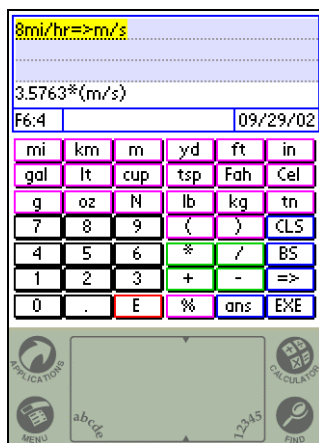


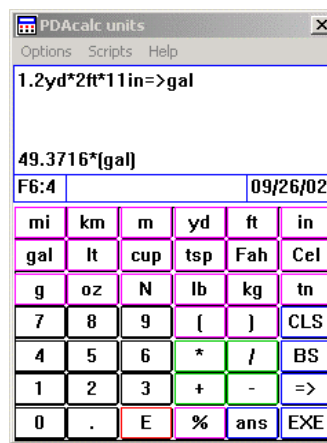
PDAlc units

The calculator for unit conversion on the
Palm®, PocketPC and Windows platforms

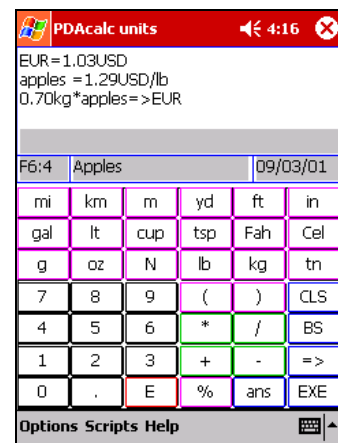
PDAlc™ units is a conversion calculator that automatically performs unit conversions. Units of measurements, while not required, can help detect errors and enhance the display of computed results. When you first start PDAlc™ units, a complete set of commonly used units is available for your calculations.



Palm OS device



Windows



PocketPC

The functionality of PDAlc™ units is not depending on the platform it is used on. A script written on your laptop works exactly the same on a PocketPC and a palm OS device. However a 800Mhz Pentium can process the scripts a bit faster then the processor in a palm OS device.

User manual

Version 1.30

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Computing with units

Use => to select which unit you want to convert to. For example if you like to convert 4 miles to kilometers type: 4mi=>km and press EXE. To calculate how many gallons a container of 1.2 yards wide, 2 feet deep and 11 inches high will hold type:
1.2yd*2ft*11in=>gal and press EXE

Without the conversion symbol '=>' PDAlc™ units will convert the result to the base unit. For example 110V * 16A will be converted to watts, 1760*(W)

When you try to add different units like 110V + 16A an error will be shown since this is not valid calculation. Its like adding apples and oranges which is not valid either.

Assigning units

Lets assume you like to compare the price of apples in the US with the price of apples in Europe. Type:
EUR=1.03USD
apples =1.29USD/lb
0.70kg*apples=>EUR

Changing the keyboard

The user can change the layout of the keyboard by changing a little text file. Commas separate the text for the buttons. The buttons are resized automatically depending on the total number of buttons per keyboard.

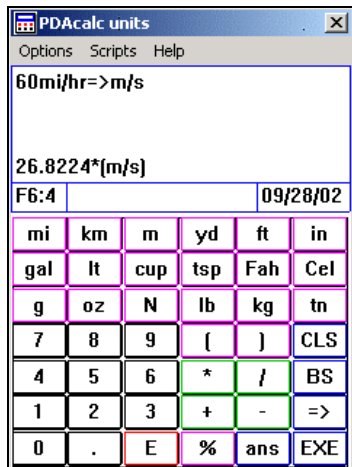
Help information

To select a unit that is not shown on the keyboard select units from the help menu. After selecting a category a list of units will be shown. Added units are only shown in the appropriate category. After adding a unit like EUR=1.03USD this unit will only be shown in the currency category.

Base units

<u>Description</u>	<u>Abbreviation</u>	<u>Unit</u>
Distance	m	meter
Mass	kg	kilogram
Time	sec	seconds
Current	A	ampere
Temperature	Cel	Celsius
Luminous intensity	cd	candela
Substance	mol	mol
Currency	CUR	Default currency.

The main screen



The first few lines are called the **scratchpad**. In the example on the left 60mi/hr=>m/s is shown in the **scratchpad**.

Below the scratchpad is the result line that as the name suggests displays the result of the calculation.

Below the result line is the status line that shows the display format, loaded script and the date.

Press EXE, execute, to calculate the result.

The scripts

PDAlc™ units scripts are stored in three different categories and are all standard text files for compatibility reasons. Opening a script with a standard editor will show that the first line of each script contains the program name. This is done for compatibility reasons with palm OS devices.

User scripts

Loading a script from this category will display the contents of the script in the scratchpad. This is where you store little scripts that you need to change frequently. A good example is the little script below:

```
EUR=1.03USD
apples=1.29USD/lb
0.70kg*apples=>EUR
```

After loading this little script it is easy to change in the scratchpad and press [exe] to calculate the new result. Changes are not saved.

Conversion

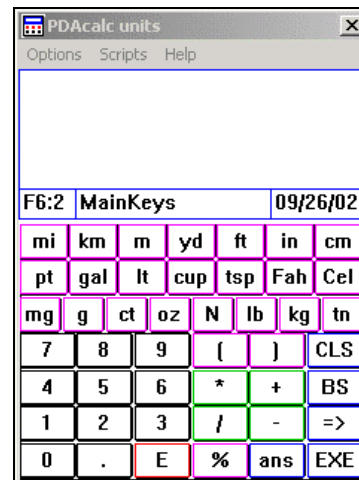
Loading a script from this category will not display the contents of the script in the scratchpad. This is where you store the bigger scripts that don't change. After a script in the category is loaded PDAlc™ units will check for a script in the keyboard category with the exact same name. When such a file exists it will be loaded and the keyboard layout will be changed accordingly.

Keyboard

Loading a script from this category will change the layout of the keyboard. Below is the little script used to create the keyboard layout on the right.

```
mi,km,m,yd,ft,in,cm
pt,gal,lt,cup,tsp,Fah,Cel
mg,g,ct,oz,N,lb,kg,tn
7,8,9,(,),CLS
4,5,6,*+,BS
1,2,3,/,-,=>
0,.,E,%,ans,EXE
```

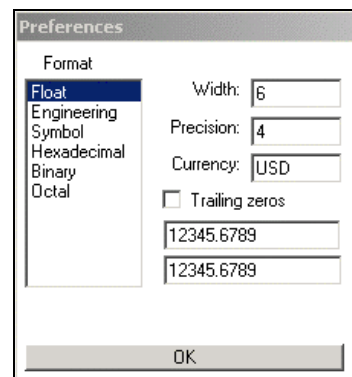
Notice the comma's between the text for each button. Deleting the top line for instance will increase the height of each button to use the same screen space for the keyboard. The width of the keys is also automatically adjusted and depending on the number of buttons per row.



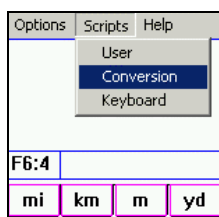
Preferences

The preference screen allows you to change the format in which numbers are displayed and the default currency.

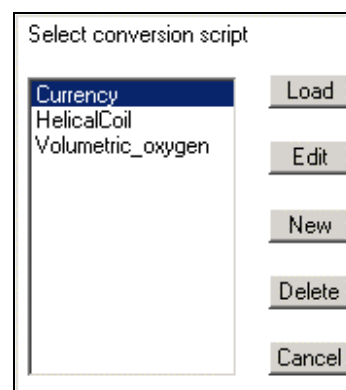
As shown on the right six different formats are supported. This screen also shows how the value 12345.6789 will be displayed based on the settings. The screenshot shows the engineering format. When the number is greater than 10^{Width} an exponent is used to display the value. In the screenshot the value 12345.6789 is greater than 10^4 and the trailing zeros are shown because the trailing checkbox is checked.



Selecting a file

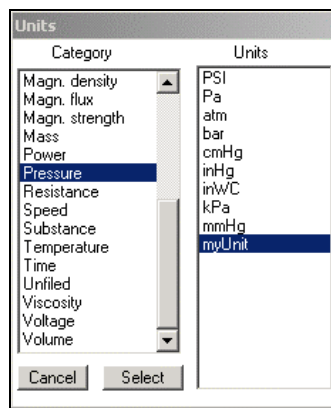


From the menu Scripts select the category conversion. The screen on the right appears. Selecting a script and pressing 'Load' will load the script. Selecting a script and selecting 'Edit' will bring you to the edit window that allows you to make changes. Press the button 'New' to create a new file in the selected category. Selecting a script and pressing 'Delete', well I let you guess what that does. Cancel will bring you back to the main screen.



Selecting units

As a little example type myUnit=89Pa in the scratchpad of the main screen. Next press the exe button to add this variable. Now highlight =89Pa and press the plus button. The scratchpad shows myUnit+. Select help from the menu and select Units from the help menu. A screen as shown on the right appears. Select 'Pressure' from the category list and notice the new unit 'myUnit' at the bottom of the list. When you add a new unit it will be automatically stored in the appropriate category. Next select PSI and press select. This will bring you back to the main screen and the scratchpad shows myUnit+PSI. Add =>Pa and press exe. The result is the same as 89Pa+PSI=>Pa.



Functions

Function	Discription	Unit
<i>Sqr(X)</i>	Square root	none
<i>Cel(T)</i>	Converts celcius to default temperature unit	Temperature
<i>Fah(T)</i>	Converts Fahrenheit to default temperature unit	Temperature

Appendix

Volumetric example

PDAlc™ units includes the following example script:

From the conversion category select the Volumetric_oxygen script.
 // Volumetric flow and mass flow

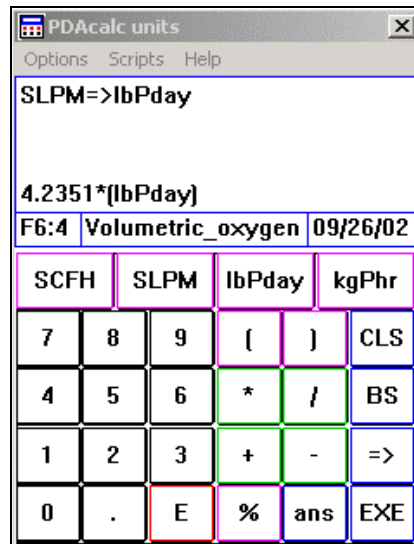
```
// Oxygen
// 1 atmosphere
// 70 degrees F
// 90% purity
density=1.334039547kg/m^3
```

```
SLPM=lt/min
SCFH=ft^3/hr
lbPday=lb/(density*day)
tnPday=tn/(density*day)
kgPhr=kg/(density*hr)
```

Notice that everything behind the // will not be processed and can be used to add remarks to a script.

After pressing load the Volumetric_oxygen script from the keyboard category will be loaded and the screen shown on the right will appear.

The density in this script can be easily changed to any other gas or fluid.



Mole-volume

Given :

$$n = 1 \cdot \text{mole}$$

$$R = 8.32441 \cdot \frac{\text{J}}{\text{K} \cdot \text{mol}}$$

$$T = 25^\circ \text{Celcius}$$

$$P = 1013 \cdot \text{mbar}$$

Calculate the mol-volume V_m in liters, i.e. for the volume that **1** mol of a gas occupies

$$V_m = \frac{n \cdot R \cdot T}{p}$$

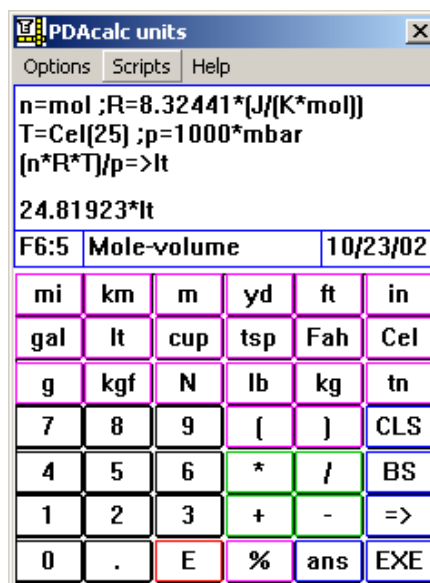
$$V_m = \frac{1 \cdot \text{mole} \cdot 8.32441 \cdot \frac{\text{J}}{\text{K} \cdot \text{mol}} \cdot 298.15 \cdot \text{K}}{1013 \cdot \text{mbar}}$$

Now type the little script below in the scratchpad and check if PDAlc units will print the result in liters.

n=mol ;R=8.32441*(J/(K*mol))
T=Cel(25) ;p=1013*mbar
(n*R*T)/p=>lt

If you are familiar with this formula you probably think that this is to good to be true. Well that is easy to test. Just change the last line into **(n*R*T)/p=>K** and try to convert the result to Kelvin. You will see that the result is shown in m^3 since that is the default measure of volume.

Of course you should save the constant R in a script if you use it often and change the layout of the keys for easier entry of the values and units.



Helical Coil Spring

A tightly wound helical coil spring is made from a material whose shear modulus is **G**. The bar from which the spring is made has a diameter **D**. The spring has a coil radius **r** with **Nc** active coils. What is the change in length of the spring from its un stretched length when the spring hangs vertically with one end fixed and a block of mass **m_b** attached to its other end?

PDACalc™ units includes the following example script:
From the conversion category select the HelicalCoil script.

```
HelicalCoil
G=80E9*N/m^2
D=0.018m
Nc=80
r=0.08m
mb=200kg

// The stiffness
k=(G*D^4)/(64*Nc*r^3)

// The change in length
// of the spring due to
// the attached mass
x=(mb*g)/k
```

Predefined units

<u>Abbreviation</u>	<u>Multiplication</u>	<u>Unit</u>
Constants		
pi	3.141592654	
g	9.80665	m/s ²
Distance		
mi	1609.344	m
km	1000	m
yd	0.9144	m
ft	0.3048	m
in	0.0254	m
cm	0.01	m
Area		
acre	4046.86	m ²
ha	10000	m ²
Volume		
tsp	5.00E-06	m ³
cup	0.000236587	m ³
lt	0.001	m ³
gal	0.0037854	m ³
pt	0.0004732	m ³
Mass		
ct	0.0002	kg
dyn	1.02E-06	kg
gr	0.001	kg
mg	1.00E-06	kg
N	0.101971621	kg
oz	0.0283495	kg
lb	0.453592	kg
tn	1000	kg
Voltage		
mV	0.001	V
kV	1000	V
Current		
mA	0.001	A
kA	1000	A
Resistance		
kohm	1000	ohm
Mohm	1.00E+06	ohm

Power

mW	0.001	W
kW	1000	W

Induction

mH	1.00E-03	H
uH	1.00E-06	H

Capacity

uF	1.00E-06	F
nF	1.00E-09	F
pF	1.00E-12	F

Frequency

kHz	1.00E+03	Hz
MHz	1.00E+06	Hz

Speed

mph	5793638.4	m/s
kph	3.60E+06	m/s

Force

mN	0.001	N
kN	1000	N

Pressure

atm	101325	Pa
bar	1.00E+05	Pa
mbar	100	Pa
cmHg	1333	Pa
inHg	3386.28	Pa
inWC	249.061	Pa
mmHg	133.3223684	Pa
PSI	6894.757293	Pa
kPa	1000	Pa

Magnetic density

Gs	1.00E-04	T
----	----------	---

Energy

Btu	1055.055853	J
kCal	4.19E+03	J
cal	4.1868	J
eV	1.60E-19	J
kWh	3600000	J

Temperature

Fah	$C = (F - 32) * 5 / 9$	Cel
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Any comments or suggestions are very welcome!