furthermore, recursive `findstr /s pattern *.txt` is possible, while in some other operating systems, the `*.txt` part would get replaced with the file names found in the current folder, disregarding nested folders.

Commands accepting wildcards include `ATTRIB`, `COPY`, `DIR`, `FINDSTR`, `FOR`, `REN`, etc.

Links:

- [Wildcards at ss64](#)
- [Using wildcard characters at Microsoft](#)

## 2.10 User input

You can get input from the user using the following methods:

- `SET /P` command
- `CHOICE` command
- Using `"type con >myfile.txt"`, for which the multi-line user input is terminated by user pressing Control + Z.

## 2.11 Percent tilde

When a command-line argument contains a file name, special syntax can be used to get various information about the file.

The following syntaxes expand to various information about the file passed as `%1`:

The same syntax applies to single-letter variables created by `FOR` command, such as `"%i"`.

To learn about this subject from the command line, type `"call /?"` or `"for /?"`.

Links:

- [Parameters / Arguments at ss64](#)
- [Using batch parameters at Microsoft](#)
- [for at Microsoft](#)

## 2.12 Functions

Functions AKA subprograms can be emulated using `CALL`, labels, `SETLOCAL` and `ENDLOCAL`.

An example of a function that determines arithmetic power:

```
@echo off call :power 2 4 echo %result% rem Prints 16,
determined as 2 * 2 * 2 * 2 goto :eof rem __Function
power_____ rem Arguments:
%1 and %2 :power setlocal set counter=%2 set interim_product=%1
:power_loop if %counter% gtr 1 (
set /A interim_product = %interim_product% * %1 set
/A counter = %counter% - 1 goto :power_loop ) endlocal
& set result=%interim_product% goto :eof
```

While the `"goto :eof"` at the end of the function is not really needed, it has to be there in the general case in which there is more than one function.

The variable into which the result should be stored can be specified on the calling line as follows:

```
@echo off call :sayhello result=world echo %result%
exit /b :sayhello set %1=Hello %2 REM Set %1 to set
```

the returning value `exit /b`

In the above example, `exit /b` is used instead of `goto :eof` to the same effect.

## 2.13 Calculation

Batch scripts can do simple 32-bit integer arithmetic and bitwise manipulation using `SET /a` command. The largest supported integer is  $2147483647 = 2^{31} - 1$ . The smallest supported integer obtained by usual means is  $-2147483647$ , more of which later. The syntax is reminiscent of the C language.

Arithmetic operators include `*`, `/`, `%` (modulo), `+`, `-`. In a batch, modulo has to be entered as `%%`.

Bitwise operators interpret the number as a sequence of 32 binary digits. These are `~` (complement), `&` (and), `|` (or), `^` (xor), `<<` (left shift), `>>` (right shift).

A logical operator of negation is `!`: it turns zero into one and non-zero into zero.

A combination operator is `,:` it allows more calculations in one `set` command.

Combined assignment operators are modeled on `"+="`, which, in `"a+=b"`, means `"a=a+b"`. Thus, `"a-=b"` means `"a=a-b"`. Similarly for `*=`, `/=`, `%=`, `&=`, `^=`, `|=`, `<<=`, and `>>=`.

The precedence order of supported operators, each precedence level separated by **●**, is as follows: `() ● * / % + - ● << >> ● & ● ^ ● | ● = *= /= %= += -= &= ^= |= <<= >>= ● ,`

As some of the operators have special meaning for the command interpreter, an expression using them needs to be enclosed in quotation marks, such as this:

- `set /a num="255^127"`
- `set /a "num=255^127"`
  - Alternative placement of quotation marks.
- `set /a num=255^^127`
  - Escape `^` using `^` instead of quotation marks.

The smallest supported integer is  $-2147483647$ , but you can get  $-2147483648$  like this:

- `set /a num=~2147483647`

Examples:

- `set n1=40 & set n2=25`  
`set /a n3=%n1%+%n2%`

- Uses the standard percent notation for variable expansion.

- `set n1=40 & set n2=25`  
`set /a n3=n1+n2`
  - Avoids the percent notation around variable names as unneeded for `/a`.
- `set /a num="255^127"`
  - Encloses `"^"` in quotation marks to prevent its special meaning for the command interpreter.
- `set /a n1 = (10 + 5)/5`
  - The spaces around `=` do not matter with `/a`. However, getting used to it lends itself to writing `"set var = value"` without `/a`, which sets the value of `"var "` rather than `"var"`.
- `set /a n1=2+3,n2=4*7`
  - Performs two calculations.
- `set /a n1=n2=2`
  - Has the same effect as `n1=2,n2=2`.
- `set n1=40 & set n2=25 & set /a n3=n1+n2`
  - Works as expected.
- `set /a n1=2,n2=3,n3=n1+n2`
  - Works as expected.
- `set n1=40 & set n2=25 & set /a n3=%n1%+%n2%`
  - Does not work unless `n1` and `n2` were set previously. The variable specifications `"%n1%"` and `"%n2%"` get expanded *before* the first `set` command is executed. Dropping percent notation makes it work.
- `set /a n1=2,n2=3,n3=%n1%+%n2%`
  - Does not work unless `n1` and `n2` were set previously, for the reason stated in the previous example.

An example calculation that prints prime numbers:

```
@echo off setlocal set n=1 :print_primes_loop set
/a n=n+1 set cand_divisor=1 :print_primes_loop2
set /a cand_divisor=cand_divisor+1 set /a
cand_divisor_squared=cand_divisor*cand_divisor
if %cand_divisor_squared% gtr %n% echo Prime
%n% & goto :print_primes_loop set /a mod-
ulo=n%cand_divisor if %modulo% equ 0 goto
:print_primes_loop & REM Not a prime goto
:print_primes_loop2
```

Links:

- [set at ss64.com](http://ss64.com)
- [set at Microsoft](http://Microsoft)

## 2.14 Limitations

There is no touch command familiar from other operating systems. The touch command would modify the last-modification timestamp of a file without changing its content.

One workaround, with unclear reliability and applicability across various Windows versions, is this:

- `copy /b file.txt+,,`

Links:

- Windows recursive touch command at [superuser.com](http://superuser.com)
- Windows version of the Unix touch command at [stackoverflow.com](http://stackoverflow.com)

## 3 Built-in commands

These commands are all built in to the command interpreter itself, and cannot be changed. Sometimes this is because they require access to internal command interpreter data structures, or modify properties of the command interpreter process itself.

### 3.1 Overview

### 3.2 ASSOC

Associates an extension with a file type (FTYPE), displays existing associations, or deletes an association. See also FTYPE.

Examples:

- `assoc`
  - Lists all associations, in the format "`<file extension>=<file type>`", as, for example, "`.pl=Perl`" or "`.xls=Excel.Sheet.8`".
- `assoc | find ".doc"`
  - Lists all associations containing ".doc" substring.

Links:

- `assoc` at [ss64.com](http://ss64.com)
- `assoc` at Microsoft
- Making Python scripts run on Windows without specifying ".py" extension at [stackoverflow](http://stackoverflow.com)

### 3.3 BREAK

In Windows versions based on Windows NT, does nothing; kept for compatibility with MS DOS.

Links:

- `break` at Microsoft

### 3.4 CALL

Calls one batch program from another, or calls a subprogram within a single batch program. For calling a subprogram, see Functions section.

Links:

- `call` at [ss64.com](http://ss64.com)
- `call` at Microsoft

### 3.5 CD

Changes to a different directory, or displays the current directory. However, if a different drive letter is used, it does not switch to that different drive or volume.

Examples:

- `cd`
- `cd C:\Program Files`
- `cd \Program Files`
- `cd Documents`
- `cd %USERPROFILE%`
- `cd /d C:\Program Files`
  - Changes to the directory of the C: drive even if C: is not the current drive.
- `C: & cd C:\Program Files.`
  - Changes to the directory of the C: drive even if C: is not the current drive.
- `cd ..`
  - Changes to the parent directory. Does nothing if already in the root directory.
- `cd ..\.`
  - Changes to the parent directory two levels up.
- `C: & cd C:\Windows\System32 & cd ..\.\Program Files`
  - Uses ".." to navigate through the directory three up and down

No surrounding quotes are needed around paths with spaces.

Links:

- [cd at ss64.com](#)
- [chdir at Microsoft](#)

### 3.6 CHDIR

A synonym of **CD**.

### 3.7 CLS

Clears the screen.

### 3.8 COLOR

Sets the console foreground and background colors.

Examples:

- `color f9`
  - Use white background and blue foreground.
- `color`
  - Restore the original color setting.

Links:

- [color at ss64.com](#)
- [color at Microsoft](#)

### 3.9 COPY

Copies files. See also **MOVE**.

Examples:

- `copy F:\File.txt`
  - Copies the file into the current directory, assuming the current directory is not F:\.
- `copy "F:\My File.txt"`
  - As above; quotation marks are needed to surround a file with spaces.
- `copy F:\*.txt`
  - Copies the files located at F:\ and ending in dot txt into the current directory, assuming the current directory is not F:\.
- `copy F:\*.txt .`

- Does the same as the above command.

- `copy File.txt`
  - Issues an error message, as File.txt cannot be copied over itself.
- `copy File1.txt File2.txt`
  - Copies File1.txt to File2.txt, overwriting File2.txt if confirmed by the user or if run from a batch script.
- `copy File.txt "My Directory"`
  - Copies File.txt into "My Directory" directory, assuming "My Directory" exists.
- `copy Dir1 Dir2`
  - Copies all files directly located in directory Dir1 into Dir2, assuming Dir1 and Dir2 are directories. Does not copy files located in nested directories of Dir1.
- `copy *.txt *.bak`
  - For each \*.txt file in the current folder, makes a copy ending with "bak" rather than "txt".

Links:

- [copy at ss64.com](#)
- [copy at Microsoft](#)

### 3.10 DEL

Deletes files. *Use with caution, especially in combination with wildcards.* Only deletes files, not directories, for which see **RD**. For more, type "`del /?`".

Examples:

- `del File.txt`
- `del /s *.txt`
  - Deletes the files recursively including nested directories, but keeps the directories; mercilessly deletes all matching files without asking for confirmation.
- `del /p /s *.txt`
  - As above, but asks for confirmation before every single file.

Links:

- [del at ss64.com](#)
- [del at Microsoft](#)

### 3.11 DIR

Lists the contents of a directory. Offers a range of options. Type “dir /?” for more help.

Examples:

- dir
  - Lists the files and folders in the current folder, excluding hidden files and system files; uses a different manner of listing if DIRCMD variable is non-empty and contains switches for dir.
- dir D:
- dir /b C:\Users
- dir /s
  - Lists the contents of the directory and all sub-directories recursively.
- dir /s /b
  - Lists the contents of the directory and all sub-directories recursively, one file per line, displaying complete path for each listed file or directory.
- dir \*.txt
  - Lists all files with .txt extension.
- dir /a
  - Includes hidden files and system files in the listing.
- dir /ah
  - Lists hidden files only.
- dir /ad
  - Lists directories only. Other letters after /A include S, I, R, A and L.
- dir /ahd
  - Lists hidden directories only.
- dir /a-d
  - Lists files only, omitting directories.
- dir /a-d-h
  - Lists non-hidden files only, omitting directories.
- dir /od
  - Orders the files and folders by the date of last modification. Other letters after /O include N (by name), E (by extension), S (by size), and G (folders first)

- dir /o-s
  - Orders the files by the size descending; the impact on folder order is unclear.
- dir /-c /o-s /a-d
  - Lists files ordered by size descending, omitting the thousands separator via /-C, excluding folders.
- dir /s /b /od
  - Lists the contents of the directory and all sub-directories recursively, ordering the files in each directory by the date of last modification. The ordering only happens per directory; the complete set of files so found is not ordered as a whole.

Links:

- [dir at ss64.com](#)
- [dir at Microsoft](#)

### 3.12 DATE

Displays or sets the date. The way the date is displayed depends on country settings. Date can also be displayed using “echo %DATE%”.

Getting date in the iso format, like “2000-01-28”: That is nowhere easy, as the date format depends on country settings.

- If you can assume the format of “Mon 01/28/2000”, the following will do:
  - set isodate=%date:~10,4%- %date:~4,2%- %date:~7,2%

Links:

- [date at ss64.com](#)
- [date at Microsoft](#)
- [How to get current datetime on Windows command line, in a suitable format for using in a filename?](#) at stackoverflow

### 3.13 ECHO

Displays messages, or turns command echoing on or off.

Examples:

- echo on

- @echo off
- echo Hello
- echo "hello"
  - Displays the quotes too.
- echo %PATH%
  - Displays the contents of PATH variable.
- echo ECHO Owner ^& son
- echo 1&echo 2&echo 3
  - Displays three strings, each followed by a new-line.

Displaying a string without a newline requires a trick:

- set <NUL /p=Output of a command:
  - Displays "Output of a command:". The output of the next command will be displayed immediately after ":".
- set <NUL /p=Current time: & time /t
  - Displays "Current time: " followed by the output of "time /t".
- (set <NUL /p=Current time: & time /t) >tmp.txt
  - Like before, with redirecting the output of both commands to a file.

Links:

- [echo at ss64.com](#)
- [echo at Microsoft](#)

### 3.14 ELSE

An example:

```
if exist file.txt ( echo The file exists. ) else ( echo The file does not exist. )
```

See also IF.

### 3.15 ENDLOCAL

Ends local set of environment variables started using SETLOCAL. Can be used to create subprograms: see Functions.

Links:

- [endlocal at ss64.com](#)
- [endlocal at Microsoft](#)

### 3.16 ERASE

A synonym of DEL.

### 3.17 EXIT

Exits the DOS console or, with /b, only the currently running batch or the currently executed subroutine. If used without /b in a batch file, causes the DOS console calling the batch to close.

Examples:

- exit
- exit /b

Links:

- [exit at ss64.com](#)
- [exit at Microsoft](#)

### 3.18 FOR

Iterates over a series of values, executing a command.

In the following examples, %i is to be used from the command line while %%i is to be used from a batch.

Examples:

- for %%i in (1,2,3) do echo %%i
  - In a batch, echoes 1, 2, and 3. In a batch, the command must use a double percent sign.
  - The remaining examples are intended to be directly pasted into a command line, so they use a single percent sign and include "@" to prevent repetitive display.
- for %i in (1,2,3) do @echo %i
  - From a command line, echoes 1, 2, and 3.
  - The for command tries to interpret the items as file names and as patterns of file names containing wildcards.
  - It does not complain if the items do not match existing file names, though.
- for %i in (1,2,a\*d\*c\*e\*t) do @echo %i
  - Unless you happen to have a file matching the third pattern, echoes 1 and 2, discarding the third item.
- for %i in (1 2,3;4) do @echo %i
  - Echoes 1, 2, 3, and 4. Yes, a mixture of item separators is used.

- for %i in (\*.txt) do @echo %i
    - Echoes file names of files located in the current folder and having the .txt extension.
  - for %i in ("C:\Windows\system32\\*.exe") do @echo %i
    - Echoes file names matching the pattern.
  - for /r %i in (\*.txt) do @echo %i
    - Echoes file names with full paths, of files having the extension .txt located anywhere in the current folder including nested folders.
  - for /d %i in (\*) do @echo %i
    - Echoes the names of all folders in the current folder.
  - for /r /d %i in (\*) do @echo %i
    - Echoes the names including full paths of all folders in the current folder, including nested folders.
  - for /l %i in (1,1,10) do @echo %i
    - Echoes the numbers from 1 to 10.
  - for /f "tokens=\*" %i in (list.txt) do @echo %i
    - For each line in a file, echoes the line.
  - for /f "tokens=\*" %i in (list1.txt list2.txt) do @echo %i
    - For each line in the files, echoes the line.
  - for /f "tokens=\*" %i in (\*.txt) do @echo %i
    - Does nothing. Does not accept wildcards to match file names.
  - for /f "tokens=1-3 delims=:;" %a in ("First:Second:Third") do @echo %c-%b-%a
    - Parses a string into tokens delimited by ":".
    - The quotation marks indicate the string is not a file name.
    - The second and third tokens are stored in %b and %c even though %b and %c are not expressly mentioned in the part of the command before "do".
    - The two consecutive colons are treated as one separator; %c is not "" but rather "Third".
    - Does some of the job of the cut command from other operating systems.
  - for /f "tokens=1-3\* delims=:;" %a in ("First:Second:Third:Fourth:Fifth") do @echo %c-%b-%a: %d
    - As above, just that the 4th and 5th items get captured in %d as "Fourth:Fifth", including the separator.
  - for /f "tokens=1-3\* delims=:;" %a in ("First,Second,Third:Fourth:Fifth") do @echo %c-%b-%a: %d
    - Multiple delimiters are possible.
  - for /f "tokens=1-3" %a in ("First Second Third,item") do @echo %c-%b-%a
    - The default delimiters are space and tab. Thus, they differ from the separators used to separate arguments passed to a batch.
  - for /f "tokens=\*" %i in ('cd') do @echo %i
    - For each line of the result of a command, echoes the line.
  - for /f "tokens=\*" %i in ('dir /b /a-d-h') do @echo %~nxai
    - For each non-hidden file in the current folder, displays the file attributes followed by the file name. In the string "%~nxai", uses the syntax described at #Percent tilde.
  - for /f "usebackq tokens=\*" %i in (`dir /b /a-d-h`) do @echo %~nxai
    - As above, but using the backquote character ( ` ) around the command to be executed.
  - for /f "tokens=\*" %i in ('tasklist ^| sort ^& echo End') do @echo %i
    - Pipes and ampersands in the command to be executed must be escaped using caret (^).
  - (for %i in (1,2,3) do @echo %i) > anyoldtemp.txt
    - To redirect the entire result of a for loop, place the entire loop inside brackets before redirecting. Otherwise, the redirection will tie to the body of the loop, so each new iteration of the body of the loop will override the results of the previous iterations.
  - for %i in (1,2,3) do @echo %i > anyoldtemp.txt
    - An example related to the one above. It shows the consequence of failing to put the loop inside brackets.
- There is no continue statement like that in C and it cannot be simulated by goto as a goto (even if it doesn't jump out of the loop body) destroys loop bookkeeping. Try
- ```
for %%i in (a b c) do ( echo 1 %%i goto :cont echo 2 %%i :cont echo 3 %%i )
```

However, putting the body in a subroutine works:

```
for %%i in (a b c) do call :for_body %%i exit /b
:for_body echo 1 %1 goto :cont echo 2 %1 :cont exit /b
```

Links:

- for at [ss64.com](#)
- for at [Microsoft](#)

### 3.19 FTYPE

Displays or sets the command to be executed for a file type. See also [ASSOC](#).

Examples:

- ftype
  - Lists all associations of commands to be executed with file types, as, for example, 'Perl="C:\Perl\bin\perl.exe" "%1" %\*'
- ftype | find "Excel.Sheet"
  - Lists only associations whose display line contains "Excel.Sheet"

Links:

- ftype at [ss64.com](#)
- ftype at [Microsoft](#)
- [Making Python scripts run on Windows without specifying ".py" extension at stackoverflow](#)

### 3.20 GOTO

Goes to a label.

An example:

```
goto :mylabel echo Hello 1 REM Hello 1 never gets
printed. :mylabel echo Hello 2 goto :eof echo Hello 3
REM Hello 3 never gets printed. Eof is a virtual label
standing for the end of file.
```

Goto within the body of a for loop makes cmd forget about the loop, even if the label is within the same loop body.

Links:

- goto at [ss64.com](#)
- goto at [Microsoft](#)

### 3.21 IF

Conditionally executes a command. Documentation is available by entering `IF /?` to CMD prompt.

Available elementary tests:

- exist <filename>
- <string>==<string>
- <expression1> equ <expression2> -- equals
- <expression1> neq <expression2> -- not equal
- <expression1> lss <expression2> -- less than
- <expression1> leq <expression2> -- less than or equal
- <expression1> gtr <expression2> -- greater than
- <expression1> geq <expression2> -- greater than or equal
- defined <variable>
- errorlevel <number>
- cmdextversion <number>

To each elementary test, "not" can be applied. Apparently there are no operators like AND, OR, etc. to combine elementary tests.

The /I switch makes the == and equ comparisons ignore case.

An example:

```
if not exist %targetpath% ( echo Target path not found.
exit /b )
```

Examples:

- if not 1 equ 0 echo Not equal
- if 1 equ 0 echo A & echo B
  - Does nothing; both echo commands are subject to the condition.
- if not 1 equ 0 goto :mylabel
- if not a geq b echo Not greater
- if b geq a echo Greater
- if b geq A echo Greater in a case-insensitive comparison
- if B geq a echo Greater in a case-insensitive comparison
- if 0 equ 00 echo Numerical equality

- if not 0==00 echo String inequality
- if 01 geq 1 echo Numerical comparison
- if not "01" geq "1" echo String comparison
- if 1 equ 0 (echo Equal) else echo Unequal
  - Notice the brackets around the positive then-part to make it work.
- if not a==A echo Case-sensitive inequality
- if /i a==A echo Case-insensitive equality
- if /i==/i echo This does not work
- if "/i"=="i" echo Equal, using quotation marks to prevent the literal meaning of /i

Links:

- [if at ss64.com](#)
- [if at Microsoft](#)

### 3.22 MD

Creates a new directory or directories. Has a synonym **MKDIR**; see also its antonym **RD**.

Examples:

- md Dir
  - Creates one directory in the current directory.
- md Dir1 Dir2
  - Creates two directories in the current directory.
- md "My Dir With Spaces"
  - Creates a directory with a name containing spaces in the current directory.

Links:

- [md at ss64.com](#)
- [md at Microsoft](#)

### 3.23 MKDIR

A synonym for **MD**.

### 3.24 MOVE

Moves files or directories between directories, or renames them. See also **REN**.

Examples:

- move File1.txt File2.txt
  - Renames File1.txt to File2.txt, overwriting File2.txt if confirmed by the user or if run from a batch script.
- move File.txt Dir
  - Moves File.txt file into Dir directory, assuming File.txt is a file and Dir is a directory; overwrites target file Dir\\*.txt if conditions for overwriting are met.
- move Dir1 Dir2
  - Renames directory Dir1 to Dir2, assuming Dir1 is a directory and Dir2 does not exist.
- move Dir1 Dir2
  - Moves directory Dir1 into Dir2, resulting in existence of Dir2\Dir1, assuming both Dir1 and Dir2 are existing directories.
- move F:\File.txt
  - Moves the file to the current directory.
- move F:\\*.txt
  - Moves the files located at F:\ and ending in dot txt into the current directory, assuming the current directory is not F:\.

Links:

- [move at ss64.com](#)
- [move at Microsoft](#)

### 3.25 PATH

Displays or sets the value of the **PATH** environment variable.

Links:

- [path at ss64.com](#)
- [path at Microsoft](#)

### 3.26 PAUSE

Prompts the user and waits for a line of input to be entered.

### 3.27 POPD

Changes to the drive and directory popped from the directory stack. The directory stack is filled using the **PUSHD** command.

Links:

- [popd at ss64.com](#)
- [popd at Microsoft](#)

### 3.28 PROMPT

Can be used to change or reset the cmd.exe prompt. It sets the value of the PROMPT environment variable.

```
C:\>PROMPT MyPrompt$G MyPrompt>CD C:\MyPrompt>PROMPT C:\>
```

The PROMPT command is used to set the prompt to "MyPrompt>". The CD shows that the current directory path is "C:\". Using PROMPT without any parameters sets the prompt back to the directory path.

Links:

- [prompt at ss64.com](#)
- [prompt at Microsoft](#)

### 3.29 PUSHD

Pushes the current directory onto the directory stack, making it available for the POPD command to retrieve, and, if executed with an argument, changes to the directory stated as the argument.

Links:

- [pushd at ss64.com](#)
- [pushd at Microsoft](#)

### 3.30 RD

Removes directories. See also its synonym **RMDIR** and antonym **MD**. Per default, only empty directories can be removed. Also type "rd /?".

Examples:

- rd Dir1
- rd Dir1 Dir2
- rd "My Dir With Spaces"
- rd /s Dir1

- Removes the directory Dir1 including all the files and subdirectories in it, asking for confirmation once before proceeding with the removal. To delete files recursively in nested directories with a confirmation per file, use **DEL** with /s switch.

- rd /q /s Dir1

- Like above, but without asking for confirmation.

Links:

- [rd at ss64.com](#)
- [rmdir at Microsoft](#)

### 3.31 REN

Renames files and directories.

Examples:

- ren filewithtypo.txt filewithtypo.txt
- ren \*.cxx \*.cpp

Links:

- [ren at ss64.com](#)
- [rename at Microsoft](#)
- [How does the Windows RENAME command interpret wildcards?, superuser.com](#)

### 3.32 RENAME

This is a synonym of **REN** command.

### 3.33 REM

Used for remarks in batch files, preventing the content of the remark from being executed.

An example:

```
REM A remark that does not get executed echo Hello
REM This remark gets displayed by echo echo Hello
& REM This remark gets ignored as wished :: This
sentence has been marked as a remark using double
colon.
```

REM is typically placed at the beginning of a line. If placed behind a command, it does not work, unless preceded by an ampersand, as shown in the example above.

An alternative to REM is double colon.

Links:

- [rem at ss64.com](#)
- [rem at Microsoft](#)

### 3.34 RMDIR

This is a synonym of `RD`.

### 3.35 SET

Displays or sets environment variables. With `/P` switch, it asks the user for input, storing the result in the variable. With `/A` switch, it performs simple arithmetic calculations, storing the result in the variable. With string assignments, there must be no spaces before and after the equality sign; thus, “set name = Peter” does not work, while “set name=Peter” does.

Examples:

- `set`
  - Displays a list of environment variables
- `set HOME`
  - Displays the values of the environment variables whose names start with “HOME”
- `set MYNUMBER=56`
- `set HOME=%HOME%;C:\Program Files\My Bin Folder`
- `set /P user_input=Enter an integer:`
- `set /A result = 4 * ( 6 / 3 )`
  - Sets the result variable with the result of a calculation. See also [#Calculation](#).

Links:

- [set at ss64.com](#)
- [set at Microsoft](#)

### 3.36 SETLOCAL

When used in a batch file, makes all further changes to environment variables local to the current batch file. When used outside of a batch file, does nothing. Can be ended using `ENDLOCAL`. Exiting a batch file automatically calls “end local”. Can be used to create subprograms: see [Functions](#).

Furthermore, can be used to *enable delayed expansion* like this: “setlocal EnableDelayedExpansion”. Delayed expansion consists in the names of variables enclosed in exclamation marks being replaced with their values only

after the execution reaches the location of their use rather than at an earlier point.

The following is an example of using delayed expansion in a script that prints the specified number of first lines of a file, providing some of the function of the command “head” known from other operating systems:

```
@echo off call :myhead 2 File.txt exit /b :: Function
myhead :: ===== :: %1 - lines count, %2
- file name :myhead setlocal EnableDelayedExpansion
set counter=1 for /f “tokens=*” %%i in (%2) do ( echo
%%i set /a counter=!counter!+1 if !counter! gtr %1 exit
/b ) exit /b
```

Links:

- [setlocal at ss64.com](#)
- [EnableDelayedExpansion at ss64.com](#)
- [setlocal at Microsoft](#)

### 3.37 SHIFT

Shifts the batch file arguments along, but does not affect `%*`. Thus, if `%1=Hello 1`, `%2=Hello 2`, and `%3=Hello 3`, then, after `SHIFT`, `%1=Hello 2`, and `%2=Hello 3`, but `%*` is “Hello 1” “Hello 2” “Hello 3”.

Links:

- [shift at ss64.com](#)
- [shift at Microsoft](#)

### 3.38 START

Starts a program in new window, or opens a document. Uses an unclear algorithm to determine whether the first passed argument is a window title or a program to be executed; hypothesis: it uses the presence of quotes around the first argument as a hint that it is a window title.

Examples:

- `start notepad.exe & echo “Done.”`
  - Starts `notepad.exe`, proceeding to the next command without waiting for finishing the started one. Keywords: asynchronous.
- `start “notepad.exe”`
  - Launches a new console window with `notepad.exe` being its title, apparently an undesired outcome.
- `start "" “C:\Program Files\Internet Explorer\iexplore.exe”`

- Starts Internet Explorer. The empty "" passed as the first argument is the window title of a console that actually does not get opened, or at least not visibly so.
- start "C:\Program Files\Internet Explorer\iexplore.exe"
  - Launches a new console window with "C:\Program Files\Internet Explorer\iexplore.exe" being its title, apparently an undesired outcome.
- start /wait notepad.exe & echo "Done."
  - Starts notepad.exe, waiting for it to end before proceeding.
- start /low notepad.exe & echo "Done."
  - As above, but starting the program with a low priority.
- start "" MyFile.xls
  - Opens the document in the program assigned to open it.
- start
  - Starts a new console (command-line window) in the same current folder.
- start .
  - Opens the current folder in Windows Explorer.
- start ..
  - Opens the parent folder in Windows Explorer.
- start "" "mailto:"
  - Starts the application for writing a new email.
- start /b TODO:example-application-where-this-is-useful
  - Starts the application without opening a new console window, redirecting the output to the console from which the start command was called.

Links:

- [start at ss64.com](#)
- [start at Microsoft](#)

### 3.39 TIME

Displays or sets the system time.

Links:

- [time at ss64.com](#)
- [time at Microsoft](#)

### 3.40 TITLE

Sets the title displayed in the console window.

Links:

- [title at ss64.com](#)
- [title at Microsoft](#)

### 3.41 TYPE

Prints the content of a file or files to the output.

Examples:

- type filename.txt
- type a.txt b.txt
- type \*.txt
- type NUL > tmp.txt
  - Create an empty file (blank file).

Links:

- [type at ss64.com](#)
- [type at Microsoft](#)

### 3.42 VER

Shows the command processor or operating system version.

```
C:\>VER Microsoft Windows XP [Version 5.1.2600]
C:\>
```

Some version strings:

- Microsoft Windows XP [Version 5.1.2600]
- Microsoft Windows [Version 6.0.6000]
- ...

The word "version" appears localized.

Links:

- [ver at ss64.com](#)
- [ver at Microsoft](#)

### 3.43 VERIFY

Sets or clears the setting to verify whether COPY files etc. are written correctly.

Links:

- verify at [ss64.com](#)
- verify at [Microsoft](#)

### 3.44 VOL

Displays volume labels.

Links:

- vol at [ss64.com](#)
- vol at [Microsoft](#)

## 4 External commands

External commands available to Windows command interpreter are separate executable program files, supplied with the operating system by Microsoft, or bundled as standard with the third-party command interpreters. By replacing the program files, the meanings and functions of these commands can be changed.

Many, but not all, external commands support the "/" convention, causing them to write on-line usage information to their standard output and then to exit with a status code of 0.

### 4.1 AT

Schedules a program to be run at a certain time. See also SCHEDULETASKS.

Links:

- at at [ss64.com](#)
- at at [Microsoft](#)

### 4.2 ATTRIB

Displays or sets file attributes. With no arguments, it displays the attributes of all files in the current directory. With no attribute modification instructions, it displays the attributes of the files and directories that match the given search wildcard specifications. Similar to chmod of other operating systems.

Modification instructions:

- To add an attribute, attach a '+' in front of its letter.

- To remove an attribute, attach a '-' in front of its letter

Attributes:

- A - Archived
- H - Hidden
- S - System
- R - Read-only
- ...and possibly others.

Examples:

- attrib
  - Displays the attributes of all files in the current directory.
- attrib File.txt
  - Displays the attributes of the file.
- attrib +r File.txt
  - Adds the "Read-only" attribute to the file.
- attrib -a File.txt
  - Removes the "Archived" attribute from the file.
- attrib -a +r File.txt
  - Removes the "Archived" attribute and adds the "Read-only" attribute to the file.
- attrib +r \*.txt
  - Acts on a set of files.
- attrib /S +r \*.txt
  - Acts recursively in subdirectories.

For more, type "attrib /?".

Links:

- attrib at [ss64.com](#)
- attrib at [Microsoft](#)

### 4.3 BCDEDIT

(Not in XP). Edits Boot Configuration Data (BCD) files. For more, type "bcdedit /?".

Links:

- bcdedit at [ss64.com](#)
- bcdedit at [Microsoft](#)

## 4.4 CACLS

Shows or changes discretionary access control lists (DACLS). See also **ICACLS**. For more, type “cacls /?”.

Links:

- [cacls at ss64.com](#)
- [cacls at Microsoft](#)

## 4.5 CHCP

Displays or sets the active code page number. For more, type “chcp /?”.

Links:

- [chcp at ss64.com](#)
- [chcp at Microsoft](#)

## 4.6 CHKDSK

Checks disks for disk problems, listing them and repairing them if wished. For more, type “chkdsk /?”.

Links:

- [chkdsk at ss64.com](#)
- [chkdsk at Microsoft](#)

## 4.7 CHKNTFS

Shows or sets whether system checking should be run when the computer is started. The system checking is done using Autochk.exe. The “NTFS” part of the command name is misleading, since the command works not only with NTFS file system but also with FAT and FAT32 file systems. For more, type “chkntfs /?”.

Links:

- [chkntfs at ss64.com](#)
- [chkntfs at Microsoft](#)

## 4.8 CHOICE

Lets the user choose one of multiple options by pressing a single key, and sets the error level as per the chosen option. Absent in Windows 2000 and Windows XP, it was reintroduced in Windows Vista, and has remained in Windows 7 and 8.

Examples:

- `choice /m “Do you agree”`

- Presents the user with a yes/no question, setting the error level to 1 for yes and to 2 for no. If the user presses Control + C, the error level is 0.

- `choice /c rgb /m “Which color do you prefer”`

- Presents the user with a question, and indicates the letters for the user. Responds to user pressing r, g or b, setting the error level to 1, 2 or 3.

An alternative is “set /p”; see **SET**.

Links:

- [choice at ss64.com](#)
- [choice at Microsoft](#)

## 4.9 CMD

Invokes another instance of Microsoft’s CMD.

Links:

- [cmd at ss64.com](#)
- [cmd at Microsoft](#)

## 4.10 COMP

Compares files. See also **FC**.

Links:

- [comp at ss64.com](#)
- [comp at Microsoft](#)

## 4.11 COMPACT

Shows or changes the compression of files or folders on NTFS partitions.

Links:

- [compact at Microsoft](#)

## 4.12 CONVERT

Converts a volume from FAT16 or FAT32 file system to NTFS file system.

Links:

- [convert at ss64.com](#)
- [convert at Microsoft](#)

### 4.13 DEBUG

Allows to interactively examine file and memory contents in assembly language, hexadecimal or ASCII. Available in 32-bit Windows including Windows 7; the availability in 64-bit Windows is unclear. In modern Windows, useful as a quick hack to view hex content of a file. Keywords: hex dump, hexdump, hexadecimal dump, view hex, view hexadecimal, disassembler.

Debug offers its own command line. Once on its command line, type "?" to find about debug commands.

To view hex of a file, invoke debug.exe with the file name as a parameter, and then repeatedly type "d" followed by enter on the debug command line.

Limitations:

- Being a DOS program, debug chokes on long file names. Use dir /x to find the 8.3 file name, and apply debug on that one.
- Debug cannot view larger files.

Links:

- [Debug at technet.microsoft.com](#)
- [Debug for MS-DOS at technet.microsoft.com](#)
- [W:Debug \(command\)](#)

### 4.14 DISKCOMP

Compares the content of two floppies.

Links:

- [diskcomp at ss64.com](#)
- [diskcomp at Microsoft](#)

### 4.15 DISKCOPY

Copies the content of one floppy to another.

Links:

- [diskcopy at ss64.com](#)
- [diskcopy at Microsoft](#)

### 4.16 DISKPART

Shows and configures the properties of disk partitions.

Links:

- [diskpart at ss64.com](#)
- [diskpart at Microsoft, for XP](#)
- [diskpart at Microsoft](#)

### 4.17 DOSKEY

Above all, creates macros known from other operating systems as aliases. Moreover, provides functions related to command history, and enhanced command-line editing. Macros are an alternative to very short batch scripts.

Macro-related examples:

- `doskey da=dir /s /b`
  - Creates a single macro called "da"
- `doskey np=notepad $1`
  - Creates a single macro that passes its first argument to notepad.
- `doskey /macrofile=doskeymacros.txt`
  - Loads macro definitions from a file.
- `doskey /macros`
  - Lists all defined macros with their definitions.
- `doskey /macros | find "da"`
  - Lists all macro definitions that contain "da" as a substring; see also [FIND](#).

Command history-related examples:

- `doskey /history`
  - Lists the complete command history.
- `doskey /history | find "dir"`
  - Lists each line of command history that contains "dir" as a substring
- `doskey /listsize=100`
  - Sets the size of command history to 100.

To get help on doskey from command line, type "doskey /?".

Links:

- [doskey at ss64.com](#)
- [doskey at Microsoft](#)

### 4.18 DRIVERQUERY

Shows all installed device drivers and their properties.

Links:

- [driverquery at ss64.com](#)
- [driverquery at Microsoft](#)

## 4.19 FC

Compares files, displaying the differences in their content in a peculiar way.

Examples:

- `fc File1.txt File2.txt >NUL && Echo Same || echo Different or error`
  - Detects difference using the error level of `fc`. The error level of zero means the files are the same; non-zero can mean the files differ but also that one of the files does not exist.

Links:

- [fc at ss64.com](#)
- [fc at Microsoft](#)

## 4.20 FIND

Searches for a string in files or input, outputting matching lines. Unlike `FINDSTR`, it cannot search folders recursively, cannot search for a regular expression, requires quotation marks around the sought string, and treats space literally rather than as a logical or.

Examples:

- `find "(object" *.txt`
- `dir /S /B | find "receipt"`
- `dir /S /B | find /I /V "receipt"`
  - Prints all non-matching lines in the output of the `dir` command, ignoring letter case.
- `find /C "inlined" *.h`
  - Instead of outputting the matching lines, outputs their count. If more than one file is searched, outputs one count number per file preceded with a series of dashes followed by the file name; does not output the total number of matching lines in all files.
- `find /C /V "" < file.txt`
  - Outputs the number of lines AKA line count in "file.txt". Does the job of "wc -l" of other operating systems. Works by treating "" as a string not found on the lines. The use of redirection prevents the file name from being output before the number of lines.
- `type file.txt | find /C /V ""`
  - Like the above, with a different syntax.

- `type *.txt 2>NUL | find /C /V ""`
  - Outputs the sum of line counts of the files ending in ".txt" in the current folder. The "2>NUL" is a redirection of standard error that removes the names of files followed by empty lines from the output.
- `find "Schönheit" *.txt`
  - If run from a batch file saved in unicode UTF-8 encoding, searches for the search term "Schönheit" in UTF-8 encoded \*.txt files. For this to work, the batch file must not contain the byte order mark written by Notepad when saving in UTF-8. Notepad++ is an example of a program that lets you write UTF-8 encoded plain text files without byte order mark. While this works with `find` command, it does not work with `#FINDSTR`.
- `find "Copyright" C:\Windows\system32\*.exe`
  - Works with binary files no less than text files.

Links:

- [find at ss64.com](#)
- [find at Microsoft](#)

## 4.21 FINDSTR

Searches for regular expressions or text strings in files. Does some of the job of "grep" command known from other operating systems, but is much more limited in the regular expressions it supports.

Treats space in a regular expression as a disjunction AKA logical or unless prevented with `/c` option.

Examples:

- `findstr /s "[0-9][0-9].[0-9][0-9]" *.h *.cpp`
  - Searches recursively all files whose name ends with dot h or dot cpp, printing only lines that contain two consecutive decimal digits followed by anything followed by two consecutive decimal digits.
- `findstr "a.*b a.*c" File.txt`
  - Outputs all lines in File.txt that match any of the *two* regular expressions separated by the space. Thus, the effect is one of *logical or* on regular expressions.
- `findstr /r /c:"ID: *[0-9]*" File.txt`

- Outputs all lines in File.txt that match the single regular expression containing a space. The use of /c prevents the space from being treated as a logical or. The use of /r switches the regular expression treatment on, which was disabled by default by the use of /c. To test this, try the following:
    - echo ID: 12|findstr /r /c:"ID: \*[0-9]\*\$"
      - Matches.
    - echo ID: 12|findstr /c:"ID: \*[0-9]\*\$"
      - Does not match, as the search string is not interpreted as a regular expression.
    - echo ID: ab|findstr "ID: \*[0-9]\*\$"
      - Matches despite the output of echo failing to match the complete regular expression: the search is interpreted as one for lines matching "ID:" or "[0-9]\*\$".
  - findstr /ric:"id: \*[0-9]\*" File.txt
    - Does the same as the previous example, but in a case-insensitive manner.
    - While findstr enables this sort of accumulation of switches behind a single "/", this is not possible with any command. For instance, "dir /bs" does not work, while "dir /b /s" does.
    - To test this, try the following:
      - echo ID: 12|findstr /ric:"id: \*[0-9]\*\$"
        - echo ID: ab|findstr /ric:"id: \*[0-9]\*\$"
          - Works with binary files no less than text files.
  - findstr /msric:"id: \*[0-9]\*" \*.txt
    - Like above, but recursively for all files per /s, displaying only matching files rather than matching lines per /m.
  - echo hel lo | findstr /c:"hel lo" /c:world
    - /c switch can be used multiple times to create logical or.
  - echo \hello\ | findstr "\hello\"
    - Does not match. Backslash before quotation marks and multiple other characters acts as an escape; thus, \" matches \".
  - echo \hello\ | findstr "\\hello\"
    - Matches. Double backslash passed to findstr stands for a single backslash.
  - echo \hello\ | findstr \hello\
    - Matches. None of the single backslashes passed to findstr is followed by a character on which the backslash acts as an escape.
  - findstr /m Microsoft C:\Windows\system32\\*.com
    - Works with binary files no less than text files.
- Limitations of the regular expressions of "findstr", as compared to "grep":
- No support of groups -- "(" , "\)".
  - No support of greedy iterators -- "\*?".
  - No support of "zero or one of the previous" -- "?".
  - And more.
- Other limitations: There is a variety of limitations and strange behaviors as documented at [What are the undocumented features and limitations of the Windows FINDSTR command?](#).
- Also consider typing "findstr /?".
- Links:
- [findstr at ss64.com](#)
  - [findstr at Microsoft](#)
  - [What are the undocumented features and limitations of the Windows FINDSTR command?](#) at Stack-Overflow
- ## 4.22 FORMAT
- Formats a disk to use Windows-supported file system such as FAT, FAT32 or NTFS, thereby overwriting the previous content of the disk. To be used with great caution.
- Links:
- [format at ss64.com](#)
  - [format at Microsoft](#)
- ## 4.23 FSUTIL
- A powerful tool performing actions related to FAT and NTFS file systems, to be ideally only used by powerusers with an extensive knowledge of the operating systems.
- Links:
- [fsutil at ss64.com](#)
  - [fsutil at Microsoft](#)
  - [Fsutil: behavior](#)
  - [Fsutil: dirty](#)
  - [Fsutil: file](#)
  - [Fsutil: fsinfo](#)

- Fsutil: hardlink
- Fsutil: objectid
- Fsutil: quota
- Fsutil: reparsepoint
- Fsutil: sparse
- Fsutil: usn
- Fsutil: volume

#### 4.24 GPRESULT

Displays group policy settings and more for a user or a computer.

Links:

- gresult at ss64.com
- gresult at Microsoft
- Wikipedia:Group Policy

#### 4.25 GRAFTABL

Enables the display of an extended character set in graphics mode. Fore more, type "graftabl /?".

Links:

- graftabl at Microsoft

#### 4.26 HELP

Shows command help.

Examples:

- help
  - Shows the list of Windows-supplied commands.
- help copy
  - Shows the help for COPY command, also available by typing "copy /?".

Links:

- help at ss64.com
- help at Microsoft

#### 4.27 ICACLS

(Not in XP) Shows or changes discretionary access control lists (DACLS) of files or folders. See also CACLS. Fore more, type "icacls /?".

Links:

- icacls at ss64.com
- icacls at Microsoft

#### 4.28 IPCONFIG

Displays Windows IP Configuration. Shows configuration by connection and the name of that connection (i.e. Ethernet adapter Local Area Connection) Below that the specific info pertaining to that connection is displayed such as DNS suffix and ip address and subnet mask.

Links:

- ipconfig at ss64.com
- ipconfig at Microsoft

#### 4.29 LABEL

Adds, sets or removes a disk label.

Links:

- label at ss64.com
- label at Microsoft

#### 4.30 MODE

A multi-purpose command to display device status, configure ports and devices, and more.

Links:

- mode at ss64.com
- mode at Microsoft

#### 4.31 MORE

Displays the contents of a file or files, one screen at a time. When redirected to a file, performs some conversions, also depending on the used switches.

Examples:

- more Test.txt
- more \*.txt

- `grep -i sought.*string Source.txt | more /p >Out.txt`
  - Taking the output of a non-Windows `grep` command that produces line breaks consisting solely of LF character without CR character, converts LF line breaks to CR-LF line breaks. CR-LF newlines are also known as DOS line breaks, Windows line breaks, DOS newlines, Windows newlines, and CR/LF line endings, as opposed to LF line breaks used by some other operating systems.
  - In some setups, seems to output gibberish if the input contains LF line breaks and tab characters at the same time.
  - In some setups, for the conversion, `/p` may be unneeded. Thus, “more” would convert the line breaks even without `/p`.
- `more /t4 Source.txt >Target.txt`
  - Converts tab characters to 4 spaces.
  - In some setups, tab conversion takes place automatically, even without the `/t` switch. If so, it is per default to 8 spaces.

Switch `/e`:

- The online documentation for “more” in Windows XP and Windows Vista does not mention the switch.
- The switch `/e` is mentioned in “more /?” at least in Windows XP and Windows Vista.
- Per “more /?”, the switch is supposed to enable extended features listed at the end of “more /?” help such as showing the current row on pressing “=”. However, in Windows XP and Windows Vista, that seems to be enabled by default even without `/e`.
- Hypothesis: In Windows XP and Windows Vista, `/e` does not do anything; it is present for compatibility reasons.

Links:

- [more at ss64.com](#)
- [more at Microsoft, Windows XP](#)
- [more at Microsoft, Windows Server 2008, Windows Vista](#)

### 4.32 NET

Provides various network services, depending on the command used. Available variants per command:

- `net accounts`

- `net computer`
- `net config`
- `net continue`
- `net file`
- `net group`
- `net help`
- `net helpmsg`
- `net localgroup`
- `net name`
- `net pause`
- `net print`
- `net send`
- `net session`
- `net share`
- `net start`
- `net statistics`
- `net stop`
- `net time`
- `net use`
- `net user`
- `net view`

Links:

- [net at ss64.com](#)
- [net at Microsoft](#)

### 4.33 OPENFILES

Performs actions pertaining to open files, especially those opened by other users over the network. The actions involve querying, displaying, and disconnecting. For more, type “`openfiles /?`”.

Links:

- [openfiles at ss64.com](#)
- [openfiles at Microsoft](#)

### 4.34 PING

Synopsis:

- **PING /?**
- **PING** address
- **PING** hostname

Send ICMP/IP “echo” packets over the network to the designated address (or the first IP address that the designated hostname maps to via name lookup) and print all responses received.

Links:

- [ping at ss64.com](#)
- [ping at Microsoft](#)

### 4.35 RECOVER

Recovers as much information as it can from damaged files on a defective disk.

Links:

- [recover at ss64.com](#)
- [recover at Microsoft](#)

### 4.36 REPLACE

Replaces files in the destination folder with same-named files in the source folder.

Links:

- [replace at ss64.com](#)
- [replace at Microsoft](#)

### 4.37 ROBOCOPY

(Not in XP) Copies files and folders. See also XCOPY and COPY.

Links:

- [robocopy at ss64.com](#)
- [robocopy at Microsoft](#)

### 4.38 RUNDLL32

Runs a function available from a DLL. The available DLLs and their functions differ among Windows versions.

Examples:

- `rundll32 sysdm.cpl,EditEnvironmentVariables`
  - In some Windows versions, opens the dialog for editing environment variables.

Links:

- [rundll32 at ss64.com](#)
- [rundll at robvanderwoude.com](#)
- [dx21.com](#) - lists rundll32 examples

### 4.39 SCHEDULE

Schedules a program to be run at a certain time, more powerful than AT.

Links:

- [schtasks at ss64.com](#)
- [schtasks at Microsoft](#)

### 4.40 SETX

Like SET, but affecting the whole machine rather than the current console or process. Not available in Windows XP; available in Windows Vista and later.

Links:

- [setx at ss64.com](#)
- [setx at Microsoft](#), Windows Server 2008, Windows Vista

### 4.41 SHUTDOWN

Shuts down a computer, or logs off the current user.

Links:

- [shutdown at ss64.com](#)
- [shutdown at Microsoft](#)

#### 4.42 SORT

Sorts alphabetically, from A to Z or Z to A. Cannot sort numerically: if the input contains one integer per line, “12” comes before “9”.

Examples:

- `sort File.txt`
  - Outputs the sorted content of File.txt.
- `sort /r File.txt`
  - Sorts in reverse order, Z to A.
- `dir /b | sort`

Links:

- [sort at ss64.com](#)
- [sort at Microsoft](#)

#### 4.43 SUBST

Assigns a drive letter to a local folder, displays current assignments, or removes an assignment.

Examples:

- `subst p: .`
  - Assigns p: to the current folder.
- `subst`
  - Shows all assignments previously made using subst.
- `subst /d p:`
  - Removes p: assignment.

Links:

- [subst at ss64.com](#)
- [subst at Microsoft](#)

#### 4.44 SYSTEMINFO

Shows configuration of a computer and its operating system.

Links:

- [systeminfo at ss64.com](#)
- [systeminfo at Microsoft](#)

#### 4.45 TASKKILL

Ends one or more tasks.

Examples:

- `taskkill /IM AcroRd32.exe`
  - Ends all process with the name “AcroRd32.exe”; thus, ends all open instances of Acrobat Reader. The name can be found using `tasklist`.
- `tasklist | find “notepad”`  
`taskkill /PID 5792`
  - Ends the process AKA task with process ID (PID) of 5792; the assumption is you have found the PID using `tasklist`.

Links:

- [taskkill at ss64.com](#)
- [taskkill at Microsoft](#)

#### 4.46 TASKLIST

Lists tasks, including task name and process id (PID).

Examples:

- `tasklist | sort`
- `tasklist | find “AcroRd”`
- `tasklist | find /C “chrome.exe”`
  - Displays the number of tasks named “chrome.exe”, belonging to Google Chrome browser.

Links:

- [tasklist at ss64.com](#)
- [tasklist at Microsoft](#)

#### 4.47 TIMEOUT

Waits a specified number of seconds, displaying the number of remaining seconds as time passes, allowing the user to interrupt the waiting by pressing a key. Also known as delay or sleep. Available in Windows Vista and later.

Examples:

- `timeout /t 5`

- Waits for five seconds, allowing the user to cancel the waiting by pressing a key.
- `timeout /t 5 /nobreak`
  - Waits for five seconds, ignoring user input other than Control + C.
- `timeout /t 5 /nobreak >nul`
  - As above, but with no output.

Workaround in Windows XP:

- `ping -n 6 127.0.0.1 >nul`
  - Waits for five seconds; the number after `-n` is the number of seconds to wait plus 1.

Perl-based workaround in Windows XP, requiring Perl installed:

- `perl -e "sleep 5"`
  - Waits for 5 seconds.

Links:

- [timeout at ss64.com](#)
- [timeout at Microsoft](#)
- [How to wait in a batch script? at stackoverflow.com](#)
- [Sleeping in a batch file at stackoverflow.com](#)

## 4.48 TREE

Displays a tree of all subdirectories of the current directory to any level of recursion or depth. If used with `/F` switch, displays not only subdirectories but also files.

Examples:

- `tree`
- `tree /f`
  - Includes files in the listing, in addition to directories.
- `tree /f /a`
  - As above, but uses 7-bit ASCII characters including "+", "-", and "\" to draw the tree.

A snippet of a tree using 8-bit ASCII characters:

```
|-----winevt | |-----Logs | |-----TraceFormat
|-----winrm
```

A snippet of a tree using 7-bit ASCII characters:

```
+---winevt | +---Logs | \---TraceFormat +---winrm
```

Links:

- [tree at Microsoft](#)

## 4.49 WHERE

Displays the location of a file, searching in the current directory and in the PATH by default. Does some of the job of “which” command of some other operating systems.

Available on Windows 2003, Windows Vista, Windows 7, and later; not available on Windows XP. An alternative to be used with Windows XP is in the examples below.

Does not find internal commands, as there are no dot exe files for them to match.

Examples:

- `where find`
  - Outputs the location of the find command, possibly “C:\Windows\System32\find.exe”.
- `for %i in (find.exe) do @echo %~$PATH:i`
  - Outputs the location of “find.exe” on Windows XP. The name has to include “.exe”, unlike with the where command.
- `where /r . Tasks*`
  - Searches for files whose name matches “Task\*” recursively from the current folder. Similar to “`dir /b /s Tasks*`”

Links:

- [where at ss64.com](#)
- [Is there an equivalent of 'which' on windows?](#)

## 4.50 WMIC

Starts Windows Management Instrumentation Command-line. For more, type “`wmic /?`”.

Links:

- [wmic at ss64.com](#)
- [wmic at Microsoft](#)

## 4.51 XCOPY

Copies files and directories in a more advanced way than COPY, deprecated in Windows Vista and later. Type `xcopy /?` to learn more, including countless options.

Examples:

- `xcopy C:\Windows\system`
  - Copies all files, but not files in nested folders, from the source folder (“C:\Windows\system”) to the current folder.

- `xcopy /s /i C:\Windows\system C:\Windows-2\system`
  - Copies all files and folders to any nesting depth (via `/s`) from the source folder (`C:\Windows\system`) to `C:\Windows-2\system`, creating `Windows-2\system` if it does not exist (via `/i`).
- `xcopy /s /i /d:09-01-2014 C:\Windows\system C:\Windows-2\system`
  - As above, but copies only files changed on 1 September 2014 or later. Notice the use of the month-first convention even if you are on a non-US locale of Windows.
- `xcopy /L /s /i /d:09-01-2014 C:\Windows\system C:\Windows-2\system`
  - As above, but in a test mode via `/L` (list-only, output-only, display-only). Thus, does not do any actual copying, merely lists what would be copied.

Links:

- [xcopy at ss64.com](#)
- [xcopy at Microsoft](#)

## 5 External links

- [Windows XP - Command-line reference A-Z at microsoft.com](#)
- [Windows CMD Commands at ss64.com](#) -- licensed under Creative Commons Attribution-Non-Commercial-Share Alike 2.0 UK: England & Wales, and thus incompatible with CC-BY-SA used by Wikibooks
- [The FreeDOS HTML Help at fdos.org](#) -- a hyper-text help system for FreeDOS commands, written in 2003/2004, available under the GNU Free Documentation License

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### 6.1 Text

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