

NAME

units – decimal and binary prefixes

DESCRIPTION**Decimal prefixes**

The SI system of units uses prefixes that indicate powers of ten. A kilometer is 1000 meter, and a megawatt is 1000000 watt. Below the standard prefixes.

Prefix	Name	Value
y	yocto	$10^{-24} = 0.000000000000000000000001$
z	zepto	$10^{-21} = 0.00000000000000000000001$
a	atto	$10^{-18} = 0.00000000000000000000001$
f	femto	$10^{-15} = 0.00000000000000000000001$
p	pico	$10^{-12} = 0.00000000000000000000001$
n	nano	$10^{-9} = 0.00000000000000000000001$
μ	micro	$10^{-6} = 0.000001$
m	milli	$10^{-3} = 0.001$
c	centi	$10^{-2} = 0.01$
d	deci	$10^{-1} = 0.1$
da	deka	$10^1 = 10$
h	hecto	$10^2 = 100$
k	kilo	$10^3 = 1000$
M	mega	$10^6 = 1000000$
G	giga	$10^9 = 1000000000$
T	tera	$10^{12} = 1000000000000$
P	peta	$10^{15} = 1000000000000000$
E	exa	$10^{18} = 1000000000000000000$
Z	zetta	$10^{21} = 1000000000000000000000$
Y	yotta	$10^{24} = 1000000000000000000000000$

The symbol for micro is the Greek letter mu, often written u in an ASCII context where this Greek letter is not available. See also

<http://physics.nist.gov/cuu/Units/prefixes.html>

Binary prefixes

The binary prefixes resemble the decimal ones, but have an additional 'i' (and "Ki" starts with a capital 'K'). The names are formed by taking the first syllable of the names of the decimal prefix with roughly the same size, followed by "bi" for "binary".

Prefix	Name	Value
Ki	kibi	$2^{10} = 1024$
Mi	mebi	$2^{20} = 1048576$
Gi	gibi	$2^{30} = 1073741824$
Ti	tebi	$2^{40} = 1099511627776$
Pi	pebi	$2^{50} = 1125899906842624$
Ei	exbi	$2^{60} = 1152921504606846976$

See also

<http://physics.nist.gov/cuu/Units/binary.html>

Discussion

Before these binary prefixes were introduced, it was fairly common to use k=1000 and K=1024, just like b=bit, B=byte. Unfortunately, the M is capital already, and cannot be capitalized to indicate binary-ness.

At first that didn't matter too much, since memory modules and disks came in sizes that were powers of two, so everyone knew that in such contexts "kilobyte" and "megabyte" meant 1024 and 1048576 bytes, respectively. What originally was a sloppy use of the prefixes "kilo" and "mega" started to become regarded as the "real true meaning" when computers were involved. But then disk technology changed, and disk

sizes became arbitrary numbers. After a period of uncertainty all disk manufacturers settled on the standard, namely $k=1000$, $M=1000\text{ k}$, $G=1000\text{ M}$.

The situation was messy: in the 14k4 modems, $k=1000$; in the 1.44 MB diskettes, $M=1024000$; and so on. In 1998 the IEC approved the standard that defines the binary prefixes given above, enabling people to be precise and unambiguous.

Thus, today, $\text{MB} = 1000000\text{ B}$ and $\text{MiB} = 1048576\text{ B}$.

In the free software world programs are slowly being changed to conform. When the Linux kernel boots and says

```
hda: 120064896 sectors (61473 MB) w/2048KiB Cache
```

the MB are megabytes and the KiB are kibibytes.

COLOPHON

This page is part of release 5.02 of the Linux *man-pages* project. A description of the project, information about reporting bugs, and the latest version of this page, can be found at <https://www.kernel.org/doc/man-pages/>.