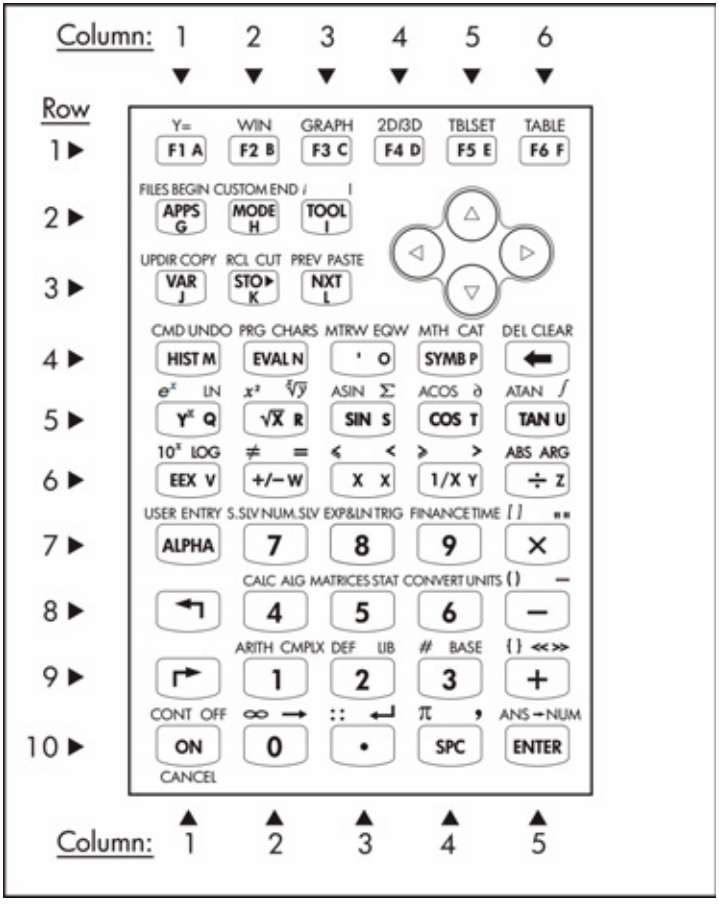
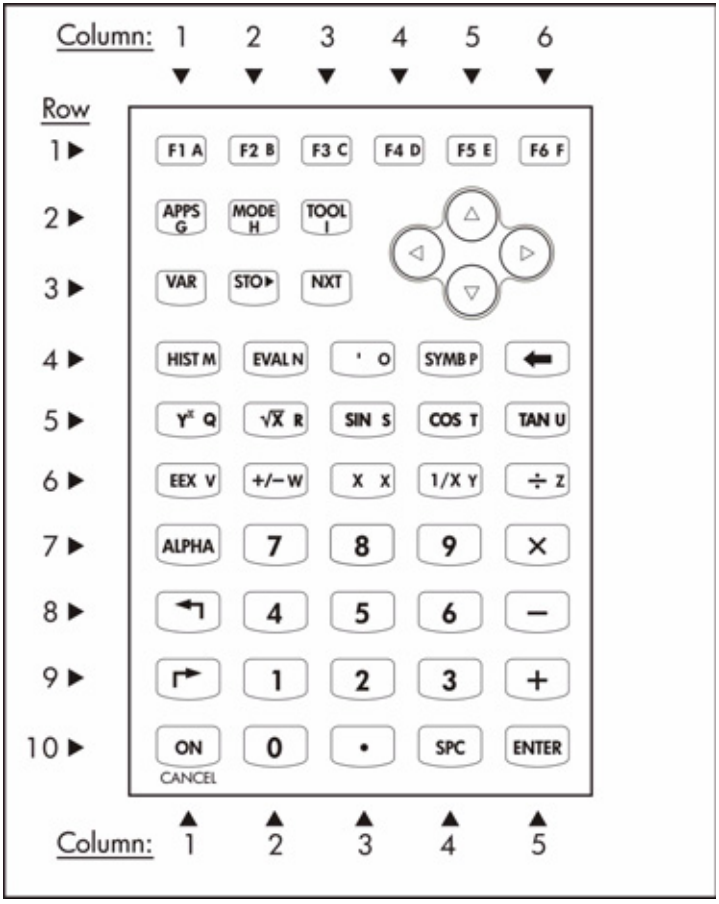
Appendix B
The calculator's keyboard

The figure below shows a diagram of the calculator's keyboard with the numbering of its rows and columns.



The figure shows 10 rows of keys combined with 3, 5, or 6 columns. Row 1 has 6 keys, rows 2 and 3 have 3 keys each, and rows 4 through 10 have 5 keys each. There are 4 arrow keys located on the right-hand side of the keyboard in the space occupied by rows 2 and 3. Each key has three, four, or

five functions. The main key functions are shown in the figure below. To operate this main key functions simply press the corresponding key. We will refer to the keys by the row and column where they are located in the sketch above, thus, *key (10,1)* is the *ON* key.



Main key functions in the calculator's keyboard

Main key functions

Keys [F1] through [F6] keys are associated with the soft menu options that appear at the bottom of the calculator's display. Thus, these keys will activate a variety of functions that change according to the active menu.

- The arrow keys, [▲][▼][◀][▶], are used to move one character at a time in the direction of the key pressed (i.e., up, down, left, or right).
- The *APPS* function activates the applications menu.
- The *MODE* function activates the calculator's modes menu.
- The *TOOL* function activates a menu of tools useful for handling variables and getting help on the calculator.
- The *VAR* function shows the variables stored in the active directory, the *STO* function is used to store contents in variables.
- The *NXT* function is used to see additional soft menu options or variables in a directory.
- The *HIST* function allows you access to the algebraic-mode history, i.e., the collection of recent command entries in that mode.
- The *EVAL* key is used to evaluate algebraic and numeric expressions, the apostrophe key ['] is used to enter a set of apostrophes for algebraic expressions.
- The *SYMB* activates the symbolic operations menu.
- The delete key [◀] is used to delete characters in a line.
- The y^x key calculates the *x* power of *y*.
- The $\sqrt{x}$ key calculates the square root of a number.
- The *SIN*, *COS*, and *TAN* keys calculate the sine, cosine, and tangent, respectively, of a number.
- The *EEX* key is used to enter power of tens (e.g., 5×10^3, is entered as [5][EEX][3], which is shown as *5E3*).
- The *+/-* key changes the sign of an entry, the *X* key enters the character X (upper case).
- The *1/x* key calculates the inverse of a number, the keys +, –, ×, and ÷, are used for the fundamental arithmetic operations (addition, subtraction, multiplication, and division, respectively).
- The *ALPHA* key is combined with other keys to enter alphabetic characters.

- The *left-shift* key ↰ and the *right-shift* key ↱ are combined with other keys to activate menus, enter characters, or calculate functions as described elsewhere.
- The *numerical keys* (*0* to *9*) are used to enter the digits of the decimal number system.
- There is a *decimal point key* (.) and a space key (*SPC*).
- The *ENTER* key is used to enter a number, expression, or function in the display or stack, and
- The *ON* key is used to turn the calculator on.

Alternate key functions

The left-shift key, *key (8,1)*, the right-shift key, *key (9,1)*, and the ALPHA key, *key (7,1)*, can be combined with some of the other keys to activate the alternative functions shown in the keyboard. For example, the SYMB key, *key(4,4)*, has the following six functions associated with it:

SYMB	Main function, to activate the SYMBolic menu
↰ MTH	Left-shift function, to activate the MTH (Math) menu
↱ CAT	Right-shift function, to activate the CATalog function
ALPHA P	ALPHA function, to enter the upper-case letter P
ALPHA ↰ P	ALPHA-Left-Shift function, to enter the lower-case letter p
ALPHA ↱ P	ALPHA-Right-Shift function, to enter the symbol P

Of the six functions associated with the key only the first four are shown in the keyboard itself. This is the way that the key looks in the keyboard:

Notice that the color and the position of the labels in the key, namely, **SYMB**, *MTH*, *CAT* and **P**, indicate which is the main function (**SYMB**), and which of

the other three functions is associated with the left-shift ↰ (*MTH*), right-shift ↱ (*CAT*) , and ALPHA (**P**) keys.

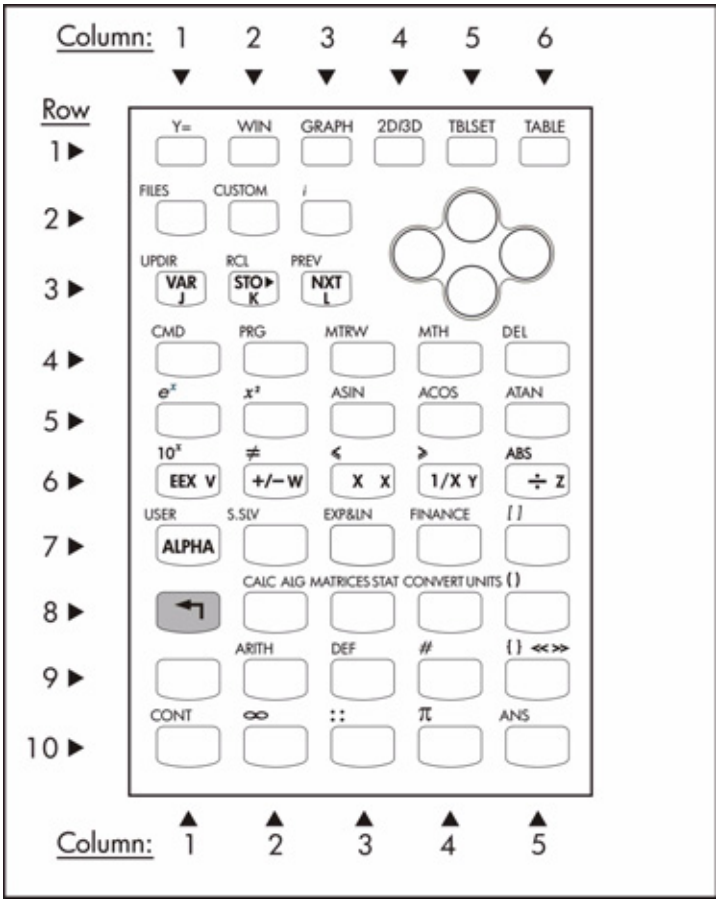
Diagrams showing the function or character resulting from combining the calculator keys with the left-shift ↰, right-shift ↱, ALPHA, ALPHA-left-shift ↰, and ALPHA-right-shift ↱, are presented next. In these diagrams, the resulting character or function for each key combination is shown in white background. If the left-shift, right-shift or ALPHA keys are activated they are shown in a shaded background. Keys that do not get activated are shown in black background.

Left-shift functions

The following sketch shows the functions, characters, or menus associated with the different calculator keys when the left-shift key ↰ is activated.

- The six left-shift functions associated with the F1 through F6 keys are associated with the setting up and production of graphics and tables. When using these functions in the calculator's *Algebraic* mode of operation, press the left-shift key ↰ first, and then any of the keys in Row 1. When using these functions in the calculator's **RPN** mode, you need to press the left-shift key ↰ simultaneously with the key in Row 1 of your choice. Function *Y=* is used to enter functions of the form *y=f(x)* for plotting, function *WIN* is used to set parameters of the plot window, function *GRAPH* is used to produce a graph, function *2D/3D* is used to select the type of graph to be produced, function *TBLSET* is used to set parameters for a table of values of a function, function *TABLE* is used to generate a table of values of a function,
- Function *FILE* activates the file browser in the calculator's memory.
- The *CUSTOM* function activates the custom menu options, the *i* key is used to enter the unit imaginary number *i* into the stack ($i^2 = -1$).
- The *UPDIR* function moves the memory location one level up in the calculator's file tree.
- The *RCL* function is used to recall values of variables.
- The *PREV* function shows the previous set of six menu options associated with the soft menu keys.

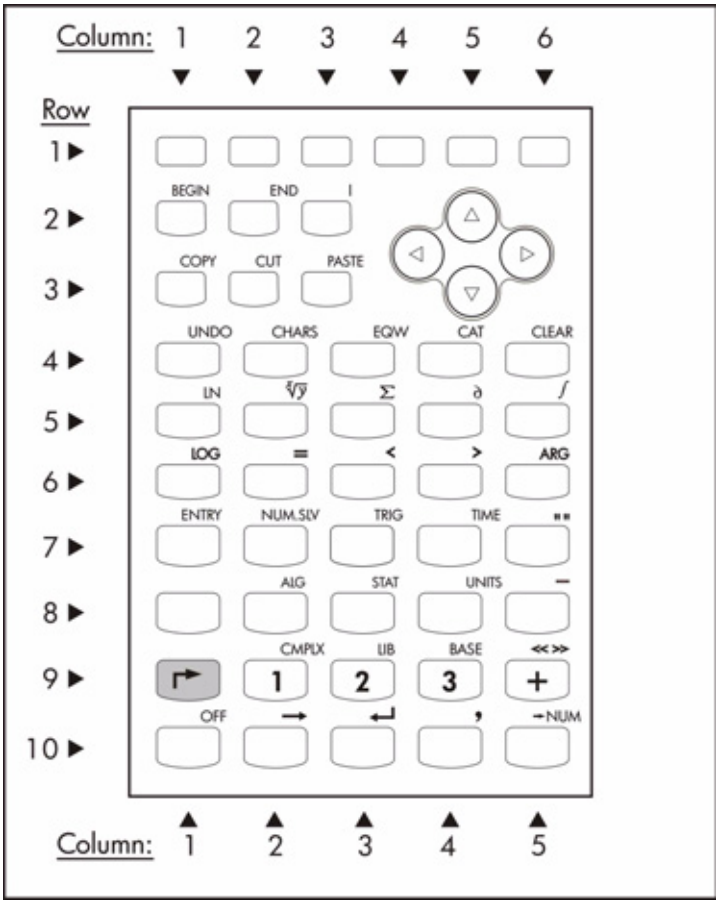
- The *CMD* function shows the most recent commands, the *PRG* function activates the programming menus, the *MTRW* function activates the Matrix Writer,



Left-shift ↰ functions of the calculator's keyboard

- The *CMD* function shows the most recent commands.
- The *PRG* function activates the programming menus.
- The *MTRW* function activates the Matrix Writer.
- The *MTH* function activates a menu of mathematical function.
- The *DEL* key is used to delete variables.

- The e^x key calculates the exponential function of *x*.
- The x^2 key calculates the square of *x* (this is referred to as the *SQ* function).
- The ASIN, ACOS, and ATAN functions calculate the arcsine, arccosine, and arctangent functions, respectively.
- The 10^x function calculates the anti-logarithm of *x*.
- The keys $\neq$, $\leq$, and $\geq$, are used for comparing real numbers.
- The *ABS* function calculates the absolute value of a real number, or the magnitude of a complex number or of a vector.
- The *USER* function activates the user-defined keyboard menu.
- The *S.SLV* function activates the symbolic solver menu.
- The *EXP&LN* function activates the menu for substituting expressions in terms of the exponential and natural logarithm functions.
- The *FINANCE* function activates a menu for financial calculations.
- The *CALC* function activates a menu of calculus functions.
- The *MATRICES* function activates a menu for creating and manipulation of matrices.
- The *CONVERT* function activates a menu for conversion of units and other expressions.
- The *ARITH* function activates a menu of arithmetic functions.
- The *DEF* key is used to define a simple function as a variable in the calculator menu.
- The *CONT* key is used to continue a calculator operation.
- The *ANS* key recalls the last result when the calculator is in Algebraic operation mode.
- The *[ ]*, *( )*, and *{ }* keys are used to enter brackets, parentheses, or braces.
- The *#* key is used to enter numbers in other than the active number base.
- The infinity key ∞ is used to enter the infinite symbol in an expression.
- The pi key π is used to enter the value or symbol for π (the ratio of the length of a circumference to its diameter).
- The arrow keys, when combined with the left-shift key, move the cursor to the first character in the direction of the key pressed.



Right-shift ↱ functions of the calculator's keyboard

Right-shift functions

The sketch above shows the functions, characters, or menus associated with the different calculator keys when the right-shift key ↱ is activated.

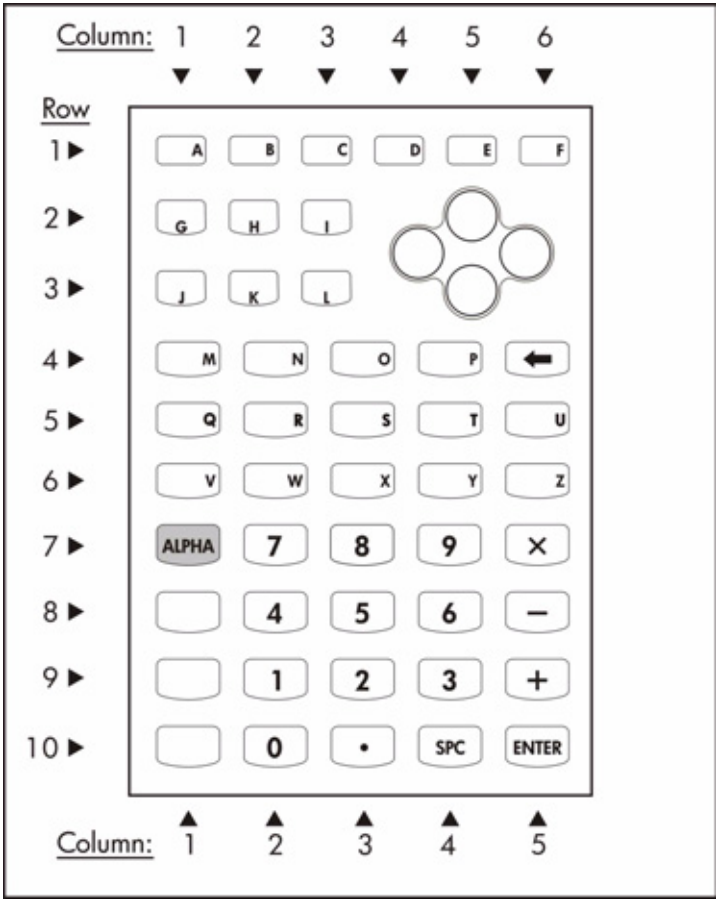
- The functions *BEGIN, END, COPY, CUT* and *PASTE* are used for editing purposes.
- The *UNDO* key is used to undo the last calculator operation.
- The *CHARS* function activates the special characters menu.
- The *EQW* function is used to start the Equation Writer.

- The *CAT* function is used to activate the command catalog.
- The *CLEAR* function clears the screen.
- The *LN* function calculates the natural logarithm.
- The $\sqrt[x]{y}$ function calculates the *x* – th root of *y*.
- The Σ function is used to enter summations (or the upper case Greek letter sigma).
- The ∂ function is used to calculate derivatives.
- The ∫ function is used to calculate integrals.
- The *LOG* function calculates the logarithm of base 10.
- The *ARG* function calculates the argument of a complex number.
- The *ENTRY* function is used to change entry mode in editing.
- The *NUM.SLV* function launches the NUMerical SOLver menu.
- The *TRIG* function activates the trigonometric substitution menu.
- The *TIME* function activates the time menu.
- The *ALG* function activates the algebra menu.
- The STAT function activates the statistical operations menu.
- The *UNITS* function activates the menu for units of measurement.
- The *CMPLX* function activates the complex number functions menu.
- The *LIB* function activates the library functions.
- The *BASE* function activates the numeric base conversion menu.
- The OFF key turns the calculator off, the →*NUM* key produces a numeric (or floating-point) value of an expression.
- The " " key enters a set of double-quotes used for entering text strings.
- The _ key enters an underscore.
- The << >> key enters the symbol for a program.
- The → key enters an arrow representing an input in a program.
- The ↵ key enters a return character in programs or text strings.
- The comma (,) key enters a comma.
- The arrow keys, when combined with the right-shift key, move the cursor to the farthest character in the direction of the key pressed.

ALPHA characters

The following sketch shows the characters associated with the different calculator keys when the ALPHA (ALPHA) is activated. Notice that the (ALPHA) function

is used mainly to enter the upper-case letters of the English alphabet (*A* through *Z*). The numbers, mathematical symbols (-, +), decimal point (.), and the space (*SPC*) are the same as the main functions of these keys. The [ALPHA] function produces an asterisk (*) when combined with the times key, i.e., [ALPHA] [×].

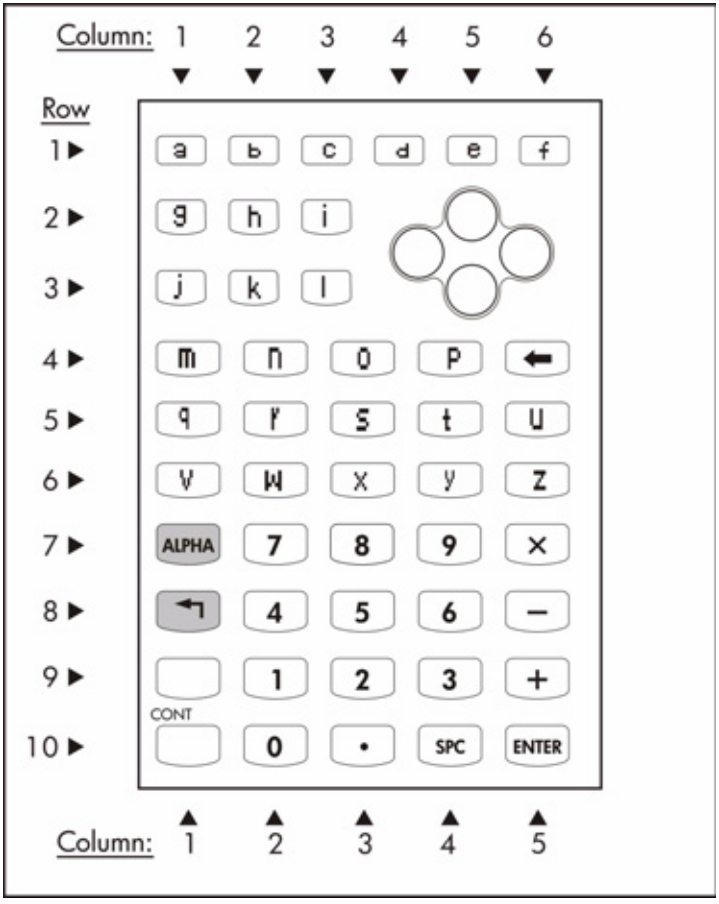


Alpha [ALPHA] functions of the calculator's keyboard

Alpha-left-shift characters

The following sketch shows the characters associated with the different calculator keys when the ALPHA [ALPHA] is combined with the left-shift key [↰].

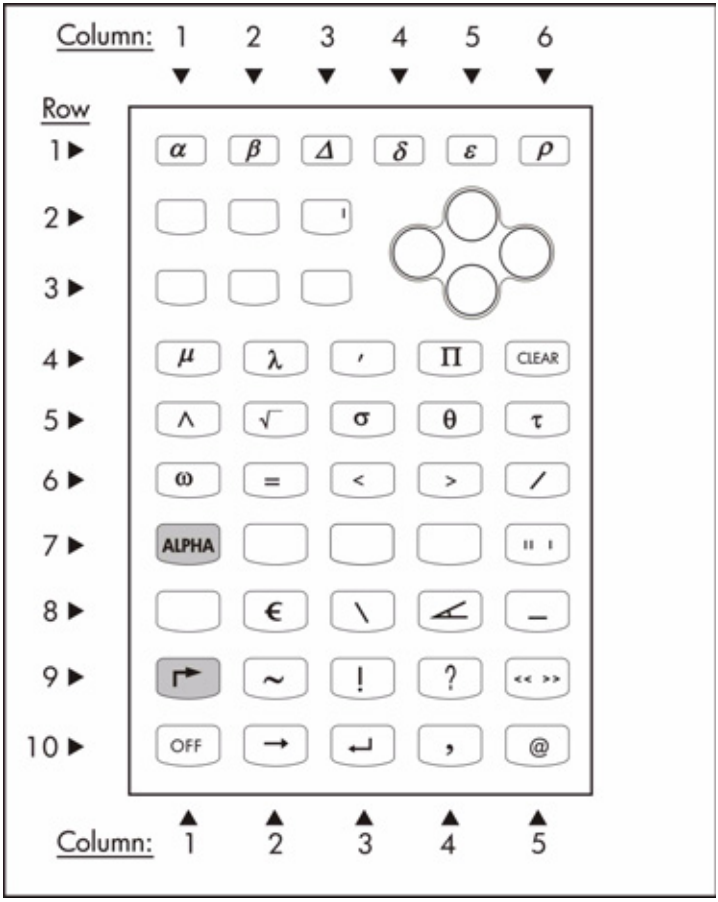
Notice that the ALPHA ← combination is used mainly to enter the lower-case letters of the English alphabet (*A* through *Z*). The numbers, mathematical symbols (-, +, ×), decimal point (.), and the space (*SPC*) are the same as the main functions of these keys. The ENTER and CONT keys also work as their main function even when the ALPHA ← combination is used.



Alpha ALPHA ← functions of the calculator's keyboard

Alpha-right-shift characters

The following sketch shows the characters associated with the different calculator keys when the ALPHA (ALPHA) is combined with the right-shift key (↱).



Alpha (ALPHA) (↱) functions of the calculator's keyboard

Notice that the (ALPHA) (↱) combination is used mainly to enter a number of special characters from into the calculator stack. The CLEAR, OFF, →, ↵, comma (,), key enters and OFF keys also work as their main function even when the (ALPHA) (↱) combination is used. The special characters generated by the

ALPHA → combination include Greek letters (α, β, Δ, δ, ε, ρ, μ, λ, σ, θ, τ, ω, and Π), other characters generated by the ALPHA → combination are |, ', ^, =, <, >, /, ", \, __, ~, !, ?, <<>>, and @.