

DETACHED SOLUTIONS

The Omnicalc User's Manual

Welcome to the Omnicalc User's Manual. Here you will find information regarding the usage of Omnicalc for your TI-83/84 Plus.

Omnicalc

Version 1.20

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The Table Of Contents

1. Installation

- [Installation](#)
- [Symbolic Compatibility](#)
- [MirageOS Compatibility](#)
- [Uninstallation](#)

2. Options Screen

- [Usage](#)
- [Parentheses Assistant](#)
- [Memory Protection](#)
- [Entry Menu](#)
- [RAM Recovery](#)
- [Virtual Calculators](#)
- [Base Conversion](#)
- [Thousands Separators](#)
- [Quick APPS Menu](#)

3. OS Extensions

- [Custom Menu](#)
- [Logarithm bases](#)
- [Partial Homescreen Clearing](#)

4. Additional Functions

- [Accessing \(**read this**\)](#)
- [!n\(\)](#)
- [baseInput\(\)](#)
- [const\(\)](#)
- [factor\(\)](#)
- [ExecAsm\(\)](#)
- [gamma\(\)](#)

5. Font Sets

- [Overview](#)
- [Creating](#)
- [Using](#)

6. Program Compression

- [Compressing ASM programs](#)
- [Running Lite8x-compressed programs](#)

7. Miscellaneous

- [Credits](#)
- [Version History](#)

- [linkGet\(\)](#)
- [linkSend\(\)](#)
- [mod\(\)](#)
- [RestoreMem\(\)](#)
- [Rom>Dec\(\)](#)
- [play\(\)](#)
- [simp√\(\)](#)
- [sprite\(\)](#)

DETACHED SOLUTIONS

The Omnicalc User's Manual

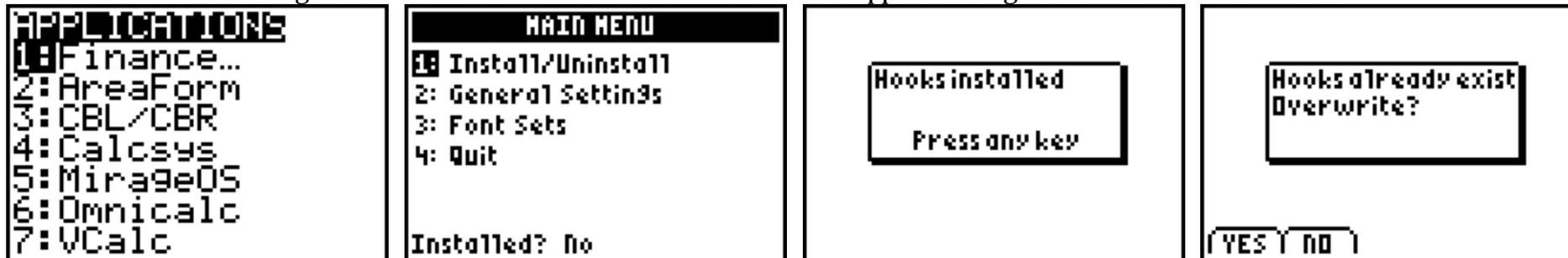
Quick Page Links

[Table of Contents](#)

[Omnicalc Homepage](#)

Installation : Installing

To install Omnicalc on your TI-83 Plus/TI-83 Plus Silver Edition (or 84+/84+ SE), first you must send omnicalc.8xk to your calculator using the TI-GRAPHLINK or TI Connect software. Once it is on your calculator, press the APPS key. From the apps menu, select Omnicalc. The splash screen will appear. Press any key to clear it. At the main menu, choose 1: Install/Uninstall. The message "Hooks installed" should appear. In subsequent runs, Install/Uninstall will toggle between the installed and uninstalled states. If you see a message that says "Hooks exist. Overwrite?" this means that another application on the calculator is currently using a hook that Omnicalc needs. Choosing Yes will install Omnicalc and disable the other app. Choosing no will not install Omnicalc.



Installation : Symbolic Compatibility

[Top of Page](#)

The usage of the key hook, token hook, and parser hook posed a problem for Omnicalc and Symbolic, which both make use of these hooks. However, Omnicalc detects and chains flash applications together to solve this problem. If you have the Symbolic app present on your calculator (you must have v1.8 or later), it will be automatically detected, and pressing MATH twice will display a menu with functions from Symbolic. In the same manner, Symbolic's pretty() links to the Pretty Print app; hence, you can use the functionality of all three apps via Omnicalc.

Installation : MirageOS Compatibility

[Top of Page](#)

To run MirageOS via On+Apps with Omnicalc, first you must run MirageOS and press ALPHA to enter options. Scroll down to "Tasker And Key Hooks" and press Enter. Uncheck "Quick Key Repeat", "ALPHA/APPS+ ON", and "Block the Memory Menu From Access". Now you can install Omnicalc. Upon pressing On+Apps, Omnicalc will automatically run MirageOS if it exists on your calculator. For On+Alpha functionality, this is always enabled whether MirageOS is on your calculator or not. On+ Alpha will power off the calculator but leave it at the current screen for resuming later.

Installation : Uninstallation

[Top of Page](#)

Uninstallation of Omnicalc is needed if you are planning to delete or replace the Omnicalc flash application. It is accomplished via the same "Install/Uninstall" option at the main menu. To check if Omnicalc is installed, look at the status indicator at the bottom of the screen. If it shows "Yes" then choosing "Install/Uninstall" will uninstall Omnicalc. When done, a message will appear:



DETACHED SOLUTIONS

Quick Page Links

[Table of Contents](#)

[Omnicalc Homepage](#)

The Omnicalc User's Manual

Options Screen : Usage

Options that enable or disable Omnicalc features are available in the General Settings screen, number 2 in the main menu. The up and down arrow keys move the cursor in the screen. Pressing 2nd or Enter will toggle the selected option. Clear returns to the main menu. The GRAPH key will toggle between the first and second pages of settings. For more specific information regarding each setting, see below.



Options Screen : Parentheses Assistant

[Top of Page](#)

The first option in the options screen is the Parentheses Assistant. This feature manages the typing of parentheses in the homescreen. To enter a right parenthesis, a left one must have been already entered. In addition, parentheses levels flash upon completing them. Parentheses within quotation marks are assumed to be strings and are exempted from the rules above.



Options Screen : Memory Protection

[Top of Page](#)

The Memory Protection feature of Omnicalc prevents users from deleting variables or resetting your memory. The Reset choice in the TI-OS memory menu (2nd+MEM) is blocked, as well as the Del key in the Mem Mgmt/Del screen. The self-test key sequence is also blocked.

Options Screen : Entries Menu

[Top of Page](#)

The Entries Menu feature modifies your 2nd+Entry key to provide a scrolling full screen menu of past entries. The up/down arrow keys scroll, or a numeric/alpha key can be pressed to direct paste an item. Enter selects the currently highlighted item. In other words, the entries menu is identical in operation to the TI-OS menus. When enabled, the entries menu appears whenever 2nd+Entry is pressed at the homescreen, overriding the usual 2nd+Entry key behavior.

```
ENTRIES:
1: sin(8
2: 78*65
3: randint(4,8
4: ln(2.5
5: 25.654+355.12
6: 7sin(X+π)-5
7: real(23,337
```

Options Screen : **RAM Recovery**

[Top of Page](#)

If you have a TI-83 Plus Silver Edition, TI-84 Plus, or TI-84 Plus Silver Edition (sorry, this feature will not work on a regular 83+), the RAM Recovery feature will automatically backup the contents of your RAM. When this option is enabled, whenever the calculator is turned off, a copy of all RAM will be created and stored. This feature works in conjunction with the RestoreMem() token. If your RAM is ever erased, run the RestoreMem() function to restore it. For more details, please see [RestoreMem\(\)](#).

Options Screen : **Virtual Calculators**

[Top of Page](#)

Warning: This function may be unstable and should be considered experimental. For the TI-83 Plus Silver Edition, TI-84 Plus, and TI-84 Plus Silver Edition only, (the extra RAM used by this function does not exist on the regular 83+), this option will enable your calculator to create an extra 'virtual calculator' within it. This gives you the ability to use two calculators in one. To use this function, after enabling it, press On+Mode anywhere in the system OS. On+Mode will switch back and forth between the two virtual calculator states. Each state has a completely different RAM space, but remember the archive is shared. When you switch to a virtual calculator state, a "1" or "2" will appear in the upper right corner of the screen to remind you which state you are now in.

Note that the state of the archive memory is shared between the two calculator states, and crashes can result if one calculator state expects a program to be in RAM and it is in archive, or vice versa. This function should be treated as experimental only.

Options Screen : **Base Conversion**

[Top of Page](#)

Omnicalc provides the ability to operate your TI-83 Plus in a variety of number bases. A number base is a number that forms the basis of the counting units of a number system, through powers. For example, decimal is base 10. As you move left in a decimal number, each digit's value increases by a factor of 10. Binary is base 2, hexadecimal is base 16, et cetera.

The base operation option, will output all homescreen real integers between 0 and $(2^{32})-1$ in the number base of your choice. The default value is 10. To change base, press On+Log. Then enter the new base (valid range is 2-36). To enter a single digit value such as "5" you must enter as "05". The new base will briefly flash in the upper right screen corner.

Some common bases:

- Binary (base 2)
- Ternary (base 3)
- Quinary (base 5)
- Octal (base 8)
- Decimal (base 10)
- Hexadecimal (base 16)

Because of OS limitations, any converted number cannot be more than 16 characters wide.

```
28
      11100b
36
      36
real(25, "10", 16
      10000b
```

Options Screen : **Thousands Separators**

[Top of Page](#)

The Thousands Separator option will insert commas after every 3 digits of a number where appropriate.

```
123
      123
32768
      32,768
2384792017
      2,384,792,017
```

Options Screen : **Quick APPS Menu**

[Top of Page](#)

Available only for the 83+ and 84+ Silver Edition calculators, the Quick APPS menu is an identically-functioning replacement for the flash applications menu in the operating system. However, unlike the OS menu, this one opens instantly and scrolls instantly. There are no more annoying 3 second delays when trying to scroll at the bottom of a 50 app menu. The "Quick APPS" setting must be checked for this feature to work. The option below it, "Hide Finance app", is used in conjunction with this menu. If checked, the built-in Finance app will not be shown on the menu.

```
APPLICATIONS
1: Finance...
2: AreaForm
3: Cabamap
4: Elements
5: GeoCalc
6: Krolypto
7: Omnicalc
```

DETACHED SOLUTIONS

Quick Page Links

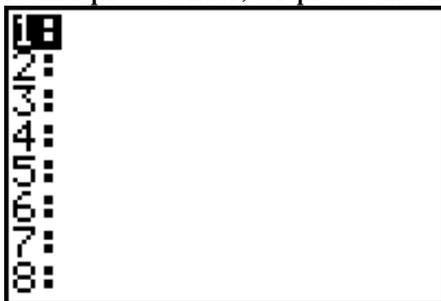
[Table of Contents](#)

[Omnicalc Homepage](#)

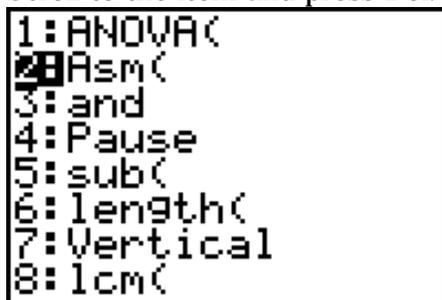
The Omnicalc User's Manual

OS Extensions : **Custom Menu**

Omnicalc provides a custom menu for your 83+, much like the CUSTOM menu on a TI-86. You can store frequently used functions from the Catalog in the CUSTOM menu for quick access. To access the custom menu, press VARS twice. To paste a function from the custom menu, scroll to it and press enter, or press the numeric key that corresponds with its entry.



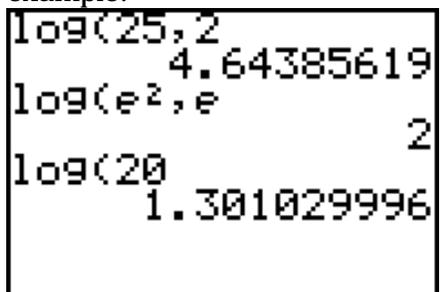
Your custom menu will be empty at first. To put a function in a slot in the custom menu, go to the catalog by pressing 2nd+Catalog. Scroll to the function you want to insert and press On and the number of the slot to fill. For example, to put abs(in slot 4 you would scroll to abs(and press On+4. To remove a function from the custom menu, first press VARS twice to access the menu. Scroll to the item and press Del.



OS Extensions : **Logarithm Bases**

[Top of Page](#)

Omnicalc modifies the existing log() function on the calculator to provide support for arbitrary log bases. log() with a single argument, such as log(20), will take the log base 10 of 20. However, there is also a format log(number,base). This function only works with real numbers. For example:



OS Extensions : **Partial Clear**

[Top of Page](#)

When you press CLEAR at the homescreen, typically it erases the entire line. With Omnicalc, a 89-style CLEAR functionality is enabled, depending on the cursor location. If the cursor is at the end

of the current entry in the homescreen, pressing CLEAR will erase the entire line. However, if the cursor is located inside the entry, pressing CLEAR will erase only tokens to the right of the cursor. Pressing CLEAR immediately again will clear the entire line.

DETACHED SOLUTIONS

Quick Page Links

[Table of Contents](#)

[Omnicalc Homepage](#)

The Omnicalc User's Manual

Functions : **Accessing**

Omnicalc provides additional functions for users and BASIC programmers. These functions can be accessed anywhere in the TI-OS by pressing the PRGM key twice. Also, if you have a function highlighted in this menu, pressing the + (Plus) key will show brief help regarding the function.

Important note: Due to conflicts with OS versions 1.15 and above, Omnicalc now uses a modified form of the real() token when displaying these tokens. This form uses real(XX, as the beginning, where XX is a unique token identifier. The parameters for the additional function follow afterwards. This will let you group, transfer, and edit programs with the custom tokens without problems. Example: real(30,5) is the same as !n(5). This is the only syntax supported by Omnicalc 1.2, and will allow programs to use these functions with the same ease and stability of the built-in OS functions.

```
PRGM MATH MISC
1:Sprite(
2:Play(
3:ExecAsm(
```

Functions : **Viewing**

[Top of Page](#)

Because all of the functions are represented by "real(12," or something similarly cryptic, you can move the cursor to the beginning of the token (on top of the 'r' in real) and press and hold down On+0 to view the name of that function. The name will be displayed until you release the keys.

```
real(25,
baseInput(
```

Functions : **Subfactorial**

[Top of Page](#)

The subfactorial function will calculate the subfactorial of a positive integer. This is used in probability. The subfactorial is the number of permutations of a set with no element remaining in its original position. For example, the set {1,2,3} has only two possibilities: {3,1,2} and {2,3,1}. Hence !n(3) returns 2.

Syntax: !n(*integer*)

Returns: subfactorial of *integer*

```
real(30,3
                2
real(30,8)
                14833
```

Functions : **Base Conversions**

[Top of Page](#)

The `baseInput()` function allows for the entering of numbers in other number bases than decimal, specifically base 2 through base 36. There are two required arguments, the first is the number in strings to be converted, the second is the base of the number. The number is converted to decimal and returned. If you wish to convert the inputted base to another base, there are two methods. Either use the [Base Operations option](#) to change the output format or add an optional third argument. The third argument is the base to convert to; it must be 2-36. The converted result of this function must be in the range 0 to $(2^{32})-1$. Letters A-Z may be used in the string for bases above 10.

Syntax: `baseInput(string number, base, [new base])`

Returns: the number converted into the current base display (usually decimal, use Base Operations to change)

```
real(25,"1100100
1",2
                201
real(25,"25",8
                15h
```

Functions : **Constant**

[Top of Page](#)

The `constant` function will return the numeric value of a constant. There is one argument, a string containing the constant to return. Valid inputs are: NA, K, CC, EC, RC, GC, G, ME, MP, MN, H, C, U.

Syntax: `const(string)`

Returns: numeric value of *string*

```
real(29,"C"
                299792458
real(29,"G"
                9.80665
```

Functions : **Execute Assembly**

[Top of Page](#)

`ExecAsm()` is used to run a string containing assembly language opcodes. This can be useful for embedding advanced features in BASIC programs without having to call external ASM programs. For example, the `B_CALL` to clear the LCD is `4540h`. To `B_CALL` `ClrLCDFull` and then return would be `ExecAsm("EF4045C9")`.

Syntax: `ExecAsm(string)`

Returns: 1 if success after executing the ASM instructions.

```
real(33, "EF4045C  
9
```

Functions : **Factor**

[Top of Page](#)

The factor function numerically factors a positive integer. It takes one argument, the integer to factor. It outputs a list of the prime factors in ascending order.

Syntax: factor(*integer*)

Returns: list of prime factors of *integer*

```
real(23, 96  
      (2 2 2 2 2 3)  
real(23, 20)  
      (2 2 5)  
real(23, 1284  
      (2 2 3 107)
```

Functions : **Gamma**

[Top of Page](#)

Gamma will return the gamma of a number. If you do not know what gamma is, then this function is not for you, read on to the next one :) It has one argument, a positive number.

Syntax: gamma(*number*)

Returns: gamma of *number*

```
real(24, 8  
      5040  
real(24, 2.47  
      1.301880689  
real(24, e  
      1.567468256
```

Functions : **Link Receive**

[Top of Page](#)

The linkGet() function will receive one byte over the link port. It has one argument, which is either 0 or 1. Zero indicates to try to get a byte immediately and fail if one is not present. One will make linkGet() wait indefinitely for a byte. linkGet returns either the byte received (0-255), or -1 if it failed.

Syntax: linkGet(*value*)

Returns: byte received or will return -1 if could not get byte.

```

real(26,0      -1
real(26,0      32

```

Functions : **Link Send**

[Top of Page](#)

The linkSend function sends one byte over the link port. It has one argument, which is the value of the byte to send (0-255). It will send the byte immediately and return 0 if it was successful. If it was a failure and you are sending from a 83+ it will return -1. Due to the hardware assist in the TI-83/84 Plus Silver Edition it is not possible at this time to determine if sending a byte fails.

Syntax: linkSend(*value*)

Returns: 0 if success or -1 if failure

```

real(27,64      -1
real(27,78      0

```

Functions : **Modulus Arithmetic**

[Top of Page](#)

The mod (modulo) function returns the integer remainder of a division. It takes two arguments, the first number is the dividend, the second is the divisor.

Syntax: mod(*dividend*, *divisor*)

Returns: remainder of (*dividend* ÷ *divisor*)

```

real(28,12478,64
                    62
real(28,8,3         2
real(28,48,12      0

```

Functions : **RAM Recover**

[Top of Page](#)

The RestoreMem() feature, if run on a TI-83/84 Plus Silver Edition that has the "RAM Recovery" option enabled, will restore the memory from the last backup point. The calculator must have been turned off at least once for this function to work. This function may turn off your calculator in the process. If the screen goes blank after running, press On to turn the calculator on. Your memory should be restored.

Syntax: RestoreMem(*0*)

Functions : **Roman Numerals**

[Top of Page](#)

The Rom>Dec function converts Roman numerals into our Arabic numerals. It has one argument, a string containing Roman numerals. Valid numerals are: I,V,X,L,C,D,M

Syntax: Rom>Dec(*string*)

Returns: decimal equivalent of Roman numeral *string*

```
real(21,"MCMLXVI
                    1966
real(21,"XCIV
                    94
```

Functions : **Play**

[Top of Page](#)

The play() function is a complete reimplement of the classic PLAY command in QBASIC. This requires either headphones to plug into the link port or the AM radio trick (check ticalc.org for the basics of listening to music on a calculator). There is only one argument, a command string composed of the following commands:

- X This will prevent the OS from checking for link activity, allowing BASIC commands such as Input to function correctly. Omnicalc will automatically reenable the link port when the BASIC program exits. It is suggested that music playing programs run play("X") as their first line.
- T Valid values are T32 through T255. This sets the tempo of the music in quarter notes per minute. The default is 120.
- MN Sets normal style, in which notes play for 7/8 of their length followed by 1/8 silence. This is the default style.
- MS Sets staccato style, in which notes play for 3/4 of their length followed by 1/4 silence.
- ML Sets legato style, in which notes play for their full length with no breaks between notes.
- L Sets the length of notes. Omnicalc supports whole notes through sixty-fourth notes. Valid values are L1,L2,L4,L8,L16,L32, and L64. The default is L4.
- O Sets the current octave. Valid values range from O0 (that's an O and a zero) to O6. The default octave is 2. Note that Omnicalc's octaves are one lower than QBASIC's. Omnicalc's notes range from 32.7 Hz to 3951.07 Hz (American Standard Pitch C1 to B7)
- < Lowers the current octave by one.
- > Raises the current octave by one.
- P Plays a pause ranging from P1 to P64 (P1,P2,P4,P8,P16,P32,P64). This may be dotted by following with one or more periods.
- N Plays a specific note from the 84 (12 * 7 octaves) that Omnicalc offers. Valid values are N0-N84. N0 is a pause.
- A-G Plays the corresponding note in the current octave. Sharps (plus sign) and flats (minus sign) may follow to adjust the pitch, as well as a number to set the length of the specific note.

The order of commands that can follow a note such as "A" can be confusing. As an example, A+ 1.. is a valid note. The sharp or flat must immediately follow the note's letter. Next, a note length may be specified (1,2,4,8,16,32,64). If no length is specified, the note is played with the length given in the L command. Last, one or more periods may follow to specify a dotted note. Each dot adds 1/2 of the previous length to the note. As an example, C. is 3/2 the length of a normal C, and C.. is 7/4 the length of a normal C.

Pauses may be dotted, e.g. "P4."

Download [mozart.8xp](#) for a demonstration of play().

real(31,"T180P2P8L8GGGL2E-P32.P8L8FFFL2D") will play the opening notes of Beethoven's fifth symphony.

Functions : **Radical Simplification**

[Top of Page](#)

Simp $\sqrt{\quad}$ returns the simplified form of a square root. It has one argument, a positive integer which is the radicand.

Syntax: simp $\sqrt{(integer)}$

Returns: string containing the simplified $\sqrt{(integer)}$

```
real(22,24)
2√(6)
real(22,81)
9
real(22,27)
3√(3)
```

Functions : **Sprites**

[Top of Page](#)

Sprite is the most complicated function in Omnicalc. It takes a part of a picture variable and displays it to the screen. It has 7 arguments, with an optional eighth. All arguments are integers. The arguments in order from left to right are explained below:

1. 0-9; this indicates which picture variable to use.
2. The X coordinate (0-94) where the desired sprite is in the picture variable. Must be a multiple of 8 bytes.
3. The Y coordinate (0-62) where the desired sprite is in the picture variable.
4. The width of the sprite in pixels, must be a multiple of 8 bytes.
5. The height of the sprite in pixels.
6. The X coordinate on the screen where you want to show the sprite.
7. The Y coordinate on the screen where you want to show the sprite.
8. **Optional:** This argument is optional and has 4 possible values that control the display options. If omitted, sprite() will assume value 0 (XOR logic, update screen also):
 - o 0 - This will display the sprite to the graph buffer and update the display. It will use XOR logic.
 - o 1 - This will display the sprite to the graph buffer, but not update the display. (Useful for erasing a sprite when you plan to immediately redraw it in a different place; or building a tilemap). It will use XOR logic.
 - o 2 - This will display the sprite to the graph buffer and update the display. It will use OR logic.
 - o 3 - This will display the sprite to the graph buffer, but not update the display. It will use OR logic.

Example: If Pic0 contains the screenshot on the left, and you ClrDraw, and then execute the sprite() command shown in the middle picture, the screen will look as shown in the right picture.

Syntax: sprite(*picture variable number, sprite X, sprite Y, sprite width, sprite height, destination X, destination Y, [options]*)

Returns: 0

DETACHED SOLUTIONS

Quick Page Links

[Table of Contents](#)

[Omnicalc Homepage](#)

The Omnicalc User's Manual

Font Sets : **Overview**

Omnicalc provides the ability for external font sets to be loaded onto your calculator. These font sets are transferred into your RAM as programs, and are detected by Omnicalc. This lets you customize the large font set of your TI-83 Plus.

Font Sets : **Creating**

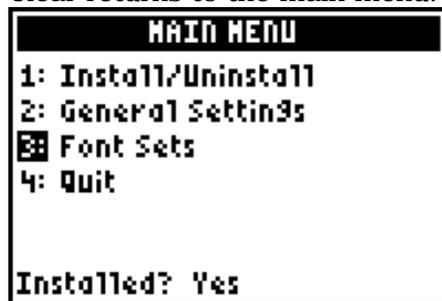
[Top of Page](#)

A computer utility is provided to allow easy creation of font sets. To download, [click here](#). Windows 95/98/ME/NT/2000/XP is required. You will need an unzipping utility such as WinZip to extract the installation files. After installing the Omnicalc Font Creator, a shortcut will be created in your Start menu. Click Start, Programs, Omnicalc, Omnicalc Font Creator. You can now create a font set. At the bottom of the window the number of the character you are editing is displayed. Characters 0-255 exist. By clicking in a box in the 5x7 grid you can edit the character. A preview is shown to the right. The Next button is a shortcut to quickly change to the next character. To switch characters, click on the Switch Character menu. The common characters are accessible via sub menus. For the other characters (0-31, 123-255) you will have to click and then enter the number of the character. The TI-OS normal font is the default for editing when you create a new font set, so this should serve as a guide to what each character number represents. The File menu is self-explanatory, consisting of standard file managing functions. When you have finished your set, click the Compile menu. You will then need to enter the calculator filename for the font set (limit 8 characters). Click OK and a DOS window should open. When its title contains the word "Finished" you should close it with a X. Your font set has been saved as a .8xp file in the Omnicalc Font Creator directory (default is C:\Program Files\Omnicalc). Send it to the RAM of your TI-83 Plus via the TI-GRAPHLINK or TI Connect software. For instructions on what next to do, please see the next section.

Font Sets : **Using**

[Top of Page](#)

To access the font set selection screen, choose option "3: Font Sets" from the Omnicalc main menu. If you see the message "No font sets found" this means that Omnicalc could not locate any font sets in RAM; you must have at least one font set on the calc. Otherwise, you will see the font selection screen (see third picture below). Pressing the left/right arrows will scroll through the font sets available on your calculator. The current selected set's name is shown, and pressing the up/down arrows will scroll the character preview. Pressing 2nd/Enter toggles if font sets are activated; and Clear returns to the main menu.



DETACHED SOLUTIONS

The Omnicalc User's Manual

[Quick Page Links](#)

[Table of Contents](#)

Program Compression : Overview

[Omnicalc Homepage](#)

The Lite8x utility allows you to compress ION and MirageOS programs to save space on your calculator. [Download Lite8x](#) (for Windows 95/98/2000/ME/XP); it will create a program group in your Start menu called "Lite8x." There is a readme link in that group that contains all the needed instructions on how to compress 83+ programs. Please note that the compression ratio varies depending on the program's size and content. In some cases with very small programs, Lite8x may actually increase the size. The exact ratio is displayed when Lite8x runs.

Program Compression : Running Compressed Programs

[Top of Page](#)

The programs compressed with Lite8x **require** that Omnicalc be present on the calculator to run. They do not require that Omnicalc currently be installed, however. Lite8x programs can be run in the same manner as uncompressed programs. When started from ION, MirageOS, or a compatible shell, a compressed program will automatically expand itself and run without any noticeable side effects to the user.

If there is insufficient free RAM to decompress a program, the required and available bytes will be shown so that you can make an attempt to free up the needed memory if possible. The last note regarding Lite8x compressed programs is that writeback does not work. If a program wishes to use writeback, it will have to be stored in the program header as Lite8x does not modify that. Potential areas include sticking data after the program title but before the label "start" in the "jr nc, start" of an ION program, or using the icon of a MirageOS program. Example:

```
xor a
jr nc,start
.db "Program Title",0
highscore:
.dw 0
highscore_name:
.db "A.A. Person",0
start:
```

DETACHED SOLUTIONS

The Omnicalc User's Manual

Quick Page Links

[Table of Contents](#)

[Omnicalc Homepage](#)

Credits : Support

- Kirk Meyer - He provided the math theory that I implemented for the factor() and simpv(). He also wrote Lite86 II and provided the source code that form the basis of Lite8x.
- Dan Englander - He discovered most of the TI-83 Plus hooks, which Omnicalc relies on for its operations. He also helped me with the bugs that seemed impossible to track down.
- Brandon Sterner - Our discussions on OS integration led to improved parser and token insert routines in Omnicalc and Symbolic, as well as interoperatibility between our two applications.
- Jason Kovacs - He helped with the aesthetics of Omnicalc and also provided some ideas for Omnicalc, most notably the idea for a clipboard.
- Jason Malinowski - He extensively beta tested and was instrumental in reporting bugs and suggesting new features.
- All the beta testers - They tracked down and reported numerous bugs in Omnicalc over months of testing.

DETACHED SOLUTIONS

The Omnicalc User's Manual

Quick Page Links

[Table of Contents](#)

[Omnicalc Homepage](#)

Version History :

Version 1.20

July 31, 2004

Fixes:

- Custom menu fixed to work on the 84+
- sprite() function improved so that it shouldn't cause crashes
- The custom appvar can now be archived
- play() and ExecAsm() functions added
- Tokens removed in favor of "real(XX," syntax
- factor(), simp() functions now faster
- Parentheses assistant handles " nPr ", strings, and edit buffers that are longer than one screen.
- The Entries menu properly scrolls the homescreen when inserting long entries
- log() now has an optional base argument
- Program compression added with Lite8x
- The omnicalc appvar can now be archived.
- Quick APPS menu added for the SE
- When switching bases, the new base is now shown
- Base conversion now works on numbers up to 2^{32}

Version 1.10

July 8, 2003

Fixes:

- Virtual Calc switching speed improved
- Clipboard functionality removed
- Entry menu bug fixed - with 7 items in the menu, the colon on the last line would change to an up arrow when scrolling down past the bottom
- Functions menu - Pressing the multiply key will insert an OS-friendly version
- mod() now handles division by zero

Version 1.0

Initial release