RedCrab

The Calculator

User Manual

RedCrab The Calculator

Version 4.30

This program can be used indefinitely as freeware. By purchasing a limited shareware license, additional features are enabled. This manual describes the basic features available in freeware and shareware mode.

With RedCrab freeware you can load data sheet which includes shareware programs. The worksheet is free to use, but the program code is read only and file saved is disabled.

data sheet which includes shareware programs can by load and use

We are not liable for any error in software or manual. Usage is at your own risk.

System requirement
Minimum Pentium P4 and 1 GB RAM.
Operating system: *Microsoft Windows*.
The following fonts: ***Courier New*** and ***Symbol*** must be installed in your system. These fonts belonged to Microsoft [*]*Windows* systems.

No installation of the software is required. You can just copy the software to your system and starts the programs.

Calculation range: 1.7e 308 to 5e-324
Accuracy: 15 digits
Display: 15 digits

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RedCrab – The Calculator

RedCrab is a scientific calculator with a full screen editor. Mathematical expressions are not entered here in a single command line, but writing in any editor position similar to a sheet of paper.

The handling of the basic functions is just like a conventional calculator. There is no training required. Whoever can operate a pocket calculator can also use ***RedCrab*** without studying the manual. This guide describes advanced features which a normal calculator does not possess.

Additional Information: www.redchillicrab.com/en/redcrab/tutor.html

RedCrab is fully portable. The program can be started from external data storage source without installation. Settings can be stored as a file in the programs root directory instead in the PC' s Windows registry. If you start ***RedCrab*** from a USB flash drive, your settings are stored on the stick. See also the paragraph at the bottom: 6.57 Settings to Registry.

1.0 Mathematical Expressions

1.1 Basics

You can write your formula basically at any editor position. Any expression may occupied any number of rows and columns. It not allowed to split an expression and continue in the next row.

Wrong:
```
z = 12+14+15+20
     +5+10
```

Correct:
```
z = 12+14+15+20+5+10
```

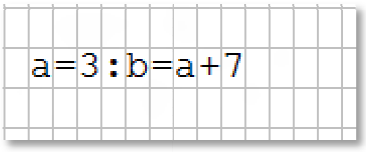
Correct:
```
X = 12+14+15+20
Z = X+5+10
```

You can write several mathematical expressions on one work sheet. The expressions result displays only if terminated with equal sign.

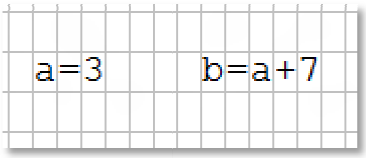
Example 1:
```
a+b      =108
a=27+9
8*4      =32
b=12*6   =72
```

Several mathematical expressions can be written per row. Between each mathematical expression, there must either a minimum number at blank columns (defined in ***Menu Options.Column Space***) or a colon must be set.

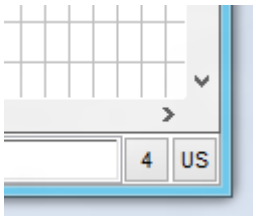
Example 1:



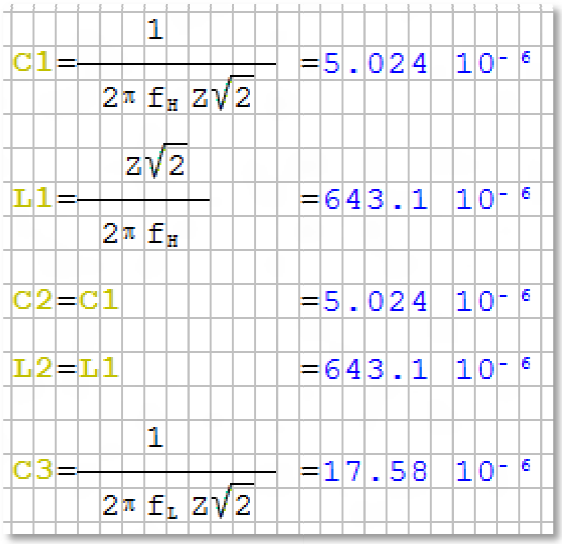
Example 2:



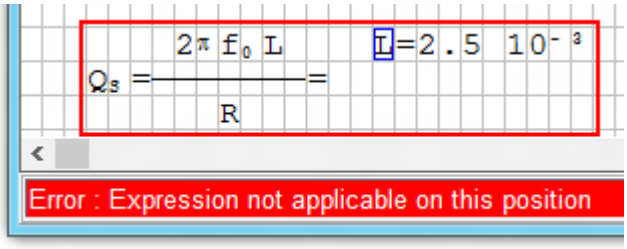
The minimum distance displayed at bottom right corner, next to the keyboard setting. In example 2 the minimum distance is set to 4 columns.



An equal sign behind a formula is always assigned to the previous formula, even if the distance to the formula is greater than the column space setting. In the example right, the distance of the equal sign is up to eight columns, although the minimum distance is only four columns.



Close proximity can caused unexpected errors. For error localization ***RedCrab*** marked the cell where an error is detected with a blue frame. It also marks the incorrect formula with a red frame. In the example below, an invalid assignment is signaled. The red box shows, however, that two formulas were joined because the distance is too close. The setting in this example is 4 columns, the distance between the formulas is only 2 columns.



1.2 Simple Addition

1. Enter the expression 17 + 4
2. For result press ***Ctrl+Enter***

The ***Ctrl+Enter*** key starts ***RedCrab*** and displays the result. Alternative click the function panels ***Enter*** button. Results are always displayed in blue.

The display shows: `17+4=21`

Variable and Values

1. Enter the expression 17 + 4 + X
2. Enter the assignment X = 43
3. For result press ***Ctrl+Enter***

RedCrab displays the result: 64

The display shows: `17+4+X=64`
`X=43`

The assignment can be entered at any position.

1.3 Exponent

The expression: $c = a^2 + 4^2$.

1. Enter the expression: c = a ***Ctr+2*** + 4 ***Ctr+2*** + =
2. Press ***Ctrl+Enter*** to display result.

The display shows: $c=3^2+4^2=25$

The keys ***Ctrl+2*** write the exponent 2. With the keys ***Ctrl+3*** you can write the exponent 3. For use of any other values for exponents, press the ***Ctrl+6*** keys or click the ***Superscript*** Button to enter the ***Super*** mode. Then enter the exponent value. Press ***Ctrl+6*** or ***Enter*** or click the ***Superscript*** Button to leave the super mode.

1.4 Subscript and Implied Multiplication

Enter the formula: $X_L = \omega L$

1. Press the following keys : X ***Ctr+_*** L ***Enter*** = ***Ctrl+W*** L =
2. Enter the assignment $\omega=2\pi f$; press the keys : ***Ctrl+W*** = 2 ***Ctrl+P*** f
3. Enter the assignment f = 2200
4. Enter the assignment $L=0.8\ 10^{-3}$; press the keys : L = 0.8 10 ***Ctrl+6*** - 3 ***Enter***
5. Press the keys ***Ctrl+Enter***

With the keys ***Ctrl+_*** (*underscore)* you can switch ***Subscript*** on / off. Alternative use ***Enter*** to leave ***Subscript*** region.

The ***Ctrl*** key shifts the letters to the alternative font. The example above shows that the keys ***Ctrl+P*** displayed the Hellenic letter ***Pi (π).***

The display shows:

$X_L=\omega L=11.06$

$\omega=2\pi f$

$f=2200$

$L=0.8\ 10^{-3}$

The example above show one more features of RedCrab: the ***implied multiplication***. That means you do not need to include the multiplication operator

Example: RedCrab interprets $X_L = \omega L$ as $X_L = \omega * L$

RedCrab interprets a sequence of letters, for example, *ab*, as different variable. Exclude subscript letters, for example X_L. Subscript letters always belong to the variable on the left.

Example:

abc : a * b * c

3ab : 3 * a * b

$2X_L = 2 * X_L$

$R_1R_2 = R_1 * R_2$

Use the Escape mode if you want a sequence of letters for a single variable. Read more about the Escape mode in the description below.

1.5 Fraction and Square Root

Enter a formula with a fraction and a square root.

1. Enter the fraction line and the numerator : f = ***Ctrl +/ Enter*** 1 ***Enter***
2. Enter the denominator : 2 ***Ctrl+P Ctrl + 1*** LC
3. Assignment L : L=0.8 10 ***Ctrl+6*** - 3
4. Assignment C: C=4.7 10 ***Ctrl+6*** - 6
5. Press ***Ctrl+Enter*** for result.

The display shows:

$$f=\frac{1}{2\pi\sqrt{LC}}=2.6\ 10^{3}$$

$$L=0.8\ 10^{-3}$$
$$C=4.7\ 10^{-6}$$

To write a fraction line press ***Ctrl+/*** (forward slash) key. Read more information below about fractions in the description.

The keys ***Ctrl+1*** write a root symbol at the cursor position, and then mark the range which should be below the root. Click the root symbol and the editor draw the root line above the marked range. Read more information about square roots in the description below.

1.6 Hexadecimal, octal and binary input

The RedCrab editor accepts input of hexadecimal numbers up to 13 digits. The hexadecimal number must mark with a dollar symbol before it. The use of small or capital letters are allowed.

Example: $1F2A or 1f2a

An octal number is marked with the dollar symbol and the letters ***oct***. The length is limited to 20 characters.

Example: `$oct3721`

A binary number is marked with the dollar symbol and the letters ***bin***. The length is limited to 20 characters.

Example: `$bin110101`

You can use hexadecimal, octal or binary numbers in any position of a formula like decimal numbers. Between this number and the following number or variable must be a space or operator symbol.

Example: Correct: `$1F2A*X` or `$1F2A X`
Wrong: `$1F2AX =>` generate an error message.

Results can be displayed as hexadecimal, octal or binary number in result boxes. Read below ***Result Box / Format Commands***.

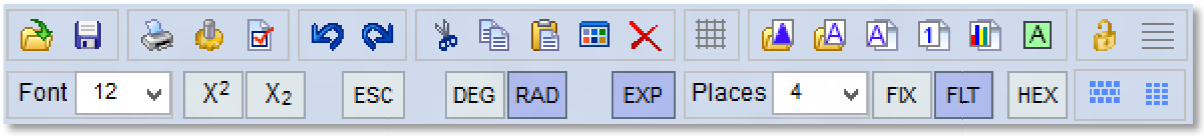
1.7 Operators

RedCrab enable you to enter numbers and functions in a simple, straightforward sequence. The table below shows the order in which functions in expressions are entered and evaluated.

1	SIN( ), NOT( ), root... and all functions left of the argument
2	X^2, .. ,
3	join
4	*, /, DIV, MOD, AND, SHL, SHR, INCL, EXCL,
5	+, -, OR, XOR

Within a priority group, RedCrab evaluates functions from left to right. Calculations within a pair of parentheses are evaluated first.

2.0 The Toolbox

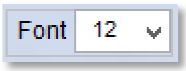


2.1 Fonts

The editor used the ***New Courier*** and ***Symbol*** fonts. They are usually included with Windows operating system. ***New Courier*** is the default font. The ***Symbol*** font includes Hellenic letters and special symbols.

You can type in letter of the alternative font by pressing the ***Ctrl*** key. Example: press ***Ctrl+P*** to write the character π or ***Ctrl+L*** to write the letter λ.

2.2 Font Size



The combo box shows the actual font size. You can change the font size with use of the combo button at the right or write the new font size in the box. The maximal font size is 512.

2.3 Superscript

Use ***Superscript*** to write an exponent. Toggle the ***Superscript*** mode per mouse click on the toolbox X^2 button.

If you click the button when the cursor is on a character, the character under the cursor changed from normal letters in ***superscript***. The ***Superscript*** mode is not enabled in this case, only the sign is changed. Similarly, the character can be reseted by ***superscript*** in normal font.

As described above you can change selected cells to ***Superscript*** or reset

Alternate key functions:

- Function key ***Ctrl+6*** enabled / disabled ***Superscript*** mode
- Function key ***F3*** enabled / disabled ***Superscript*** mode.
- The ***Enter*** key leave the Superscript mode.
- ***Superscript*** mode disabled if you enter a non alpha numeric sign .Same thing if you select cells.

2.4 Subscript

To write name extensions in ***Subscript*** mode click on the toolbox X_2 button.

If you click the button when the cursor is on a character, the character under the cursor changed from normal letters in ***subscript***. The ***Subscript*** mode is not enabled in this case, only the sign is changed. Similarly, the character can be reseted by ***Subscript*** in normal font.

As described above you can change selected cells to ***Subscript*** or reset

The *underscore_* key and ***Ctrl+_*** *(underscore)* toggles *Subscript* too.
Alternate key functions:

- The *underscore_* key and ***Ctrl+_*** *(underscore)* toggles ***Subscript*** too.
- ***Subscript*** mode can be enabled / disabled using the function key ***F4***.
- The ***Enter*** key leaves the ***Subscript*** mode.
- ***Subscript*** mode disabled if you entering a non alpha numeric sign. Same thing if you select cells

2.5 Escape

A mouse click on the ***Esc*** button toggles the Escape mode. You can leave the Escape mode with the ***Enter*** key. If the editor is in ***Escape*** and ***Superscript*** mode the ***Enter*** key leaves ***Escape*** mode only.

Read below the description about ***Escape*** mode.

2.6 DEG / RAD

The ***DEG*** and ***RAD*** buttons select the input to a trigonometric function.

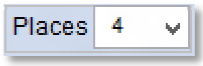
DEG : input must be in degrees.
RAD : input must be in radians.

The selected button is displayed in blue.

2.7 Exponent - EXP

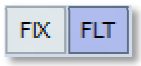
If the ***EXP*** button switched on (displayed blue), the calculator write the result as power of ten.

2.8 Decimal Digits



Next to the ***EXP*** button you can change the number of decimal digits in your result. To change the decimal digits click the up/down button right or change the number in the display. RedCrab stores different number of digits for fix- and floating point results

2.9 Fix- / Floating point results



Choose between fix- and floating point results with mouse click on the ***FIX*** / ***FLT*** buttons.

- ***FIX*** : fix point
- ***FLT*** : floating point

2.10 Hexadecimal Output

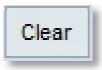
Press the ***HEX*** button to show results as hexadecimal number. RedCrab can display hex numbers up to 13 digits. Any numbers more than 13 digits will be displayed as error message.

Left hand zeros of positive numbers will not be displayed. Only one left hand ***F*** by negative numbers will be displayed with a Minus symbol.

Example:

Decimal: `-2` => Hexadecimal Result `$FFFFFFFFFFFFE`
Displayed as: `$FE`

2.11 Clear



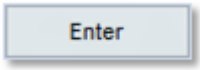
The ***Clear*** function clears the worksheet and the undo memory.

The ***Clear*** function clears the worksheet and the undo list, without prompting. Instead data are stored in the startup directory in a file named ***redcrab.his***. If the ***Clear*** button was clicked by mistake, the worksheet can be restored with ***Reopen*** function in the ***File*** menu.

2.12 Reset

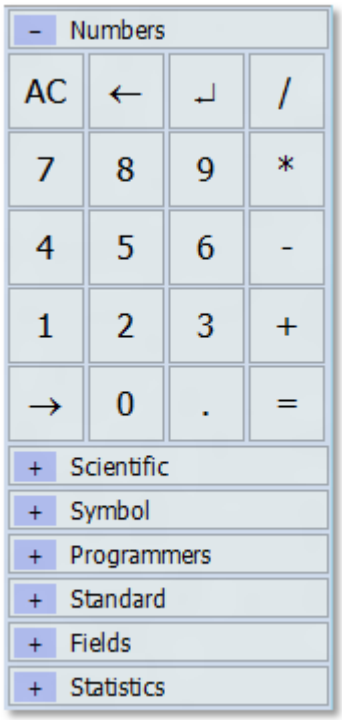
Reset clear all calculators output (displayed in blue). It don't change the user input. It's equal to the ***F7*** key.

2.13 Enter



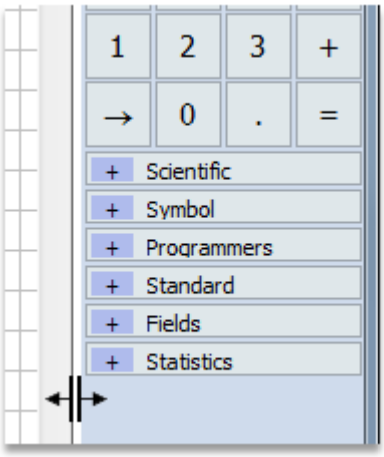
Enter start the calculator and display the result. It’s equal to the ***F8*** and ***Ctrl+Enter*** keys.

3.0 Function Panel



The following section describes the function panels buttons. The panels can pop up or retract with the + or - symbols.

All the features of these panels can also be entered via the keyboard. Read the description of the ***Escape*** and ***Long Term*** mode.

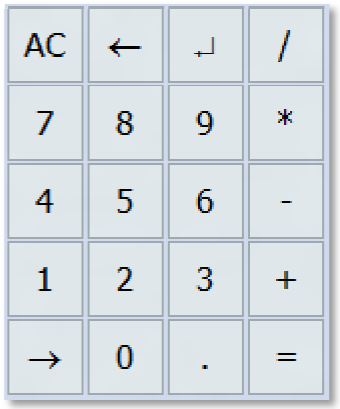


You can change the size of the function panels and the buttons. This improves the readability of the text for use on touch screens, depending on monitor used.

To change the width of the panel, drag and drop the splitter that separates the panel from the worksheet, to the left or right. The size of the button and the font will be automatically adjusted.

If the panel is undocked, adjust the size by turning the mouse wheel.

3.1 Number Panel



The following part describes the ***Number*** panel buttons. Alternative you can use the keyboard to execute the panel functions.

AC clears the mathematical expression at cursor position.

Backspace.

Linefeed-Return: moves the cursor to the first column at the next free row.

Space.

All other number and operator buttons function as shown.

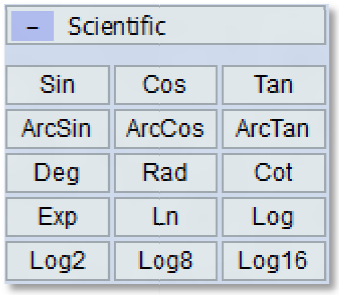
3.2 Scientific Panel

The following part describes the Function panel buttons. Alternative you can use the keyboard to write the functions to the editor. Use the ***ESC*** or ***LongTerm*** Mode (Menu: Option.Long_Term). Read the description about Escape mode below.

If you are not using the Function panel, you can switch this off under the ***View.Function_Panel*** menu.

Scientific Functions

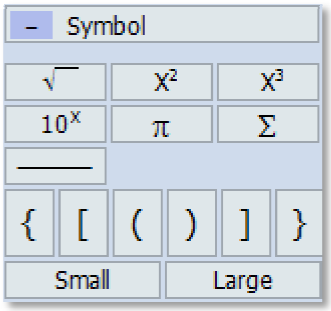
sin()	sine
cos()	cosine
tan()	tangent
arcsin()	inverse sine
arccos()	inverse cosine
arctan()	inverse tangent
deg()	convert radian in degrees
rad()	convert degrees in radians
cot()	cotangent
exp()	exponent to Euler's constant : 2.7182818284590452...
ln()	natural logarithms to base e (2,7182818284590452...)
log()	logarithms base 10
log2()	logarithms base 2
log8()	logarithms base 8
log16()	logarithms base 16



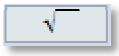
Extended Functions

E	Euler's constant : 2.7182818284590452...
π	constant PI: 3.1415....
ld()	logarithms base 2
lg()	logarithms base 10 (equal to log)
log10()	logarithms base 10 (equal to log)

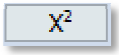
3.3 Symbol Panel



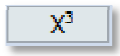
The *Symbol* Panel contained symbols, you can write with the keyboard too. But problem may arise by any non English keyboard or language. For more information about the keyboard read below the description about keyboard configuration.



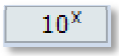
This button writes the *Root* symbol to the cursor position. It's equivalent to ***Ctrl + 1*** key. For more information read paragraph 7.6 Root.



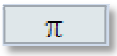
This button writes exponent < 2 > to the cursor position. It is equivalent to < *Ctrl + 2* > keys.



This button writes exponent < 3 > to the cursor position. It is equivalent to < *Ctrl + 3* > keys.

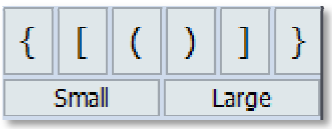


This button writes the symbols < *10 > to the cursor position and switched in the *Super* mode to input the exponent.



This button writes the π – symbol to the cursor position. It is equivalent to < *Ctrl + p* > keys.

This button writes a *Fraction* line to the cursor position. It is equivalent to < *Ctrl + /* > keys.



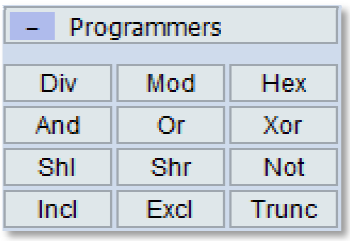
This button writes different brackets to the cursor position. Dependant on selection (small or large), brackets will be displayed either in normal font size or triple row size.

Details can be found under paragraph 5.0 Keyboard

The *Symbol* panel contains extra large brackets which are not included in *ANSI* fonts. The following list shows the key codes for the English US keyboard:

- Ctrl + '9' (Left round bracket
- Ctrl + '0') Right round bracket
- Ctrl + '[' [Left square bracket
- Ctrl + ']'] Right square bracket
- Ctrl + Shift + '[' { Left curly bracket
- Ctrl + Shift + ']' } Right curly bracket

4.0 Programmer Panel



The following part describes the ***Programmer*** panel buttons. Alternative you can use the keyboard to execute the panel functions. Read the description about Escape mode below.

The following Programmer functions and operators (except Int, Frac and Round) perform manipulation on integer operands. If the operands real type numbers, the values are rounded toward zero.

Operator

4.1 Div

The ***DIV*** operator returns the result of an integer number division without remainder. If floating point numbers are entered, the ***DIV*** operator cuts off all digits after the decimal point before executing the division ***DIV***.

Example:

```
11   DIV 3   = 3
11.2 DIV 3.9 = 3
```

4.2 Mod

The ***MOD*** operator returns the remainder of the division of two integer numbers. If floating point numbers are entered, the ***MOD*** operator cuts off all digits after the decimal point before executing the division ***MOD.***

Example:

```
11   MOD 3   = 2
11.7 MOD 3.9 = 2
```

4.3 And

The logical ***AND*** operator performs bitwise AND manipulation on integer operands

Example: `Z = X AND Y`

4.4 Or

The logical ***OR*** operator performs bitwise OR manipulation on integer operands.

Example: `Z = X OR Y`

4.5 Xor

The logical ***XOR*** operator performs bitwise XOR manipulation on integer operands.

Example: `Z = X XOR Y`

4.6 Shl / Shr

The ***SHL*** or ***SHR*** operator shift bitwise left or right manipulation on integer operands. The value of ***Y*** is interpreted modulo 32. Thus for example, if ***X*** is 40, ***X*** is interpreted as **8** because **40** ***mod*** **32** is **8**.

Examples:
```
Z = X shl Y
9 shl 2 = 36
```

4.7 INCL

The ***INCL*** operator adds a bit to the integer operands.

Example: `Z = X INCL Y`

In the example above ***INCL*** sets the bit number ***Y*** in operant ***X***

Example: `8 INCL 3 = 12`

4.8 EXCL

The ***EXCL*** operator excludes a bit from an integer operands.

Example: `Z = X EXCL Y`

In the example above ***EXCL*** clears the bit number ***Y*** in operant ***X***

Example: `15 EXCL 4 = 7`

Functions

4.9 Not

The logical ***NOT*** function performs bitwise negation on integer operands.

Example: `Z = NOT(X)`

4.10 TRUNC

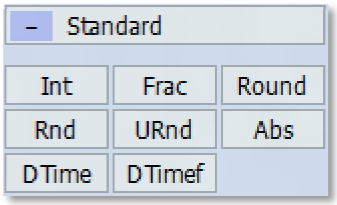
The ***Trunc*** function truncates a real-type value to an integer-type value. The values are rounded toward zero.

Example: `TRUNC(123.67) = 123`

4.11 HEX

This button writes the ***$*** symbol for hexadecimal input to cursor position. More information can be found under paragraph 1.9 Hexadecimal Input.

5.0 Standard Functions Panel



5.1 Round

Round returns a value rounded to the nearest whole number.
Example: x=`round(y)`

`round(2.6)=3`

`round(3.5)=4`

`round(2.5)=2`

If ***y*** is exactly halfway between two whole numbers, the result is always the even number. This method of rounding is often called "Banker's rounding".

5.2 Int

Int returns the integer part of a value; that is, the value rounded toward zero.

Example:
```
x= int(y)
x=int(4.67)=4
```

5.3 Frac

Frac returns the fractional part of an argument.

Example:
```
x=frac(y)

x=frac(4.67)=0.67
```

5.4 Rnd

Rnd returns a random integer number within the range 0 <= X <= Range.

Example:
```
x=rnd(y)
```

5.5 URnd

URnd fills a field with a series of random numbers between 0 and the highest argument of the field. In contrast to ***Rnd***, which also can be used for fields, ***URnd*** returns a set of unique numbers.

Example:
```
a=urnd([1..5,45])
b=urnd([44..45])
```

Both examples return a list of six different numbers between 1 and 45.

5.6 Abs

Abs returns the absolute value of numbers and fields.

Example: `x=abs(y)`

`x=abs(4.56) =4.56`

`x=abs(-4.56)=4.56`

5.7 DTime

The function ***DTime*** returns the ***DateTime*** value of the given year, month, day, hour, minute and second. The argument must be a data field that includes six cells which contains the value of year, month, day, hour, minute and second.

The year must be between 1 and 9999.
Valid Month values are 1 through 12.
Valid Hour values are 0 through 23.
Valid Min and Sec values are 0 through 59.

Valid Day values are 1 through 28, 29, 30, or 31, depending on the Month value. For example, the possible Day values for month 2 (February) are 1 through 28 or 1 through 29, depending on whether or not the Year value specifies a leap year.

Example: `d = dtime([Y,M,D,h,m,s])`

A call of ***DTime*** with the argument ***0*** returns the current date and time.

Example: `current = dtime(0)`

DateTime value format

The integral part of ***DateTime*** value is the number of days that have passed since 30.12.1899. The fractional part of the ***DateTime*** value is fraction of a 24 hour day that has elapsed. Following are some examples of values and their corresponding dates and times:

0	:	30.12.1899	12:00 am
2.75	:	01.01.1900	06:00 pm
-1.25	:	29.12.1899	06.00 pm
35065	:	01.01.1996	12:00 am

To find the fractional number of days between two dates, simply subtract the two values, unless one of the ***DateTime*** values is negative. Similarly, to increment a date and time value by a certain fractional number of days, add the fractional number to the date and time value if the ***DateTime*** value is positive. When working with negative ***DateTime*** values, computations must handle time portion separately. The fractional part reflects the fraction of a 24-hour day without regard to the sign of the ***DateTime*** value. For example, 6:00 am on 29.12.1899 is –1.25, not –1 + 0.25, which would be –0.75. There are no ***DateTime*** values between –1 and 0.

5.8 DTimeF

The function ***DTimeF*** returns a data field that includes six cells which contains the value of year, month, day, hour, minute and second of the arguments ***DateTime*** value.

Example `DTimeF(d) = 2012 4 12 14 27 18`

6.0 ***Fields*** Panel

Operators

6.1 Join

The operator ***Join*** connects one or two-dimensional fields with each other. The result contains the sum of the rows of the first and second operand.

Excample:
```
a = [1..5] =    1 2 3 4 5

b = [6..10] =   6 7 8 9 10

c = a join b =  1 2 3 4  5
                6 7 8 9 10
```

If the fields are different lengths, the shorter field is filled with zeros.

```
x = [11..18] = 11 12 13 14 15 16 17

d = x join c = 11 12 13 14 15 16 17
                1  2  3  4  5  0  0
                6  7  8  9 10  0  0
```

6.2 Mulx

Mulx is an operator for multiplication of matrices. Multiplication of two matrices with *Mulx* is possible only if the number of columns of the left matrix is the same as the number of rows of the right matrix.

Beispiel:

```
x=[1,2,3]        [2,4]     26  38
  [4,5,6] mulx   [3,5]     59  89
  [7,8,9]        [6,8]     92 140
```

The result is a matrix whose entries are given by dot product of the corresponding row of the left operand and the corresponding column of the right operand:

```
(1*2 + 2*3 + 3*6)     (1*4+ 2*5 + 3*8)
(4*2 + 5*3 + 6*6)     (4*4+ 5*5 + 6*8)
(7*2 + 8*3 + 9*6)     (7*4+ 8*5 + 9*8)
```

More Information about multiplication of matrices:

1) http://en.wikipedia.org/wiki/Matrix_multiplication

2) The description of the function ***Trans***.

6.3 Det

Det returns the determinant of a 2x2 or 3x3 matrix. More information of determinants can be found at:

http://en.wikipedia.org/wiki/Determinant

Example: `d=det(A)`

6.4 Invx

Invx inverse a 2x2 or 3x3 matrix. If the matrix is not invertible, RedCrab displayed an error message. More information about inverted matrices can be found at:

http://en.wikipedia.org/wiki/Invertible_matrix

Example: `A1 = invx(A)`

6.5 Fill

The result of the operator ***Fill*** is a data field the size of the left operand. The field contains values specified by the right operand.

Example: `x = [1..5] fill 8 = 8 8 8 8 8`

6.6 Patt

The result of the operator ***Patt*** is a data field the size of the left operand. The field contains continuous values of the right field operand.

Example: `x = [1..10] patt [1,1,2] = 1 1 2 1 1 2 1 1 2 1`

6.10 Trans

Trans producing the transpose of a matrix A^T, which is computed by swapping columns for rows in the matrix ***X***.

Example:

$$x = \begin{bmatrix} 1,2,3 \\ 4,5,6 \\ 7,8,9 \end{bmatrix}$$

$$\text{trans}(x) = \begin{matrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{matrix}$$

For more information read: http://en.wikipedia.org/wiki/Matrix_transpose

6.11 Min , Max

Min (minimum) and **Max** (maximum) return the value at which the minimum or maximum value of one– or multidimensional fields.

Example:: `z=min(x)`

```
x= [9,7,2,8,12,3,5]

min(x) = 2

max(x) = 12
```

6.12 Count

Count returns the number of elements of one– or multidimensional fields.

Example: `z=count(x)`

```
x= [9,7,2,8,12,3,5]

count(x) = 7
```

6.13 Aver

The function ***Aver*** returns the mean values of successive elements of fields. The result is always one element smaller than the original field.

Example:
```
a = [1..5]^2 = 1 4 9 16 25
b = aver(a) = 2.5 6.5 12.5 20.5
```

6.16 AddOn

The function ***AddOn*** adds any value of a continuous series of numbers to the next value.

Example: `addon([10,30,25,-10,15]) = 10 40 65 55 70`

6.17 MulIn

The operator ***MulIn*** returns a data field with a logarithmic series of numbers. The number of values corresponds to the numbers of the left operand. The first number is taken from the first element of the left operand. The following values are each the product of multiplication by the right operand.

Example: `[2..8] mulin 2.0= 2 4 8 16 32 64 128`

The left operand's first element defines the start value; the following values have no significance. They are place holders to determine the size of the field. The following example shows therefore the same result as above.

Example: `[2..-4] mulin 2.0= 2 4 8 16 32 64 128`

Descending sequence of numbers generated by a value < 1.

```
[2..8] mulin 0.5= 2.0 1.0 0.50 0.25 0.13 0.06 0.03
```

6.18 MulTo

The operator ***MulTo*** returns a data field with a series of logarithmic numbers. The series begins with the first value of the left operand and is gradually multiplied by the value of the right operand till the value of the next operand is reached.

Example:

```
[1,150] multo 2 = 1 2 4 8 16 32 64 128
```

```
[150,3] multo 0.5 = 150 75 37.5 18.8 9.38 4.69
```

For ascending order, right operand must be >, for a descending order the right operand must be < 1. Negative values and the values 0 and 1 are not allowed.

6.19 MulAd

The operator ***MulAd*** returns a series of numbers where each value of the left operand first multiplied by the right operand, and added to the next value.

Example:

```
x=[1..5] fill 100 =100.00 100.00 100.00 100.00 100.00

y=x mulad 1.1 = 110.00 231.00 364.10 510.51 671.56
```

The right operand can be a one-dimensional field.

6.30 Dim

The ***Dim*** function returns the number of dimensions of a multi dimensional data field.

Example:

```
X = [1..4;12..15]
Dim(x) = 2
```

6.31 Rows

The function ***Rows*** returns the number of rows of a two dimensional data field.

Example:

```
x = [1..4;12..15]
r = Rows(x) = 2
```

6.32 Cols

The function ***Cols*** returns the number of columns of a two dimensional data field.

Example:
```
x = [1..4;12..15]
c = Cols(x) = 4
```

7.0 *Statistics* Panel

7.1 Sum

The function ***Sum*** returns the sum of the elements in fields. The function can be called by the Greek letter ***Σ.***

Example:
```
z = sum(x)

X = [9,7,2,8,12,3,5]

sum(x) = 46
Σ(x) = 46
```

7.2 Prod

Prod returns the product of all elements of fields.

Example:
```
z=prod(x)

X = [9,7,2,8,12,3,5]

prod(x) = 181440
```

7.3 Cusum

The function CUSUM returns the calculation of a cumulative sum of one-dimensional fields.

Example:
```
z = cusum(x)
```

```
cusum([2,4,7,3,9])= -3 -4 -2 -4 0
```

For more information read : http://en.wikipedia.org/wiki/CUSUM

7.4 Sort, DSort

Sort sorts field elements from low to high values (sort ascending). ***DSort*** sorts field elements from high to low values (sort descending). Complex fields are sorted based on first row values.

Example: `z = sort(x)`

7.5 Median

Median returns the median value of fields. In multidimensional fields the result is the median of all elements.

Example: `z = median(x)`

7.6 Mean

The result of ***Mean*** is the mean value of field. In multidimensional fields the result is the mean of all elements.

Example: `z = mean(x)`

7.7 Vari / SVari

The result of ***Vari*** and ***SVari*** is the variance of values in one-dimensional fields. Use ***Vari*** if the field contains all evaluated data**.** ***SVari*** is more applicable for samples.

Example: `z = vari(x)`

For more infomation read: http://en.wikipedia.org/wiki/Variance

7.8 StDev / SStDev

StDev returns the standard deviation of values in one–dimensional fields. Use ***StDev*** if the field contains all evaluated data**.** ***SStDev*** is more applicable for samples.

Example: `z = stdev(x)`

For more information, read: http://en.wikipedia.org/wiki/Standard_deviation

7.9 Diff

Diff returns the difference values of successive elements of fields. ***Diff*** subtracts the first field element from the second, the second element from the third, etc.. The field of the difference values is always one element shorter than the original field.

Example: `z = diff(x)`

```
X = rnd([11..20]) = 15 19 18 2 11 12 20

diff(x) = 4 -1 -16 9 1 8
```

7.10 LQuart

LQuart returns the value of the first quartile (lower quartile) of a sorted list. In the following example in a field of 10 elements, the position of the first quartile is (10 × ¼) = 2.5, rounded up to 3.

Beispiel: `lquart([3,6,7,8,8,10,13,15,16,20]) = 7`

7.11 UQuart

UQuart returns the value of the third quartile (upper quartile) of a sorted list. In the following example, in a field of 10 elements the position of the third quartile is (10 × ¾) = 7.5, rounded up to 8.

Example: `lquart([3,6,7,8,8,10,13,15,16,20]) = 15`

7.12 QRan

QRan results the area from the first to 3rd quartiles of a sorted list. The following example shows the result of a field with 10 elements.

Beispiel: `lquart([3,6,7,8,8,10,13,15,16,20])`
`= 7 8 8 10 13 15`

8.0 Keyboard

The keyboard inputs in the following description correspond to the English keyboard and Windows regional and language option English-US. When using a non-English keyboard or language, some functions are acquired with other key combinations. This concern most of the ***Ctrl*** key functions. In the attachment of this manual you will find pictures about key codes of different keyboards. Read the description below about keyboard configurations.

The editor used the ***New Courier*** and ***Symbol*** fonts. They are usually included with Windows operating system. ***New Courier*** is the default font. The ***Symbol*** font includes Hellenic letters and special symbols.

You can type in letter of the alternative font by pressing the ***Ctrl*** key. Example: press ***Ctrl+P*** to write the character π or ***Ctrl+L*** to write the letter λ.

Esc	Switch to escape mode.	To exit escape mode: press *enter* key or bracket open
Enter	- Exit escape mode	
	- Exit Superscript	
	- Exit Subscript	
	- Moves cursor to numerator, if this position is end of fraction bar,	
	- Moves cursor to denominator, if this position in the numerator row.	
	- Moves cursor to end of fraction, if this position at the denominators row.	
Enter + Ctrl	Display result	Equal to the *Function* panels *Enter* button
Enter + Shift	Line feed- return : move the cursor to the first used column in the next row	
Ctrl + (Shift)	switch to alternative font	
Ctrl + .	Toggle ANSI / Symbol font	
Ctrl + ,	Toggle on / off Subscript	
Ctrl + _	Toggle on / off Subscript (equal Ctrl + ,)	
Ctrl + Shift + ,	Toggle on / off Superscript (exponent)	
Ctrl + 6	Toggle on / off Superscript (equal Ctrl + Shift + ,)	
Ctrl + 9	large round bracket open	
Ctrl + 0	large round bracket close	
Ctrl + [	large square bracket open	
Ctrl +]	large square bracket close	
Ctrl + Shift + {	large curly bracket open	
Ctrl + Shift + }	large curly bracket close	
Ctrl + /	fraction line	
Ctrl + 1	root	
Ctrl + 2	Exponent 2	
Ctrl + 3	Exponent 3	
Ctrl + 4	Integral Formula	
Ctrl + Shift + 4	Integral Symbol	
Ctrl + 5	Function Symbol	
Insert	Insert a column at cursor position	

Insert + Shift	Insert a row at cursor position			
Delete	Delete a column at cursor position			
Delete + Shift	Delete a row at cursor position			
Ctrl + Csr left	Page left			
Ctrl + Csr right	Page right			
Ctrl + Csr up	Scroll up			
Ctrl + Csr down	Scroll down			
Ctrl + Page up	Move cursor to the first row of the screen			
Ctrl + Page down	Move cursor to the last row of the screen			
F2	Marked/Unmarked the selected range or cursor position as remark			
F3	Enable or disable *Superscript* mode.			
F4	Enable or disable *Subscript* mode.			
F5	AC - Clears the the mathematical expression at cursor position.			
F6	Clear - clear all			
F7	Reset – clear the output of the calculator			
F8	Enter – starts the calculator			
Ctrl + A	α	A	Alpha	
Ctrl + B	β	B	Beta	
Ctrl + C	χ	X	Chi	Copies the selected area *
Ctrl + D	δ	Δ	Delta	
Ctrl + E	ε	E	Epsilon	
Ctrl + F	ϕ	Φ	Phi	
Ctrl + G	γ	Γ	Gamma	
Ctrl + H	η	H	Eta	
Ctrl + I	ι	I	Iota	
Ctrl + J	φ		Phi (alt.)	
Ctrl + J		ϑ	Theta (alt.)	
Ctrl + K	κ	K	Kappa	
Ctrl + L	λ	Λ	Lambda	
Ctrl + M	μ	M	Mu	
Ctrl + N	ν	N	Nu	
Ctrl + O	ο	O	Omicron	
Ctrl + P	π	Π	Pi	
Ctrl + Q	θ	Θ	Theta	
Ctrl + R	ρ	P	Rho	
Ctrl + S	σ	Σ	Sigma	
Ctrl + T	τ	T	Tau	
Ctrl + U	υ	Y	Upsilon	
Ctrl + V	ϖ		Pi (alt.)	Insert text from clipboard *
Ctrl + V		ς	Sigma (alt.)	
Ctrl + W	ω	Ω	Omega	
Ctrl + X	ξ	Ξ	Xi	Cut and copies the selected area *
Ctrl + Y	ψ	Ψ	Psi	
Ctrl + Z	ζ	Z	Zeta	

)
Ctrl + C copies the selected area to clipboard. ***Ctrl + X*** cuts the selected area and copies it to the clipboard. If no area is selected, the corresponding Greek letter is written.

Ctrl + V writes the text from the clipboard to the cursor position if, immediately before a text with ***Ctrl + C / X*** was copied, otherwise the corresponding Greek letter is written.

The decimal key below the numeric keypad (point / comma) produces a decimal point always, regardless of the country setting.

The Menu Bar

10.0 *File* Menu

10.1 Open

Click ***Open*** on the ***File*** menu. In the Navigation pane, click folder or drive that contains the file that you want to open. You can only load file that are saved with RedCrab before, with the file extension ****.rcc***.

10.2 Reopen

Reopen function opens the last deleted file.

The ***Clear*** function clears the worksheet and the undo list, without prompting. Instead data are stored in the startup directory in a file named ***redcrab.his***. If the ***Clear*** button was clicked by mistake, the worksheet can be restored with ***Reopen*** function.

10.3 Save

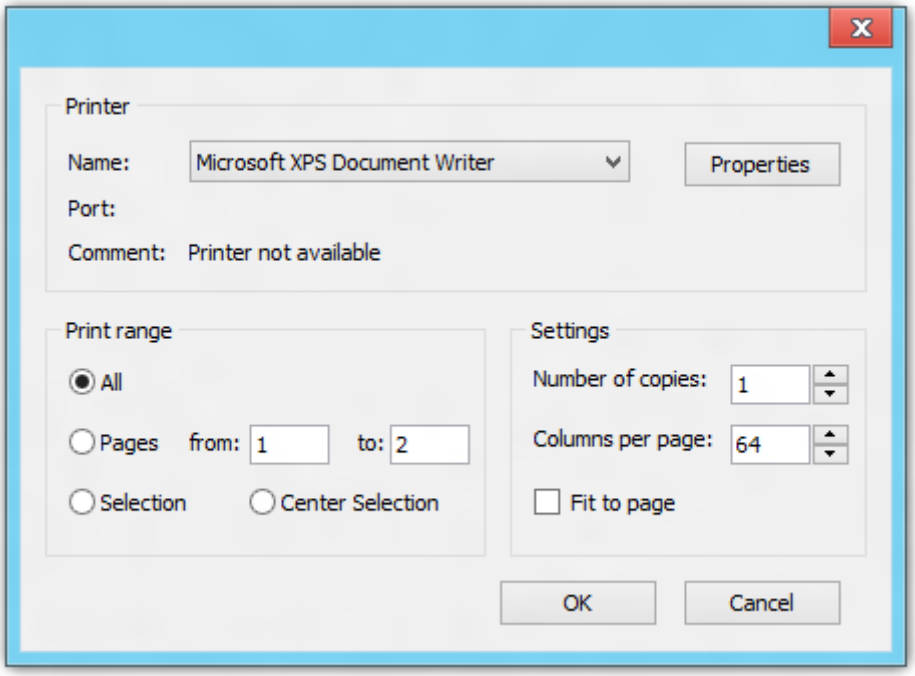
If you are saving a changed file click ***Save*** on the ***File*** menu or press ***Ctrl+Alt+S***.

10.4 SaveAs

If you are saving the file for the first time use ***SaveAs*** on the ***File*** menu, the file browser prompt for a file name.

10.5 Print a worksheet

The right picture shows the print dialog box. By default, 64 columns per page are printed. The number of rows depends on the size of the page. By entering a different value, you can increase or decrease the printer output.



With the button ***All*** you print the working area of the worksheet from position (1.1). If necessary, the worksheet is split into several pages. The layout of the pages is shown in the following table.

If the button ***Page*** is selected, individual pages can be printed.

Page 1 Column 1..64 Row 1..68	Page 2 Column 65..128 Row 1..68	Page 3 Column 129..192 Row 1..68
Page 4 Column 1..64 Row 69..136	Page 5 Column 64..128 Row 69..136	Page 6 Column 129..192 Row 69..136

With the button ***Selection*** you can print selected area of the worksheets. The print-out is positioned on the top of the page. ***Center Selection*** prints the selected area at the center of the page.

With the check box ***Fit to page*** the print-out is adjusted to the page size. The ***Columns per Page*** setting is ignoring. A small selected area can so enlarged to the width or height of the page. Similarly, a print-out what normally occupied several pages are reduced to one page.

- ### 10.5.1 Page Setup

  With Page Setup you can set the margins width and paper format.

- ### 10.5.2 Printer Setup

  Select the printer and the printer settings.

11.0 ***Edit*** Menu

11.1 Undo / Redo

You can undo and redo your action by clicking ***Undo*** or ***Redo*** on the Edit menu. You can undo and redo up to 100 actions. ***Undo*** and ***Redo*** is not possible by imported object like bitmaps.

11.2 Copy / Paste

With the ***Copy*** and ***Paste*** functions you can copy and insert data within RedCrab or from/to external programs. The ***Copy*** function copies the selected fields to the clipboard. Texts from/to external programs will posted as unformatted ASCII text.

Within RedCrab the data are copied in format style. Exception: square root. With ***Paste*** function only the symbol of the square root is inserted. The range belonging to this field must be selected at the new position again. Hence errors can be avoided, e.g. only the sub range square of a root is copied and inserted to other position.

11.3 Paste to Box

For complex technical calculations, it may be useful to include technical drawings to mathematical formulas. With ***Paste to Box*** on menu ***Edit*** you can import images and formatted texts from external programs. The image or the formatted text is inserted into a box and can be positioned freely. Multiple images or text boxes can be inserted. The amount is limited only by resources of your computer.

To change a box position, move the mouse pointer on a box, press the left mouse button and pull with pressed mouse button the box into the desired position.

Text and Images boxes are deleted with ***Delete*** on a popup menu. Open the menu with click on right mouse button, and then choose ***Delete***.

Information about the import of images and text files can be found below under Menu ***Insert.***

11.3.1 Text Box

To edit the text or change the size of text box, text box must be active. Activate the text box with double-click of the left mouse button. The background of the activated text box will displayed coloured and the text cursor is indicated.

To change the size of the text box, position the mouse pointer on the lower right corner of the box and drag the box with pressed right mouse button to the desired size. The area to draw the text boxes is displayed with a NW- mouse pointer. Information for editing text can be found below at Chapter text editing.

Click the right mouse button to open the text box's popup menu. The text box must be activated first

Popup Menu:

- ***Word Wrap***: Word wrap on / off
- ***Lock Text***: text edit is disabled.
- ***Scroll Bars***: scroll bars on / off
- ***Font***: open Font Dialog to change the font type, size and colour.
- ***Delete Text Box***: delete the text box.

If the editing of the box and text is completed, deactivate the box with double-click on the left mouse button.

11.3.2 Text Editing

For editing of text the following table shows a list of keyboard instructions.

Keys	**Operations**
Ctrl + Tab	Tab
Ctrl + Number Pad 5	Select all

Ctrl + A	Select all
Ctrl + E	Center alignment
Ctrl + J	Justify alignment
Ctrl + R	Right alignment
Ctrl + L	Left alignment
Ctrl + C	Copy
Ctrl + V	Paste
Ctrl + X	Cut
Ctrl + Z	Undo
Ctrl + Y	Redo
Ctrl + '+'	Superscript
Ctrl + '='	Subscript
Ctrl + 1	Line spacing = 1 line.
Ctrl + 2	Line spacing = 2 lines.
Ctrl + 5	Line spacing = 1.5 lines.
Ctrl + ' (apostrophe)	Accent acute
Ctrl + ` (grave)	Accent grave
Ctrl + ~ (tilde)	Accent tilde
Ctrl + ; (semicolon)	Accent umlaut
Ctrl + Shift+6	Accent caret (circumflex)
Ctrl + , (comma)	Accent cedilla
Ctrl + Shift + ' (apostrophe)	Activate smart quotes
Backspace	Delete previous character.
Ctrl + Backspace	Delete previous word.
F16	Same as Backspace.
Ctrl + Insert	Copy
Shift + Insert	Paste
Insert	Overwrite
Ctrl + Left Arrow	Move cursor one word to the left.
Ctrl + Right Arrow	Move cursor one word to the right.
Ctrl + Left Shift	Left alignment
Ctrl + Right Shift	Right alignment
Ctrl + Up Arrow	Move to the line above.
Ctrl + Down Arrow	Move to the line below.
Ctrl + Home	Move to the beginning of the document.
Ctrl + End	Move to the end of the document.
Ctrl + Page Up	Move one page up.
Ctrl + Page Down	Move one page down.
Ctrl + Delete	Delete the next word or selected characters.
Shift + Delete	Cut the selected characters.
Alt + X	Converts the Unicode hexadecimal value preceding the insertion point to the corresponding Unicode character.
Alt + Shift + X	Converts the Unicode character preceding the insertion point to the corresponding Unicode hexadecimal value.
Alt + 0xxx (Number Pad)	Inserts Unicode values if xxx is greater than 255. Inserts ASCI values if xxx is less than 256
Ctrl + Shift + A	Set all caps.
Ctrl + Shift + L	Fiddle bullet style.
Ctrl + Shift + Right Arrow	increase font size
Ctrl + Shift + Left Arrow	decrease font size

11.4 Cut/Delete

With functions ***Cut*** and ***Delete*** on the Edit menu the selected range on the computing sheet is deleted. With ***Cut*** the range is copied in the clipboard and can be inserted in other position again.

12.0 *View* Menu

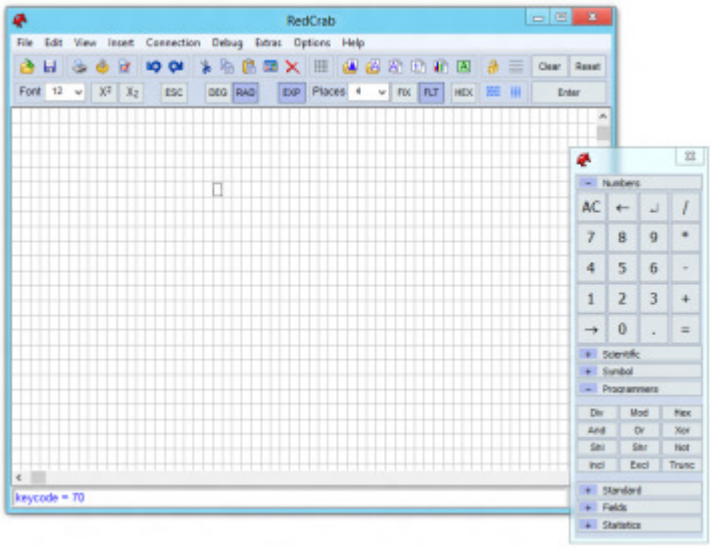
12.1 Grid

You can show or hide gridlines. Use ***Grid*** on the ***View*** menu to switch the grid on / off.

12.2 Undock Function Panel

The function panel can be displayed within the main window or as new window.

This function is activated through Menu ***Undock_Function_Panel*** or by double clicks on the function panel.



12.3 Function Panel

Switch the ***Function Panel*** on / off with click on ***Function Panel*** on the ***View*** menu

12.4 Virtual Keyboard

Switch the ***Virtual Keyboard*** on / off with click on ***Virtual Keyboard*** on the ***View*** menu.

13.0 ***Insert*** Menu

13.1 Image File

Load a graphic file. For complex technical calculations, it may be useful to include technical drawings to mathematical formulas. Click ***Image File*** in the ***Insert*** menu to open the image file browser and select the image file. RedCrab can imports photos from Jpeg files (*.jpg) and Windows Bitmap files (*. bmp). The Jpeg format is not suitable for technical drawings. It creates blurred images around edges and errors in the transparency of the images. When RedCrab saving files that includes bitmap images, RedCrab compressed images without loss and they are usually smaller than jpeg format.

Inserted image is positioned on the top left of the page. You can move it by clicking the left mouse button on the image and drag, while holding down the mouse button, the image to the desired position.

Text and Images boxes are deleted with ***Delete*** on a popup menu. Open the menu with click on right mouse button then choose ***Delete***.

Click the right mouse button to open the image box's popup menu.

Popup Menu:

- ***Transparent***: displays the image with a transparent background. This function works only if the image has a background defined and all textboxes in deactivated mode.
- ***Delete***: delete the box.

13.2 Text File

For documentation purposes, text files can be inserted in any position in text box.

To load a text file click ***Text File*** on menu ***Insert***. It opens a file browser to select a file. Files of the type ***TXT*** (unformatted text) or ***RTF*** (Rich Text Format) can be inserted.

The text is inserted in a text box positioned on the top left corner at the calculation sheet. To move the text box, position the cursor on the text box and press the left mouse key. Then drag the box in the desired position by holding down the left mouse button. . Multiple text boxes can be inserted. The amount is limited only by resources of your computer.

Text and Images boxes are deleted with ***Delete*** on a popup menu. Open the menu with click on right mouse button then choose ***Delete***.

Text boxes are always inserted in a preset size. You can resize the box according to text size. It is possible to edit the texts in the text box. For information about resize and edit textboxes read Textbox Editing above.

13.3 New Textbox

With ***New Textbox*** on menu ***Insert*** an empty text box will be inserted. To input text the box must be activated with a double click of the left mouse button. For more information about text box editing read the capital Text Box above.

13.4 Textbox to Image

The function text ***Box to Image*** converts a text box into an image box. The advantage of a graphics box is:

1) The texts cannot be changed.
2) The formatted text is displayed in original format (similar to a PDF file), even if the displayed font is not installed on the user computer.

The function should only be used if it makes sense. By changing the format of the file, the file size will be larger.

! Important: This function cannot be reversed!

13.5 Show Textbox

The function ***Show Text*** box in the menu ***Insert*** displayed all text boxes with a coloured background. The function is helpful in allocating an empty text box or showing the exact positioning.

13.6 Result box

With ***Result*** boxes you can display formatted results of calculations on any work sheet position. Click ***Result box*** on the ***Insert*** menu to open a result box.

Example: If the result of a calculation is a distance of 3650 meters, RedCrab write: `= 3650` or: `= 3.65 10^3` in the work sheet.

A result box can show the display format: `= 3.65km.`

A result box can be displayed on any position. So you can insert results directly on technical drawings. Result text can be displayed vertically, horizontally or inclined position. The size of the box is auto fitted to the size of the text.

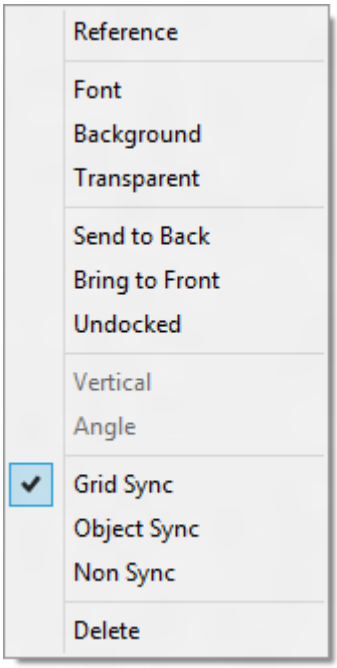
13.6.1 Popup Menu

With click of the right mouse key you open the result box popup menu. The list below show an overview of the various functions.

- ***ference*** opens the *Reference* dialog box to enter the reference variable and pre setting of the display format .

- ***Font*** opens the *Font* dialog box. Adjustment is dependant from the setting of the sync function (see below).

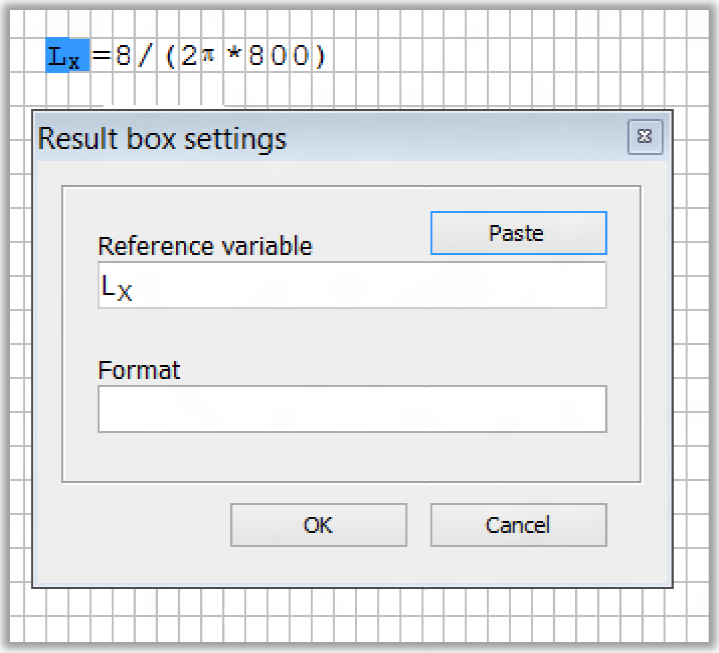
- ***Background*** opens a colour dialog box to choose the result box background colour.



- ***Transparent***: displays the result box with a transparent background.
- ***Send to Back***: moves the top object to other object below.
- ***Bring to Front***: ensures that a box is visible or to reorder overlapping boxes within a worksheet.
- ***Undocked***
- ***Vertical***: displays the result box content vertically.
- ***Angle***: opens a dialog box to adjust the slant of results display. It can be an angle in the range of + / - 90 degrees, adjustable in 0.1 degree increments.
- ***Grid sync***: synchronizes the box to the worksheet.
- ***Object sync***: synchronizes the box to a *Text* or *Image* box.
- ***Non sync***: size and position of the box are freely adjustable.
- ***Delete***: deletes the box.

13.6.1.1 Reference und Format

The ***Reference*** popup menu opens the ***Reference*** dialog box to enter the reference variable and the display format instruction.

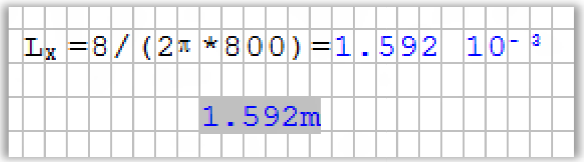


he row Reference variable show the name of the variable whose value is displayed in the box.

To determine the variable you select here the name on the worksheet. Then click the ***Paste*** button in the dialog box. The name is accepted and pasted to

the reference row.

In the first example below the format row are empty. The Result box shows the same display format as the worksheet. But instead of the power of ten, the box displays the SI-Prefix ‚m'. The result box background is displayed gray.



13.6.1.2 SI-Prefix

Result boxes used SI prefixes instead of exponents to reduce the number of zeros shown in numerical quantities before or after a decimal point. For example, an electrical current of 0.001ampere, or 10^{-3} of an ampere, is written by using the SI-prefix ***m*** (milli) as 1 milliampere or 1mA. The SI prefixes are standardized by the International Bureau of Weights and Measures (IBWM).
The list below shows the prefixes which RedCrab used.

	Prefix		**Decimal**	**Short scale**	**Long scale**
Y	yotta	10^{24}	1.000.000.000.000.000.000.000.000	Septillion	Quadrillion
Z	zetta	10^{21}	1.000.000.000.000.000.000.000	Sextillion	Trilliard
E	exa	10^{18}	1.000.000.000.000.000.000	Quintillion	Trillion
P	peta	10^{15}	1.000.000.000.000.000	Quadrillion	Billiard
T	tera	10^{12}	1.000.000.000.000	Trillion	Billion
G	giga	10^{9}	1.000.000.000	Billion	Milliard
M	mega	10^{6}	1.000.000	Million	
k	kilo	10^{3}	1000	Thousand	
h	hecto	10^{2}	100	Hundred	
-	-	-	1	One	
d	deci	10^{-1}	0,1	Tenth	
c	centi	10^{-2}	0,01	Hundredth	
m	milli	10^{-3}	0,001	Thousandth	
µ	micro	10^{-6}	0,000.001	Millionth	
n	nano	10^{-9}	0,000.000.001	Billionth	Milliardth
p	pico	10^{-12}	0,000.000.000.001	Trillionth	Billionth

f	femto	10^{-15}	0,000.000.000.000.001	Quadrillionth	Billiardth
a	atto	10^{-18}	0,000.000.000.000.000.001	Quintillionth	Trillionth
z	zepto	10^{-21}	0,000.000.000.000.000.000.001	Sextillionth	Trilliardth
y	yocto	10^{-24}	0,000.000.000.000.000.000.000.001	Septillionth	Quadrillionth

13.6.1.3 Formatting

In the ***Reference*** dialog box (described above) you can input control characters in the ***Format*** row to control and completion of the display format. For the example above among SI prefixes, the two characters, #A' are entered. The pound sign (#) is a placeholder for the result and prefix: 12m (12 million), the ***A*** stands for the unit ampere. The box shows the result: 12mA.

Before and after the pound you can insert any character. An exception is the backslash symbol (\) because it has a special function.

Examples:

Result	Formatted Text	Result Box Display
0.012		`12m`
0.012	#A	`12mA`
0.012	= # A	`= 12 mA`
125	US$ #	`US$ 125`
0.012	Current: #A~	`Current: 12mA~`

13.6.1.4 Specification of a prefix

If the result of an expression is the distance between two points, the control symbols, #m' displays the result in meters (m).

Examples:

Result: 365 Display: `365m`
Result: 3600 Display: `3.6km`
Result: 3650000 Display: `3.65Gm`

The displayed result: 3.65Gm (Giga meter) is correct, but unusual. Therefore, in RedCrab you can preset certain prefixes. This is written in the format text after the pound, a backslash (\) followed by the preferred prefix. In this example, the issue is better suited to kilometres, so the two characters ‘ \k’ are inserted. The format string looks like this: '# \km'.

Examples:

Result: 365	Display: 0.365km
Result: 3600	Display: 3.6km
Result: 3650000	Display: 3650km

RedCrab also has the option to select a group of prefixes or to determine an upper or lower limit. A '+' sign in front of the prefix determined the upper limit. The formatting string, # \+km ' shows all results of 1000 or above in kilometres. Results under 1000 are displayed according to the value in meters or millimetres etc. A '-' sign in front of the prefix determined the lower limit. The two limits can also be combined. The following examples show the output at a range setting of millimetres to kilometres.

Example: Format = ‚# \-m\+k m‘

Result: 3650000	Display: 3650 km
Result: 36500	Display: 36.5 km
Result: 365	Display: 365 m
Result: 3.65	Display: 3.65 m
Result: 0.0365	Display: 36.5 mm
Result: 0.000365	Display: 0.365 mm

The ‚x‘ symbol represents the base of an unit. The format string ‚#\-x\+km‘ displays the result in meters or kilometres.

13.6.1.5 Format Commands

The list below shows the format commands.

$	Result displays hexadecimal
o	Result displays octal
b	Result displays binary
^	Displays the result with exponent

0..9	Number of decimal places
#.##	Number of pounds after decimal point = number of fixed decimal places

Example:

Format:	,#\$‘	Display:	8F3.
Format:	,$#\$‘	Display:	$8F3.
Format:	,#\o‘	Display:	173.
Format:	,#\b‘	Display:	10110.
Format:	,#\^‘	Display:	$1.36\ 10^3$
Format:	#\^\4	Display:	$1.368\ 10^3$
Format:	#.##	Display:	1.20

Display Date and Time

DateTime values can be displayed as a formatted text string in result boxes. The format command is “\D”, with a following format string.

Example:	#\D”dd.mm.yyyy tt”	display : 14.04.2012 2:24:09 PM
	#\D”dd.mm.yyyy”	display: 14.04.2012
	#\D”dd.mmm.yyyy”	display: 14.Apr.2012
	#\D”ddd, dd.mmm.yyyy”	display: Sat, 14.Apr.2012

The format string must follow the command without space. If the format string is empty, the DateTime value is formatted as if a 'c' format specifier had been given. See the table below for information about the supported format strings.

In the following table, specifiers are given in lower case. Case is ignored in formats, except for the "am/pm" and "a/p" specifiers.

Specifier	Displays
c	Displays the date using the system ***ShortDateFormat***, followed by the time using the system ***LongTimeFormat.*** The time is not displayed if the ***DateTime*** value indicates midnight precisely.
d	Displays the day as a number without a leading zero (1-31).
dd	Displays the day as a number with a leading zero (01-31).
ddd	Displays the day as an abbreviation (Sun-Sat) using the strings given by the system ***ShortDayNames***.
dddd	Displays the day as a full name (Sunday-Saturday) using the strings given by the system ***LongDayNames***.
ddddd	Displays the date using the format given by the system ***ShortDateFormat***.

dddddd	Displays the date using the format given by the system ***LongDateFormat***.
e	Displays the year in the current period/era as a number without a leading zero (Japanese, Korean and Taiwanese locales only).
ee	Displays the year in the current period/era as a number with a leading zero (Japanese, Korean and Taiwanese locales only).
g	Displays the period/era as an abbreviation (Japanese and Taiwanese locales only).
gg	Displays the period/era as a full name. (Japanese and Taiwanese locales only).
m	Displays the month as a number without a leading zero (1-12). If the m specifier immediately follows an h or hh specifier, the minute rather than the month is displayed.
mm	Displays the month as a number with a leading zero (01-12). If the mm specifier immediately follows an h or hh specifier, the minute rather than the month is displayed.
mmm	Displays the month as an abbreviation (Jan-Dec) using the strings given by the system ***ShortMonthNames***.
mmmm	Displays the month as a full name (January-December) using the strings given by the system ***LongMonthNames***.
yy	Displays the year as a two-digit number (00-99).
yyyy	Displays the year as a four-digit number (0000-9999).
h	Displays the hour without a leading zero (0-23).
hh	Displays the hour with a leading zero (00-23).
n	Displays the minute without a leading zero (0-59).
nn	Displays the minute with a leading zero (00-59).
s	Displays the second without a leading zero (0-59).
ss	Displays the second with a leading zero (00-59).
z	Displays the millisecond without a leading zero (0-999).
zzz	Displays the millisecond with a leading zero (000-999).
t	Displays the time using the format given by the system ***ShortTime*** Format.
tt\	Displays the time using the format given by the system ***LongTime*** Format.
am/pm	Uses the 12-hour clock for the preceding h or hh specifier, and displays 'am' for any hour before noon, and 'pm' for any hour after noon. The am/pm specifier can use lower, upper, or mixed case, and the result is displayed accordingly.
a/p	Uses the 12-hour clock for the preceding h or hh specifier, and displays 'a' for any hour before noon, and 'p' for any hour after noon. The a/p specifier can use lower, upper, or mixed case, and the result is displayed accordingly.
ampm	Uses the 12-hour clock for the preceding h or hh specifier, and displays the contents of the system ***TimeAMString*** for any hour before noon, and the contents of the system ***TimePMString*** for any hour after noon.
'xx'	Characters enclosed in single quotes are displayed as-is, and do not affect formatting.

13.6.2 Font and Background

13.6.2.1 Font

The ***Font*** menu opens a dialog box to adjust font settings. If the box synchronisation is set to ***Grid sync***, the ***Font*** menu opens a colour dialog box. You can only change the font colour. All other font settings are as on the worksheet.

In ***Object sync*** or ***Non sync*** mode, the *Font* menu opens a font dialog box. You can adjust the font name, size, style and colour.

13.6.2.2 Background

The menu ***Background*** opens a colour dialog box to choose the result box background colour.

13.6.2.3 Transparent

The menu ***Transparent*** displays the result box with a transparent background.

13.6.3 Positions

13.6.3.1 Send to Back – Bring to Front

Use ***Send to Back*** to change the order of overlapping result or image boxes. Click ***Bring to Front*** to ensure that a box is visible or to reorder overlapping boxes within a worksheet. For example if a result box is included in a technical drawing, click the ***Send to Back*** menu for the image object to move it below the result box. Fix the result box in foreground with a click on the ***Bring to Front*** menu.

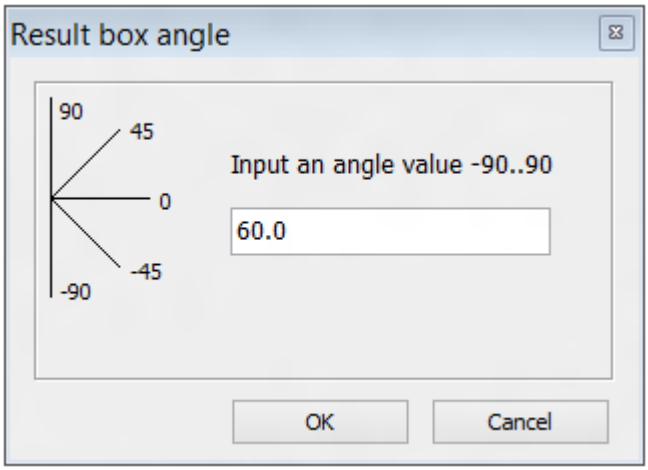
These settings will be saved if the worksheet store to a file. When you load the worksheet from file, RedCrab restores the previous settings. For overlapping boxes, it is important that ***Send to Back*** or ***Bring to Front*** is activated (the menu shows the check mark).

13.6.3.2 Vertical

A click on menu ***Vertical,*** displays the result box content vertically. This function is disabled, when ***Grid sync*** is selected.

13.6.3.3 Angle

The menu ***Angle*** opens a dialog box to adjust the slant of results display. It can be an angle in the range of + / - 90 degrees, adjustable in 0.1 degree increments. This function is disabled, when ***Grid sync*** is selected.



13.6.4 Synchronization

The properties and positions of ***Result*** boxes can be synchronized with the worksheet or text and image boxes.

13.6.4.1 Grid sync

In ***Grid sync*** mode the position and font settings of the result box is synchronized with the worksheet. ***Grid sync*** is intended for formatted output with prefix and unit instead of the default result display. The font settings are automatically adapted to the worksheet. If you change the worksheet font size, the result box font size is changed accordingly. In the popup menu ***Font***, the text colour can be changed.

RedCrab supports positioning on the worksheet. You can move the box in any position. After releasing the mouse button the box snap into place on a worksheet position, where their text is exactly in line to the text on the worksheet.

13.6.4.2 Object sync

If the result box mode set to ***Object sync***, the box position is synchronized to a text or image box. This mode is suitable for positioning results within engineering drawings. The synchronized result boxes always retain their position relative to the drawing when it is moved on the worksheet.

The popup menu ***Object sync*** opens a dialog box prompting user to determine the parent box which result box to be synchronized. Click the left mouse button on the corresponding text or image box and then click the ***OK*** button on the dialog box. The position of the result box is now synchronized with the parent box. You can move the result box to any position. Each time you move the parent box, the synchronized result boxes are moved automatically and always hold their position relative to the parent box.

The text of the result box can also be adjusted horizontally, vertically or diagonally, as described above. The font settings can be adjusted as desired by the popup menu font.

13.6.4.3 Non sync

In ***Non sync*** mode the result box settings have all the features like ***Object sync*** mode. But the box is not synchronized with any other objects.

13.7 Chart Box

Chart boxes are advanced result boxes to display results graphically. The handling is similar to the result box.

The popup menu is extended with two menu items: ***Chart*** and ***Options***.

13.7.1 Chart

With the ***Chart*** menu you can choose between different chart types. You can select the types: ***Line***, ***Area***, ***Point, Bar*** and ***Pie***.

13.7.2 Option

With ***Options*** item you can choose the properties of the Chart box.

Axis	scale
3D	3-D representation
Marks	write values in the graph
Legends	Legend of several data series shown
X/Y Positions	free definition of ***X*** and ***Y*** coordinates

13.7.2.1 X/Y Positions

This option allows the free definition of ***X*** and ***Y*** coordinates. As data source, one- and multidimensional arrays are allowed.

In a one-dimensional field, the values are interpreted as ***X*** and ***Y*** alternate, begining with ***X***.

Example: [x, y, x, y, x, y, x, y, x, y]

In multi-line fields, the first row contains the ***X*** coordinate and the second row the ***Y***-coordinate.

Example: [x, x, x, x, x, x]
[y, y, y, y, y, y]

This procedure is repeated in the following rows. If the number of rows is odd, the last row is ignored.

Before printing the list, the coordinates are sorted, according to the ***X*** position. This means a line is drawn with ascending ***X*** values from left to right.

14.0 ***Extras*** Menu

14.1 Page Lock

With ***Page Lock*** on the menu ***Extras***, the editor's page will be blocked for additional entries. This function protects unintentional changes made. For data input the cells can be unlocked with ***Unlock Cell***.

14.2 Cell Unlock

With ***Unlock Cell*** on menu ***Extras*** cells in a locked page, are unlocked for data entry. Select the cells by mouse, and then click ***Unlock Cell*** on menu ***Extras***. The unlocked fields are marked with an underscore.

To clear the unlocked cells select the cells by mouse, then click ***Unlock Cell*** on menu ***Extras***. The cells are locked now.

14.3 Remark

The ***Remark*** function marks data in a worksheet as a comment. This function can be performed with the function key F2. Comments are ignored by the calculator.

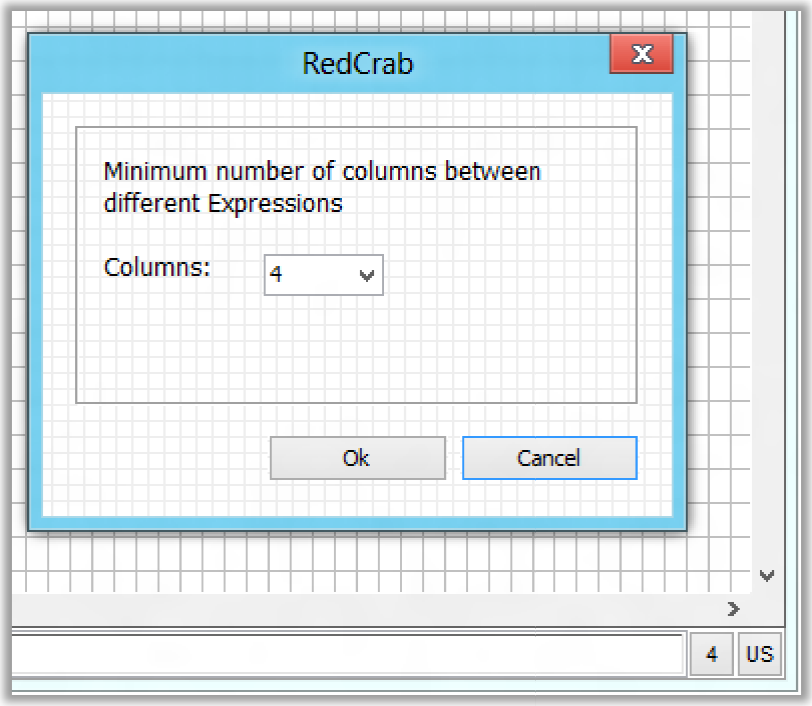
To mark the data, first select the range with the mouse, and then click ***Remark***. The selected data is displayed in green. You can undo this function using the same step.

For longer comments, text boxes are more suitable. ***Remark*** is particularly suited to parts of a formula or input, temporarily excluded from the calculation

15.0 ***Options*** Menu

15.1 Column Space

The menu ***Column Space*** opens a dialog window to set the minimum distance between two formulas in a row. The minimum value you can set is 2 columns. RedCrab displays the value in the bottom, right corner, next to the keyboard setting. You can also open the dialog window with click on the number.



15.2 Long Term

Switch to ***LongTerm*** mode to write long variable names. The implied multiplication interpreted “abc” as `a*b*c`. In ***LongTerm*** mode, rather "abc" is interpreted as one word. In ***Long Term*** mode the ***ESC*** Button is in orange colour. The ***ESC*** function is disabled.

15.3 Display Buffer

RedCrab works with a dual screen memory. This will scroll faster and flicker is avoided. However, this feature works only on new generation computers and video cards. On older computers, it can lead to slower response to inputs. In this case, it is convenient to click ***Display Buffer*** on ***Option*** menu to eliminate this feature.

15.4 Keyboard

The keyboard input in this description refers to an English keyboard in the country's setting English-US When using a non-English keyboard or language, some functions are acquired with other key combinations. This concern most of the ***Ctrl*** key functions. If you have problems with the assignment of the keys, click ***Keyboard*** in the ***Options*** menu. It opens with a list of alternative keyboards, which differ significantly in important features of the English keyboard. Here you select a keyboard that corresponds to your specification. Attached you will find images about key codes of the alternative keyboards and the occupancy of the ***Ctrl*** functions.

15.5 Settings to Registry

When you shut down RedCrab, all major settings are stored in the PCs Windows Registry. Whenever RedCrab is started, these settings are restored. This concerns the keyboard settings, font size, number of decimal places, window size and many more. If you start RedCrab from an external source, e.g. USB stick from different computers, it does not make sense to save the settings on all computers. With the menu ***Options.Settings to Registry*** this function can be switched. The menu will display the text Settings to File and RedCrab saves the settings in the file ***redcrab.con*** in the root directory of the program.

16.0 ***Help*** Menu

16.1 About RedCrab

Display the version number and license.

16.2 Check for Updates

Compare the version of the program with the latest version on the RedCrab server. It displays a message if an update is available. To use this function you must have an online connection.

17.0 Work with RedCrab

After program start RedCrab display an empty page, similar to an empty sheet of paper. The arithmetic field's size is 256 x 256 cells.

17.1 Variable overload

You can assign different values to the same variable.

Example: `P = U*I =`
`P = U²/R =`

But an overloaded variable has no defined value and can't be used for further calculations or result boxes.

Overloaded constants can be reused. Example: the constant ***e*** is occupied by the ***Euler*** number ***e = 2.7182818***. You can overload this value and use ***e*** for further calculations.

Example 1: `x=e=2.7182818`

Example 2: `e=11`
`X=2e=22`

17.2 Fractions

Entering a fraction line: Press the keys ***CTRL+/*** (Ctrl + Slash) and a three-character fraction bar will be displayed. By repeatedly pressing the keys the fraction bar is extended by one character forward. In general, it is sufficient if you continue entering data above and below the fracture line. When typing the numerator or denominator data, the fraction bar is automatically extended by the editor as far as it is required.

If you have taken the fraction line, the cursor is in the first column after the line. Press in this position ***Enter*** key, the cursor moves over the slash to the first position of the numerator. After entering the numerator, press again ***Enter***, the

cursor jump to the first position of the Denominators. After entering the data press ***Enter*** again. The cursor jump back into the column right of the fraction line.

! The fraction bar must exceed at least 1 character front and rear.

Examples:

$$\frac{123}{abc}$$ wrong

$$\frac{123}{Abc}$$ correct

17.3 Root

Set the root character with the keys ***CTRL+1*** to the desired position. Then mark the area which is to be included under the root. Finally set the cursor on the root of character, the editor draws the root symbol over the marked area.

For one-line root calculation, the following steps apply:

1. Set root symbol with ***CTRL+1***.
2. Enter the data
3. Holding down the Shift key and with ***Cursor-left*** key reposition to the root sign.

The editor draws the root symbol over the marked area.

For multi-line data in the root (e.g., fractions):

1. Set root symbol with ***CTRL+1***.
2. Data entry.
3. Mark the area for the root with the mouse.
4. Click the mouse on the root symbol.

The editor draws the root symbol over the marked area.

In order to highlight the area, it is sufficient if the last column under the root is marked.

To change the area under the root, highlight, as described above, the new field and then click the cell of the root sign. The roots then marked the new area.

By double-clicking on the root symbol the root lines around the data is removed.

17.4 Escape Mode

RedCrab works as described above with implied multiplication. A sequence of letters be regarded as a single variable and be multiplied.

Example: `c=ab` interpreted as `c=a*b`

If it is necessary for a variable or a function to use a name with more than one letter use the Escape mode. The Escape mode is activated by pressing the *ESC* key. All these characters are then interpreted as one word, until the Escape mode is switched off. To cancel *ESC*, press *Return* or '('. The screen will be printed bold characters in Escape mode.

Example: **`value = sum - discount`**

If a bracket follows an Escape variable you must set an operator before the bracket. Escape name followed by a bracket without operator is usually interpreted as a function call.

For example: correct: **`sin`**`(12 + a)`
correct: **`six`**`*(12 + a)`
wrong: **`six`**`(12 + a)`

Different Esc names must be separated by *SPACE* or operator; otherwise they are interpreted as a word

For example: correct: **`apple * banana`**
correct: **`apple banana`**
wrong : **`applebanana`**

17.5 Fields

The following section describes how to work with dynamic data fields. ***RedCrab*** can manage multi-dimensional fields. Size and dimensions are limited by the resources of the computer only.

The handling of the fields corresponds to the simple variables. That means no special declaration of variables is required. To generate a field, a sequence of numbers is assigned to a variable. The sequence is written in square brackets and separated by commas.

Example: `x = [1,3,7,12]`

The assignment of a series shows the following example. It will be assigned to the variable x 180 indices with the values 1 to 180.

Example: `x = [1..180]`

A series is always expanded in increments of + /- 1. Other step sizes can multiply or divide by the field generated, or in definition of data fields you can optionally specify the increment of a range (example 2).

Example 1: `x = 5[0..4] = 0  5  10  15  20`

`x = [0..5]/5 = 0  0.2  0.4  0.6  0.8  1`

`x = 5/[1..5] = 5  2.5  1.67  1.25  1`

`x = 2[5..0] = 10  8  6  4  2  0`

Example 2: `x = [2..5:0.75] = 2 2.75 3.5 4.25 5`

Series, individual values and variables can be combined.

Example: `x = [1,5..8,12,15] = 1  5  6  7  8  12  15`

Example:
```
a = 3
b = 12
x = [1,a..5,b] = 1  3  4  5  12
```

Fields are treated as normal values in calculations and can be combined with all operators and functions. The result is a field as well.

Example: `[2,4,7] + 10 = 12  14  17` (2+10 4+10 7+10)

Example: `sin([30,60,90])= 0.5  0.87  1`

Example: `[12,18,36,44] mod 10 = 2  8  6  4`

Example:
```
C = 4.6 10-6
f = [1200,1600,2000,2600]
```

$$X_C = \frac{1}{2\pi f C} = 28.2 \quad 21.2 \quad 16,9 \quad 13$$

The example above shows a list as a result, which contains four different values of f.

Individual components of a field can be accessed via the index.

Example:
```
x = [11..20]
y = x[1,4,6..8] = 11  14  16  17  18
```

17.6 Multidimensional fields

To generate multi-line fields, separate each row by semicolon.

Example:
```
x=[1,2,3;4,5,6]= 1  2  3
                 4  5  6
```

If rows have different length, the missing indexes are filled with zeros.

Example: `x = [1..5;2,4,6;3..9]=`

```
1  2  3  4  5  0  0
2  4  6  0  0  0  0
3  4  5  6  7  8  9
```

Fields with three rows can be written alternative with a large bracket.

Example: $x = \begin{bmatrix} 1,2,3 \\ 4,5,6 \\ 7,8,9 \end{bmatrix} = \begin{matrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{matrix}$

This standard is generally used in matrix notation, but has no effect on the following calculations. For multiplication of matrices, refer to section below ***Mulx*** function.

By entering the data, as described above, one-and two-dimensional fields are generated. Fields with three or more dimensions can be generated computationally.

17.7 Work with fields

Two fields can be operands of a mathematical expression when the fields are of the same type. This means they must have the same size and number of dimensions. An exception is different length in the first dimension. The excess of the longer field are ignored.

Example:
```
a = [2,3,4,5]
b = [10,11,12,13]
c = a + b =  12 14 16 18
```
(2+10 3+11 4+12 5+13)

Example:
```
a = [2,3,4,5]
b = [10,11,12,13,14,15]
c = a + b =  12 14 16 18
```

Excess field length of ***b*** (14,15) is ignored.

Example:
```
a = [2..5; 20..23]
b = [10..13; 30..33]
c = a + b =  12 14 16 18
             50 52 54 56
```

Example:
```
a = [2..5; 20..23]
b = [10..13; 30..33; 40,44,45,48]
c = a + b =  12 14 16 18
             50 52 54 56
```

In this example, the third row of ***b*** is ignored

Example:
```
a = [2..5; 20..23]
b = [10..13; 30..33; 40,44,45,48]
c = a + b[1,3] = 12 14 16 18
                 60 65 67 71
```

In this example, ***a*** from row 1 is added with ***b*** from row 3

In the examples above, each index of ***a*** is added with the corresponding index of ***b***. Alternatively ***RedCrab*** can calculate fields in which each index of an field ***a*** is calculated with each index of the field ***b***. The result is a multidimensional field of the size indices ***a*** times indices ***b***.

The empty brackets following ***c*** declares the result as a multidimensional field and determines the type of the following calculation.

Example:
```
a = [10,15]
    b = [2..4]
    c[] = a+b =  12 13 14   (10+2 10+3 10+4)
                 17 18 19   (15+2 15+3 15+4)
```

Example:
```
a = [3..6]
b = [11..15]
            33 36 39 42 45
c[] = ab =  44 48 52 56 60
            55 60 65 70 75
            66 72 78 84 90
```

The next example shows to multiply a one-dimensional field by a two-dimensional field. The result is a three-dimensional field.

Example:
```
a = [3..6]
b = [11..15]
c[] = ab
                99 108 117 126 135
d[] = ac = 132 144 156 168 180
           165 180 195 210 225
           198 216 234 252 270
```

The display above shows the two-dimensional field of the first level. This is the field that lies behind the first row. Other fields can be accessed via index.

Example:
```
          132 144 156 168 180
d[2] = 176 195 208 224 240
       220 240 260 280 300
       264 288 312 336 360
```

The following example shows reading of a single cell from a multi dimensional field. ***b*** is the value of the cell in the second row and the third column of ***a***. The apostrophe is the delimiter.

Example:
```
b = a [2'3]
```

17.8 Field Display

The result of a data field is always displayed in result boxes. This avoids display problems if not enough space on the worksheet to display large fields.

If you have not assigned a result box to a field variable, ***RedCrab*** automatically generates a temporary result box. This temporary box is displayed with a transparent background and has a limited pop-up menu. If the result is deleted by reset, the result box is deleted too.

One-dimensional data fields are displayed as a horizontal row. With the pop-up menu item ***Vertical***, the display can be switched to a vertical list.

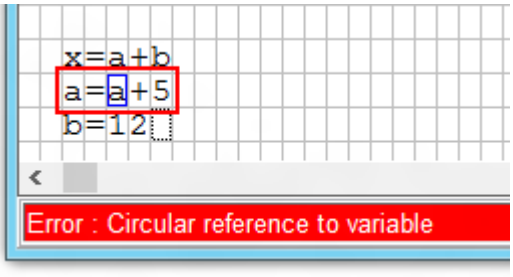
With a click on the pop-up menu item ***Undocked*** you can show the result box in a separate window. The function is particularly suitable for large data fields.

17.9 Constants

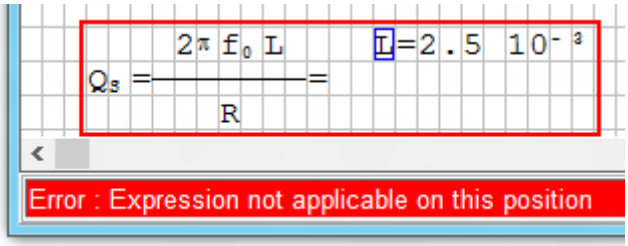
e	Eulerscher Number: 2.7182818284590452...
π	PI : 3.1415....

17.10 Error Messages

For error location RedCrab marks the cell in where an error is detected with a blue frame. It also marks the incorrect formula with a red frame.



The marking of the entire formula simplifies the localization of errors that cause a false positioning. In the example below, an invalid assignment is signaled. The red selected box indicates, however, that two formulas were joined because the distance is too close. In this example the adjustment of the distance (column space) is 4 columns; the distance between the formula is only 2 columns.



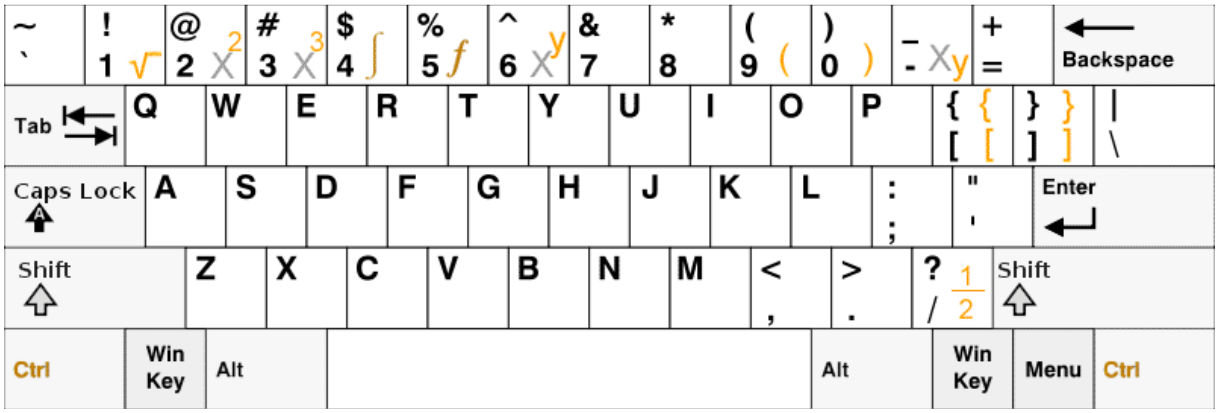
18.1 Reset Preferences

When you shut down RedCrab, all major settings are stored in the PCs Windows Registry. Whenever RedCrab is started, these settings are restored. You can reset the settings, when you restart RedCrab with the command line option “/d”.

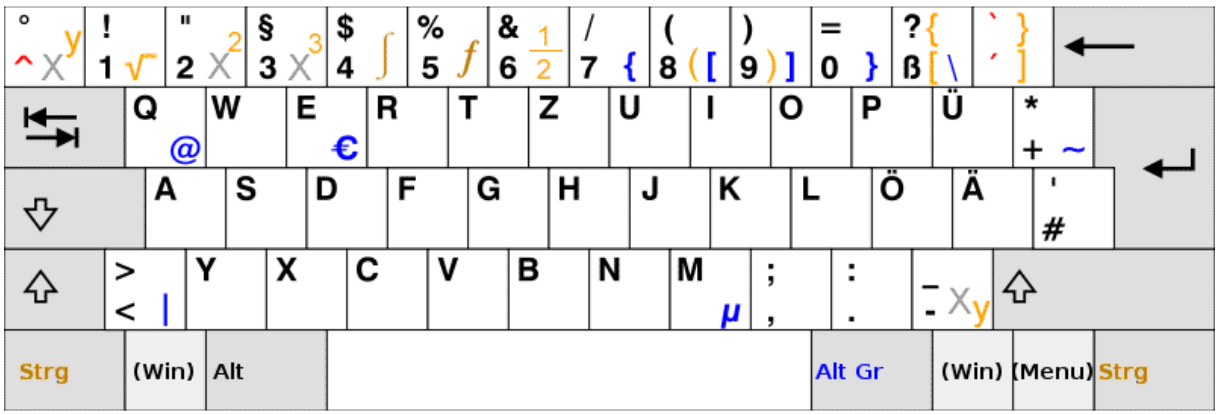
Attachment

Key Code Configuration

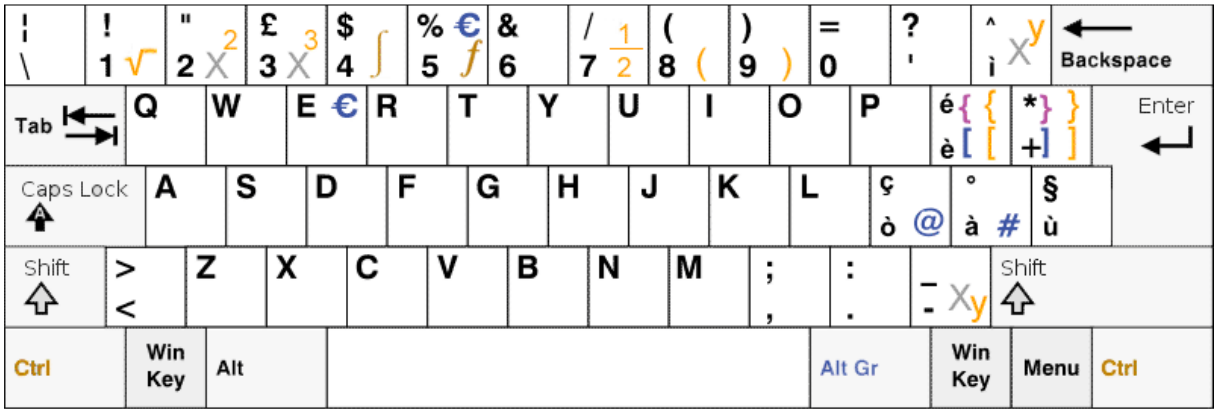
US-English



German



Italian



Brazil (Portuguese)