CONTENTS

The purpose of ADDER

Adder is designed to ADD long columns of numbers, and to *improve* on normal calculator usage by including the extra capability of allowing <u>compound calculations</u> entered on a given line.   This is a valuable extension to normal calculator usage.   It is a key advantage to the ADDER program.

In providing this capability, however, an extra step is required when you choose to revert to simple usage of ADDER as a four function calculator.   Specifically, multiplication and division are restricted to the ENTRY column, while addition and subtraction are restricted to the SUM column.   This means that simple four-function use will require shifting the operand between ENTRY and SUM columns by means of the right and left arrows.

Other capabilities in ADDER are the capability of new entries being operated **upon**, as opposed to normal syntax in which new entries always operate **on** the past entries.   In this context,   "normal" operation syntax is for new entries to be typed in such a way as they operate **on** the last entry in the queue:
        *   2   or
        /   3
"Inverted" mode capability allows a syntax such as the following:
        2   *   or
        3   /

ADDER also offers some additional capability such as the ability to save a sheet to disk, and to FIX the digits in the display.   Also provided is the capability for user definition of a few commonly-used numeric constants, and support   for square roots and logarithms.

Single Entry mode

Any number entered is added to the Accumulated SUM.   To subtract from the SUM, enter a negative number.   Examples of single number entry are:

Enter number	Value of ENTRY	Accum SUM
1		1
24		25
4.1		29.1
-2		27.1
1E-02		27.11
-26.11		1
P		4.14159

The program always awaits a new number.   In general, the mouse is never required. Every number entered is always added to the accumulator.

Use backspace to correct a typing mistake, or if preferred use the CLEAR ENTRY button.   To clear the Accumulated SUM, use any of 3 techniques:
2 RETURNs in sequence
or, click the CLEAR ACCUM button,
or, from the keyboard, enter the letter C.

The other CLEAR function, Clear Sheet, erases *all* previous information.   This allows for a clean slate in case you wish to save some calculations to a File on your hard disk.

Compound Entry mode

To improve on the entry of a single number each line, it is also possible to enter one *operation* on a line.   Examples are:

Enter number	Value of ENTRY	Accum SUM
2		2
2 * 10	20	22
4 / 8	.5	22.5
-3/2	-1.5	21
s25	5	26
L10	1	27
4 ^ 2	16	43

This is a valuable extension to normal calculator usage.   It is a key advantage to the ADDER program.

But note that a single *operation* means one operator per line.   Keyboard operators are
        *   /   ^   S   L.
Also note that the Accumulated SUM continues to increment.   The main purpose of ADDER is to keep accumulating this SUM.

Entry Operator mode

Occasionally, while in ADDER tabulating numbers, it may be of value to perform some arithmetic operation similar to a four-function calculator.   To permit this within the program, the last value of the ENTRY may be operated upon in a manner similar to a calculator.

Enter number	Value of ENTRY	Accum SUM
3	3	
2 * 6	12	
* 3	36	
/ 4	9	
^ 2	81	
s	9	
L	.9542	

This is *not* exactly like a calculator, however, because OPERATORS work on the last ENTRY only, not on the accumulated SUM.   Hence you can't add a number to these ENTRYs unless the ENTRY is moved over to the SUM column using the Right arrow.

This means that to use ADDER like a calculator (interchanging multiplication and addition) an extra step is required to use the right and left arrows to get back and forth from column 2 and column 3.   However, the benefit is more than compensated by having **no** extra steps to maintain an accumulated sum.

Entry Operator mode inverted

Similar to the capability to operate on the last ENTRY using "entry operator" mode, inverted entry operator mode is the capability of being operated **upon**.   Examples are:

Enter number	Value of ENTRY	Accum SUM
4	4	
10 ^	10 000	
1 /	.0001	

In this context, normal operation syntax is:
         *   2   or   / 3
and inverted mode syntax is:
         2 *   or   3 /

Mathematical functions

The full set of mathematical functions permitted in ADDER may be displayed by clicking the OPTION   menu and selecting   MATH FUNCTIONS.   Functions supported by ADDER are:

        square root
        inverse   [1/x]
        powers   [a^b]

        logarithm (base 10)
        logarithm (base e)
        exponent   [e^a]

        sin
        cos
        tan

        arc sin
        arc cos
        arc tan

        average
        std dev   [sqr((x-$\underline{x}$)²/n]

Inverse and powers are keyboard operators.   Square root and logarithm are either keyboard or command button operators.   To use the keyboard to take the square root of a number, type "S" and the number.   To find the logarithm of a number, type "L" and the number.   To take the square root or logarithm of the last ENTRY, enter the S or the L alone on the line.   Examples are:

Enter number	Value of ENTRY	Accum SUM
5	5	
s4	2	
s64	8	
L10000	4	
s	2	
L	.301	

Explanation:
5   The number   5   comes across like a normal single entry.
S4   The is interpreted as the   SQUARE ROOT of 4,   which is 2.
S64   This is the square root of 64, which is 8.
L10000   This is the logarithm (base 10) of 10,000,   which is 4.
s   Then when "s" is entered alone on the line, the square root of the last entry is
               calculated.   Since the last entry was   4,   [SQR(4) = 2].

L   When the "L" is entered alone on the line, the logarithm of the last ENTRY is presented (log of 2 is 0.301).

Caution:
    Note that functions act as operators in that they apply to the ENTRY, never to the SUM. To get a function to act on a number in the SUM column, use the left arrow key to move it into the ENTRY column.

Caution #2
All command button math functions operate on the last ENTRY.   Thus, a number must be entered first before you click the desired math function button.

Logarithm to another base:
To find the log of a number "X" to some base other than 10, use the formula:
    $LOG_n(X)$ = $LOG(X) / LOG(n)$
As an example, with this technique the *natural* log of a number   X   becomes:
    $LOG_e(X)$ = $LOG(X) / LOG(e)$
The pre-defined constant E may be used to verify this calculation.

Keyboard controls   C,   X,   Q,   H

To allow continuous entry from the keyboard, without requiring mouse movement, a few common commands are provided with a keystroke code.

C   will *clear* the accumulator,
X or Q will *exit* the program,
H or ? will call for the short one screen *Instruction* aid that is also accessible from the help
    menu.
Cntl-Alt-Plus will provide a keyboard alternative to "Store"
Cntl-Alt-Minus will provide a keyboard alternative to "Recall"

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Store and recall always operate on the last visible entry in column 2.

Other keyboard commands in addition to these special controls are the <u>numeric constants</u>, the RETURN key Clear function, the left and right arrow Entry/Sum exchanges, and the <u>math functions</u>.

S   Square Root
L   Logarithm
        RETURN 1 Return will merely enter a **zero** as input.
                        2 Returns will clear the accumulator.

Numeric constants   P, E, I, O, U

The letter P is reserved for the numeric constant Pi.   Similarly, the letter E is initialized to the constant 2.71828 which is the base of the natural logarithm system.   These constants may be used alone on a line (to be added to the accumulator), or in a compound entry.   Examples are:

Enter number	Value of ENTRY	Accum SUM
6	6	6
P	3.141593	9.141593
P * 2	6.283185	15.42478
e	2.718282	18.14306
e / 3	.906094	19.04915
U	0	19.04915

The constants I, O, U are initialized in ADDER.INI to zero.   They may be defined to any value by editing the INI file with a text editor such as Notepad.

The use of the letter E as a constant does not preclude its use as a power of 10, as in the case 4E09 to represent 4 times 10 to the 9th power.   See Powers of 10.

Numeric powers of 10

Standard calculator notation uses the letter E to denote powers of 10.   This does not conflict with the use of "E" as a definable constant.   However, when using E as a delimiter for a power of 10, it must be prefaced by a number.

Acceptable	Interpretation
1E5	1 times 10 to the fifth power
2.4E-02	2.4 times 10 to the -2 power
-7E+3	-7 times 10 cubed

The following are examples of *Unacceptable* entry.

Not Acceptable	
E5	No number before the E
2.4 -02	Letter E omitted
-E+3	No number before the E

Shifting between ENTRY and SUM

To allow for shifting of values between the ENTRY column and the SUM column, the right arrow and left arrow keys may be used.

Left arrow moves the last value in the SUM column to move left.
Right arrow moves the last value in the ENTRY column to move right.
Shift arrow (right or left) *exchanges* between ENTRY and SUM columns.

This technique may be useful to perform occasional four-function calculator operations without leaving ADDER.   Since operators and functions deal only on the ENTRY, while addition and subtraction deal only with the SUM,   a means of exchanging between ENTRY and SUM columns is necessary.

To *add* something to a sequence of multiplication operations ("Entry Operator" mode) in the ENTRY column, use the right arrow to move the result into the SUM column.   Once in the SUM column, your next entry will be added to it.

Shift arrows (or control-arrows or alt-arrows) *exchange* between ENTRY and SUM columns.

Fix digits in the display

For currency calculations, it may be of value to fix the digits in the display to two digits to the right of the decimal point (for nearest cent) or to zero digits to the right of the decimal point (for nearest whole dollars).   This is done from the menu bar.   First, click *Options* then click *Fix Digits*.   The ENTRY column and the SUM column can be "fixed" to separate choices.

The range of choices are 0 to 9, or blank.   Choosing 0 means to always have *no* digits to the right of the decimal point, while choosing 9 means to always have *nine* digits to the right of the decimal point.   Choosing "blank" means that the display is automatically formatted. *Blank* is the default, and in the INI file, this is recorded as -1.

To save your choices so that ADDER starts with your digit preferences at program start-up, save the settings to the INI file.   They may be changed back at any time.

Digit accuracy
The number of significant digits used internally by ADDER is about 14 digits.   These internal references are "Double" data types, an 8 byte floating point number, with a maximum value of about 1.8E+308.   All "Double" data types are truncated slightly before display on the screen to make them easier to read.

Window size and Sheet size

The window size is the height of the window on your monitor screen. It may be scaled up or down by using the mouse on the edge of the ADDER form border. After setting your window height size, you may save the settings to the INI file so that ADDER starts that way during your next program start-up. Use the Save Settings command under the Options menu. The window size may be changed back at any time, again using the mouse on the form border. The window height size affects only the number of lines visible on your monitor, it does not affect the total scrollable lines available on the sheet.

The sheet size is the number of lines available within the total scrollable range. It may be thought of as the total lines you may save to text file, or, as the total you may use before the program crashes! It is preset in the INI file to 256 lines, or about 5 full pages of numeric entry. If you have a need for more than that, you must adjust the maximum by editing the INI file before running ADDER.

INI file, Start-up options

Start up options that may be user-customized are in the ADDER.INI file.

MaxSheetSize= 256
DigitFixEntry= -1
DigitFixSum= -1
WindowHeightAtStart=6660
ShowMathAtStart= 0
Constant_P=3.1415926535898
Constant_E=2.7182818284590
Constant_I=0
Constant_O=0
Constant_U=0
Registry=

      The *Max sheet size* is the number of lines in the total scrollable grid, and would need to be increased only if you add many pages of numbers at one time.

      The *DigitFix* value is set at -1 for unformatted numbers (the default, or auto format choice), or to   0   to assign "0" digits to right of decimal, or   2   to assign "2" digits to right of decimal, etc up to a max of "9" digits.   The entry and the sum are set separately.   This setting affects the start-up option only, and the value may be reset during program operation at any time.

      The *WindowHeight* is the size of the form at start-up time, and the default value is 6600 twips, or about 6 inches.   This setting affects the start-up option only, and the value may be reset during program operation at any time using the mouse to drag the window size.

      The *ShowMathAtStart* option determines the width of the form at start-up time.   The default is 0, which does *not* show the math functions at start-up.   Change it to -1 if you *do* want to see the math functions at start-up.   This setting affects the start-up option only, and the value may be reset during program operation at any time using the menu choice.

      The letters   P   E   I   O   U   are constants which can be preset in the INI file to the user's choice.   The default value for P is PI and for   e   is the base of the natural logarithm. Constants I, O, U may be set to your preference by editing the INI file.

      The *Registry* code is string that removes the "Unregistered Version" display in the title bar during run time.   This "Unregistered Version" display is the only reminder to pay the shareware fee.

INI file, changes during run time

The current settings set by the Fix Digit menu choice, or by mouse readjustment of the window height size, may be save to disk (to the ADDER.INI file) by the Save Settings menu choice under OPTIONS.   These settings then become the default for the next time the program starts under windows.

The display digit formatting and window height size may also be changed by editing the INI file with a text editor.   See INI file, start up options.

Troubleshooting

The most common problem in ADDER is the mistaken entry of more than one operator on a line.   The following examples are NOT PERMITTED, because they use two non-numeric operators in the same line.

Enter number	Value of ENTRY	Accum SUM
7 ^ S4	1	
s5 / 3	2.236	
* 1/9	Abort	

The first line does **not** give 7^2   (7 Squared)
Reason: It has   ^   and   S   on same line.
Result: What's returns is 7 to power 0.

The second line does **not** give   SQR(5) / 3
Reason: It has   s   and   /   on one line.
Result: What's returned is   s5   only.

The third line does **not** give   ENTRY   *   1/9.
Reason: It has   *   and   /   on a single line.
Result: The result is an illegal function call, and the program will abort.

Math Function usage difficulties
All command button math functions operate on the last ENTRY.   Thus, a number must be *entered* first before you click the desired math function button.   (I.e., type the ENTER key on the keyboard before using the command button.)

Math Function Traps and Overflows
See Traps and Overflows

INI file difficulties
If the INI file gets corrupted, save it to a different filename.   Then, upon start-up, when ADDER cannot find an ADDER.INI, it will create a new one.   However, when created from scratch in this way, the Registry=   in ADDER.INI will not be filled in (valid registration must be added by a text editor), also, all comments in ADDER.INI will be lost.

Traps and Overflows

All potentially illegal math functions are "trapped" to prevent a program crash.   Illegal functions are:

square root of a negative number
logarithm of a negative number or zero
division by zero
arc sin or arc cos of a number greater than 1

Also, potential overflow conditions are "trapped" for prevention of program crash.   Overflow traps are:

exp (x)   where x > 700
x !   where x > 170
sin   x   where x > 2E09   [a series expansion problem]

When these conditions occur, the value of the function is set to zero.

Shareware fee   &   Order info

ADDER is copyright 1993 by Russell Gaspari.   All rights reserved.

ADDER is provided as copyrighted shareware; the registration fee is $5.00.   Registered users receive a postcard by return mail with a REGISTRY validation code that, when inserted into ADDER.INI,   will remove the "(Unregistered Version)" notice from the Windows title bar. However, there is no other change in ADDER.EXE, and the program is always fully functional.

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