

XCALC Ver 1.1



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XCALC Ver 1.1

If you double-click on this logo in XCALC, you will bring up the Windows Help for XCALC.

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XCALC.EXE

Version 1.1 rel. 2, January 1993

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XCHELP.EXE

Version 1.1, December 1992

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Whats new to Version 1.1

New to Version 1.1 (over 1.0) are the following items:

- Clipboard Copy/Paste
- Separate VGA/Super VGA Borland Dialogue Boxes (looks prettier)
- Option to make XCALC topmost
- Stack size can be as big as 8
- Can customise the display to show or hide the various panes
- Extra popup window with memory contents
- Memory can be saved between sessions (to file XCALC.DAT)
- Corrected overflow error with +, -, * and / operation

See also:

[Configuring XCALC](#)

From Version 3.1 of Windows, any window can be made topmost, i.e., it will never be obscured by other windows and is thus always visible.

XCALC in short

XCALC is an "extended" calculator for Windows 3.1, that you can use for simple calculations using decimal or complex, hexadecimal, octal or binary numbers (signed 2's complement). The program uses RPN (Reverse Polish Notation), similar to Hewlett Packard handhelds.

The user interface is designed for ease of use, so there is no fancy looking "keyboard" display. If you want to key in a number, use the keyboard! To find **123+456**, for example, key in "**123 <Enter> 456 +**". The weakness with this method is of course the lack of square root keys and such on the PC keyboard, but the keyboard interface is definitely faster than the mouse. If you can't remember the keys for the various mathematical operations, use the Keyhelp button. What you *will* find mouse support for, however, is memory store/recall, the setting of various modes such as Decimal/Complex/Hex, and the "Fix" or "Float" decimal settings.

XCALC will remember its settings between sessions; in its .INI file are kept the various configurable items, and also the screen position, or whether the KeyHelp should be active.

See also:

[RPN operation](#)

[XCALC buttons](#)

[Configuring XCALC](#)

XCALC Buttons

On the XCALC main window there are three buttons that can be clicked (apart from the mode indicators):

Configure

Keyhelp

Exit

Yes, Exit. Stop. DestroyWindow().
If active, the Help and KeyHelp windows will also be closed.



The KeyHelp Button

XCHELP is a separate application that can be started from XCALC. Just press the **Keyhelp** button and a window comes up with a quick reference to the keyboard.

XCHELP will know when XCALC is being minimised, restored or closed, and will thus follow.

XCHELP can also be configured.

RPN Calculator

In short, an RPN calculator operates using a stack, into which you push numbers for subsequent maths operations. This means you enter the numbers first, then you calculate.

Example: to calculate "3+4" using an RPN calculator, you enter the following:

3
Enter
4
+

The RPN calculator is virtually modeless, and you do not have to worry about how many nested levels of parentheses you have keyed in. The only mode (apart from the mathematical modes) is the Stack Lift: this is an On/Off mode that tells the calculator whether or not the next number keyed in should overwrite the X register. Stack Lift is On at all times except when Enter or BackSpace was just pressed.

Standard maths functions that operate on one number only are called without pressing enter:

Example: to calculate "sin (3)" on the RPN calculator, press:

3
s

See also:

Last X register
Maths modes
Keyboard function mapping
Mouse operations
XCALC buttons

Last X:

The *LastX* register is one that will store the last value that was used from the X register in a mathematical operation. The value is recalled by pressing "l" (lowercase ell).

Example:

Enter **3** Enter **4 +**

This will yield the answer of **7** in the X register, and the Last X register will contain the last value from the X register, namely, **4**.

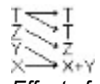
This can be used as a primitive *undo* function, provided you know which operation you did last, and that there is an inverse operation. For example, immediately following the example above, you can enter:

l-l (ell, minus, ell)

This will restore the stack to the state it had just prior to the addition.

RPN is short for "Reverse Polish Notation"

If you want to be finicky, the RPN stack is not really a stack, since the RPN stack never becomes empty..!
Also, the top register (T) is always copied down to the register immediately below it following a binary
maths operation, instead of inserting a zero in T. Example:



Effect of addition.

The "stack" registers (default 4) are named:

T (top)

:

Z

Y

X (the 'active' register)

An additional register is Last X

Use the keyboard to enter numbers and operators.

Use the "Enter" or "Return" key on the keyboard.

The BackSpace key will clear the last digit if you are entering a number; otherwise it will clear the X register and disable the stack lift.

See Function Keys

Modes

There are 5 modes of operation for XCALC, divided into two distinct groups, floating point and 32-bit signed integer:

Floating Point: [Decimal](#)
[Complex](#)

Integer: [Hexadecimal](#)
[Octal](#)
[Binary](#)

For the **Floating Point** modes, various settings will take effect:

Fix/Float:

Using the [mouse](#) or the [keyboard](#), you can select the display of numbers using a fixed amount of digits behind the decimal point ([fixed](#)) or a variable amount ([float](#)). You can also choose between the [Fix](#), [Scientific](#) and [Engineering](#) modes.

Trigonometric settings:

For Decimal (not Complex) operation, you can choose between the [Degree](#) or [Radian](#) angular measurements. The degree measure does not make much sense for complex numbers, so the only setting available for complex operation is the Radian measurement. (See [Complex Operation](#) for an explanation.) If you switch back to Decimal mode, your original setting is restored.

Normal mode, radix 10.

Real and Imaginary parts of the numbers, radix 10.

Radix 16, digits 0,1,2,3,4,5,6,7,8,9,a,b,c,d,e and f. Treated as signed numbers.

Radix 8, digits 0,1,2,3,4,5,6 and 7. Treated as signed numbers.

Radix 2, digits 0 and 1. Treated as signed numbers.

There are 360 degrees in a full circle.

There are 2π radians in a full circle.

Examples of "float" numbers:

-3.878455

456.6

50

The same numbers with "fix" 2 decimals:

-3.88

456.60

50.00

Fix: No forced exponent, e.g., **3.1416**.

Scientific: Always an exponent of 10, e.g., **-1.00 e+001**.

Engineering: Always an exponent of 10, which is always divisible by 3, e.g., **66.67 e+003**.

Complex Number Calculations

The following explains some of the reasoning behind the operation of XCALC. If you are not familiar with complex numbers, go read a maths textbook.

I have chosen a complex-only solution for the floating-point routines in XCALC. This means that when you do decimal calculations, behind the scenes quite a few invisible things happen (like additions of Imaginary parts of numbers). Normally, this goes without any problems, and you might appreciate the solution if you want to know, say, the square root of -1. If the imaginary part of the result of any calculation becomes non-zero, the mode is automatically set to Complex. In the [accuracy](#) section you can see some unfortunate effects of this, but it certainly makes the operation of XCALC a lot tidier!

Since complex numbers and radian angle measures are inseparable, there is no provision for "degrees" in the Complex mode. Euler's formulae simply do not make any sense unless radians are used.

There is also an ambiguity for many complex operations; the value returned by XCALC is correct, but only to a certain degree. Because of this, not all functions will have a true *inverse* with complex numbers. For example, $\cos(1+j)$ will with XCALC result in $0.83... + j0.98...$, but the inverse operation (\arccos) of this will yield $1-j$. [A result of this is that $\arctan(\tan(x))$ often has no resemblance to x itself.]

See also:

[Accuracy](#)

Accuracy

XCALC works (for floating-point modes) internally with Double Precision numbers. This accounts for an *approximate* accuracy of 15 decimal digits. This is, however, not precise, and certain operations may generate errors that accumulate to be larger than this. I will give two examples to show what to expect:

Example 1:

Calculate the square root of the square of five, minus 5:

Press: **5 Q q 5 -**

The result is *not* zero, but approximately $-8.88e-16$. This is because the square root is not exact.

Example 2:

Calculate minus 1 to the power of two:

Press: **1 m Enter 2 ^**

The result is complex! Again, the reason is inaccuracy in the computation, which is done using logarithms for the power function, with in this case a small "leakage" into the imaginary part.

Keyboard Function Mapping

The keyboard operation depends partly on the mode used; see the following topics.

General Keys (all modes)

Decimal/Complex keys

Hexadecimal/Octal/Binary keys

See also:

Mouse operations

General Keys (always operating)

Keyboard

| Key | Explanation |
|------------------|--|
| Enter | Finish entering digits, push stack upwards; |
| + - * / | These keys are for normal input and operation; |
| I (ell) | Recall last X; |
| [up], [down] | Roll up/Roll down stack. |
| [Backspace] | Backspace / Clear X; |
| Z, X | Clear stack; |
| Alt-0 - Alt-9 | Set FIX mode to zero through nine decimals; |
| Alt-F | Set F LOAT mode (varying number of decimals); |
| Alt-I | Set normal (Fix/Float) mode; |
| Alt-S | Set S cientific mode; |
| Alt-E | Set E ngineering mode; |
| Alt-D | D ecimal; |
| Alt-C | C omplex; |
| Alt-H | H exadecimal; |
| Alt-O | O ctal; |
| Alt-B | B inary; |
| Alt-G | Set D egree mode; |
| Alt-R | Set R adian mode; |
| Alt-N | Bring up configuration box; |
| Alt-K | Start K EYHELP; |
| Alt-X, Alt-F4 | Exit; |
| Ctrl-Z, Ctrl-N | Toggle display of <u>memory popup</u> window; |
| Ctrl-C/Ctrl-Ins | Copy X (as text and bitmap) to the <u>clipboard</u> ; |
| Ctrl-V/Shift-Ins | Paste (text) from the <u>clipboard</u> into X; |
| Ctrl - 0-9 | [<i>Numeric keypad</i>] Store to <u>memory register</u> <i>n</i> ; |
| Alt - 0-9 | [<i>Numeric keypad</i>] Recall from memory register <i>n</i> ; |
| Ctrl-Alt - 0-9 | [<i>Numeric keypad</i>] Clear memory register <i>n</i> ; |
| F1 | Help; |
| Esc | Minimise window; |

Clipboard Functions

XCALC can both copy to, and paste from, the Windows Clipboard using the standard Copy/Paste keys (the operation is akin to memory store/recall: numbers are copied from/to the X register, and the stack is pushed if StackLift is on).

Using the mouse, you can bypass the stack operation and copy directly to/from any visible stack register by clicking on the display itself:

Left Double-Click: Copy to clipboard
Right Double-Click: Paste from clipboard

The text is copied verbatim from the display, so if you use "fixed point" display, only the visible digits are copied. Blanks are removed. A paste operation is successful if a textual representation (ANSI or OEM text) of a number valid for the current radix setting is the first non-whitespace content of the clipboard (a maximum of 34 digits will be read). If a paste cannot be done (if there is no text on the clipboard, or if the text is non-numerical), no operation takes place at all. Successful copy and paste operations are indicated briefly on the display.

Note that a copy operation will also transfer a bitmap representation of the display to the clipboard. I can't see why anyone in their right mind would use this, but it's there anyway.

Decimal/Complex mode Keys

Keyboard

| Key | Explanation |
|------------------|---|
| p | π ; |
| s c t S C T | S ine, C osine and T angent, respectively; Arc S ine, Arc C osine and Arc T angent; |
| q Q | S quare root and s quare, respectively; |
| L E G N | Natural logarithm (ln) and exponential (e^x); Base-10 logarithm (log) and antilog (ten , 10^x); |
| ^ & | Power (y^x) and root (y^{1/x}); |
| | Absolute value (x); |
| ! | Factorial (x!) of the integer real part of X ; |
| \ | Reciprocal (1/x); |
| i, j | Combine the real parts of Y and X into Y + jX . Switch to complex mode if in decimal mode; |
| [Left], [Right] | Set FIX/FLOAT modes; |
| ' (single quote) | Complex conjugate (Complex only); |
| " | Swap real and imaginary part (Complex only); |
| , (comma) | Finish entering real part, start entering imaginary part of number (Complex only). |

Hexadecimal/Octal/Binary mode keys

Keyboard

| Key | Explanation |
|--------------------|--------------------------|
| & ~ ^ | And, Or, Not and Xor; |
| [Left], [Right] | Shift 1 bit Left/Right; |
| Shift-[Lft], [Rgt] | Rotate 1 bit Left/Right; |

There are 10 memory registers, numbered 0 through 9. Each can hold a number in any format. See [Memory Registers](#).

Mouse Operations

You don't operate a calculator with a mouse. So there is no "keyboard" under XCALC's number display. With the mouse you can do the following operations in XCALC:

The standard move and system menu operations;

Click on the buttons for various modes;

Set the Fixed/Float display by clicking on the small digits in the Fix/Float box;

Store/Recall/Clear Memory registers;

Copy/Paste to/from the Clipboard;

Click on the buttons **Configure**, **KeyHelp** and **Exit**.

You cannot resize the window with the mouse.

See also:

[XCALC buttons](#)

[Keyboard operation](#)

[Configuring XCALC](#)

Memory Registers

XCALC is equipped with ten memory registers; each can hold one number in Decimal, Complex or Integer (Hex/Oct/Bin) format. The keys to control the memory are as follows (use the numeric keypad):

| | |
|--------------------------|---|
| Ctrl-<i>n</i> | Store the X register in memory cell <i>n</i> ($0 \leq n \leq 9$). |
| Alt-<i>n</i> | Recall memory cell <i>n</i> to the X register. |
| Ctrl-Alt-<i>n</i> | Clear (zero) memory cell <i>n</i> . |

As a reminder, you can optionally (see [Configuring XCALC](#)) show small digits on the bottom pane on the screen that represent the memory registers. If a register contains zero, the digit is shown in white, otherwise in red. When the memory display is turned on, you can also control the operations with the mouse by clicking on the small digits:

| | |
|--------------------------|---|
| LEFT click | Store the X register in memory cell <i>n</i> ($0 \leq n \leq 9$). |
| RIGHT click | Recall memory cell <i>n</i> to the X register. |
| LEFT double click | Clear (zero) memory cell <i>n</i> . |

You can also start (see [Configuring XCALC](#)) a separate, movable [popup window](#) which shows the contents of the various memory registers. You can also specify that memory registers are saved between sessions. The registers are saved in binary format in the file XCALC.DAT in your Windows directory.

Memory Popup Window

If you select to show the separate popup window for the memory registers, you add another option to the store/recall processes; the small panes that appear with the memory contents can be clicked for store/recall as follows:

| | |
|---------------------------|--|
| LEFT double-click | Store the X register in the selected memory cell |
| RIGHT double-click | Recall the selected memory cell to the X register. |

The popup window does not have any caption, but to move the window you can click/drag anywhere within the popup.

Note: The keyboard shortcut keys **Ctrl-Z** or **Ctrl-N** will quickly toggle the display of the popup window, without affecting the setup.

See also:

[Configuring XCALC](#)

Configuring XCALC

In the Configure Dialogue Box you can make the following settings:

General Options

Sound (default On):

Whether or not to get a beep when you make a maths error.

Underline (default On):

Whether or not the *Alt*-hotkey for the various buttons should be underlined.

Icon Start (default Off):

This lets you force XCALC to start in an iconised state.

Keep In Front (default Off):

This lets you force XCALC to stay a topmost window (always visible).

Save Registers (default Off):

Memory registers can be saved in a file between sessions.

Memory

Show Indicators (default Off):

This lets you turn on or off the memory display digits (0-9) in the bottom pane of the display.

Popup Window (default Off):

This lets you turn on or off the popup memory display that shows the contents of the memory registers.

Popup 1 or 2 Columns (default 2):

This changes the layout of the popup window.

Display

Caption (default On):

Show or hide the caption/system menu. With this *off*, the program takes on a somewhat non-standard behaviour.

Radix Buttons (default On):

Turns on/off the Decimal/Complex/Hex/Octal/Binary buttons.

Disp/Trig Buttons (default On):

Turns on/off the Fix/Eng/Sci/Deg/Rad buttons.

Fix/Pushbuttons (default On):

Turns on/off the fixed point settings and the 3 pushbuttons (Configure, KeyHelp, Exit).

Logo/Error Window (default On):

Turns on/off the bottom pane with the memory indicators, error messages and logo.

Other Options

Stack Display (default 4):

This sets the number of stack registers that are shown on the display, as well as the actual size of the stack. The value must be between 1 and 8 (included). Note that the actual stack never becomes smaller than 4, although you may choose to display only 1, 2 or 3 registers.

Size / Help Size (default 100%):

This resizes the windows of XCALC and XCHELP, respectively, as a percentage of the default size. The default size of XCALC depends on the Display Bitmaps. The default size of XCHELP is fixed (and too big for a VGA display).

Display Bitmap:

Everything in XCALC is sized around the display bitmaps. There are currently 6 bitmaps you can select, with the respective sizes (pixels) per digit:

DIGITS1 (the default, 19x29 pixels),
DIGITS2 (small and ugly, 8x10 pixels),
DIGITS3 (*Courier*, 15x21 pixels),
DIGITS4 (medium ugly, 12x18 pixels),
DIGITS5 (small Zapf Chancery, 11x15 pixels), and
DIGITS6 (larger **Zapf Chancery**, 18x25 pixels).

Experiment to get the display and size that suits you best. If you make any changes to the XCALC main display (such as adding/deleting a pane, changing the Size or the Bitmap), and press OK, XCALC will momentarily disappear from the screen while it is rebuilding the screen windows.

This program lets you hide the Window Caption to minimise the use of screen real-estate. If you do this, you lose the normal 'move-the-window-with-the-mouse' procedure, as well as the minimise button, the system menu and the caption active/inactive state display. Most of these functions are retained, however, in a somewhat non-standard way:

- You can move the window by click/drag anywhere on the number display;
- A little blue circle in the top left corner shows if the window is active;
- You can click this circle: *left double-click* = configure, *right double-click* = exit program.

Who wrote this program

The XCALC program is written by

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Note: I'll be leaving Australia in March 1993, and will thus not be available on the above address after this. Look for an updated XCALC where you found this, to see my new address.

This is one of the very first programs I have ever written for MS Windows, and I have learned a lot during the development period. Thanks to Borland C++ (Versions 2.0 and 3.1) writing the program has been fun, and I am happy to share it with anyone who will use it (well, not the source code...).

So dont send me any money, send email instead, and tell me that you like the program! I would appreciate any constructive feedback (or shout me a beer the next time you visit Wollongong).

Version History:

Sep 1992: Version 1.0
Nov 1992: Version 1.01 (added clipboard functions)
Nov 1992: Version 1.02 (separate VGA/SuperVGA dialogue boxes)
Dec 1992: Version 1.1 (fixed overflow error, added keep in front, display only selected elements on screen, configure on system menu, memory popup window, memory save)
Jan 1993: Version 1.1 rel. 2 (removed BWCC.LIB from XCALC_A)

See also

[Known Bugs](#)

Bugs

The bug with overflow in the four basic maths functions from Version 1.0 has been corrected. If you now get a Maths Exception error, please tell me.

This means I am currently not aware of any errors in XCALC. Bug reports are always welcome, of course!

A Maths Exception has occurred in XCALC

This error happens if you generate an overflow or a singularity that is not trapped by another routine. The author honestly believes that such an error should never occur, but if it does and you see this, please contact me ([the author](#)) and report what happened.

Your only option now is to click OK, and the XCALC instance will be closed. Note that the program will exit in a normal manner, so all the settings (such as mode, position etc.) will be updated as usual.

