

# convert\_units

v. 1.0

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4 September 2017

`convert_units` performs unit conversions, providing a command-line interface to the `Units` module that accompanies `rxntoarb` (`lib/units.rb` in the `rxntoarb` root directory). `convert_units` requires Ruby 1.9 or newer.

## Contents

1	Invocation and command-line options	1
2	Examples	2
3	Copyright and licence	3

## 1 Invocation and command-line options

`convert_units` is invoked as follows:

```
convert_units [options_list] <input_string> [output_units].
```

`input_string` should consist of an optional numerical value (assumed to be 1.0 if not specified) and a list of unit abbreviations, all of which should be separated by spaces. Accepted unit abbreviations may be accessed by calling `convert_units` with the `-l` flag, but there shouldn't be too many surprises; of note are `degC`, `degF`, and `degR` for °C, °F, and °R, respectively. Any valid SI prefix (see [Table 1](#)) may immediately precede the unit name; note that `u` is used for the 'micro' prefix. Exponents on units should immediately follow the unit name, optionally preceded by the `^` character. Use of a solidus (/) to indicate reciprocal units is not supported; use negative exponents instead.

The optional `output_units` should contain the units into which the input is to be converted, following the same conventions described above. If `output_units` is present then it must have the same dimensions as `input_string`. If `output_units` is omitted (or an empty string) then conversion to SI base units will be performed.

The optional `options_list` may include any of the following:

**Table 1** SI prefixes. Note that `convert_units` uses `u` (instead of  $\mu$ ) for the ‘micro’ prefix.

name	prefix	factor	name	prefix	factor
yotta	Y	$10^{24}$	deci	d	$10^{-1}$
zetta	Z	$10^{21}$	centi	c	$10^{-2}$
exa	E	$10^{18}$	milli	m	$10^{-3}$
peta	P	$10^{15}$	micro	u	$10^{-6}$
tera	T	$10^{12}$	nano	n	$10^{-9}$
giga	G	$10^9$	pico	p	$10^{-12}$
mega	M	$10^6$	femto	f	$10^{-15}$
kilo	k	$10^3$	atto	a	$10^{-18}$
hecto	h	$10^2$	zepto	z	$10^{-21}$
deka	da	$10^1$	yocto	y	$10^{-24}$

- `-a|--arb` Output in *arb* format, i.e. with units in square brackets before the numerical value. Implies `-d`.
- `-d|--double-precision` Output is formatted using the letter `d` for exponents (Fortran double precision copy-and-paste mode).
- `-f|--format <format>` Output is formatted using the specified format string. Any format string recognised by Ruby’s `Kernel#sprintf` method is valid.
- `-l|--list` List all recognised units and their abbreviations.
- `-s|--sig-figs` Output with the same number of significant figures as the input. Overrides `-f`.
- `-t|--tdiff` Specifies that input temperatures should be interpreted as temperature differences rather than references to absolute temperatures. See § 2 for examples.
- `-v|--version` Print version information.

## 2 Examples

```
> convert_units 'nM'
1e-06 mol m-3
> convert_units '0.84 pmol cm-2 min-1'
1.4e-10 mol m-2 s-1
> convert_units '11.893 mile h-1' 'ft s-1'
17.4431 ft s-1
```

*arb format:*

```
> convert_units -a '0.84 pmol cm-2 min-1'
[mol m-2 s-1] 1.4d-10
```

*Double precision mode:*

```
> convert_units -d '0.84 pmol cm-2 min-1'
1.4d-10 mol m-2 s-1
> convert_units -d '11.893 mile h-1' 'ft s-1'
17.4431d0 ft s-1
```

*Custom output formats:*

```
> convert_units -f '%.3e' '1478.5 kJ kg-1 K-1' 'BTU lb-1 degF-1'
3.531e+02 BTU lb-1 degF-1
> convert_units -f '%.3f' '1478.5 kJ kg-1 K-1' 'BTU lb-1 degF-1'
353.132 BTU lb-1 degF-1
> convert_units -f '%.3g' '1478.5 kJ kg-1 K-1' 'BTU lb-1 degF-1'
353 BTU lb-1 degF-1
```

*Significant figures mode:*

```
> convert_units '10 atm' 'Pa'
1.01325e+06 Pa
> convert_units -s '10 atm' 'Pa'
1.0e+06 Pa
```

*Temperature conversions:*

```
> convert_units '100 degC'
373.15 K
> convert_units -t '100 degC'
100 K
> convert_units -- '-40 degC' 'degF'
-40 degF
> convert_units -t -- '-40 degC' 'degF'
-72 degF
```

### 3 Copyright and licence

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