

# SciPlus-2500

*Graphing Scientific Calculator*

User Guide



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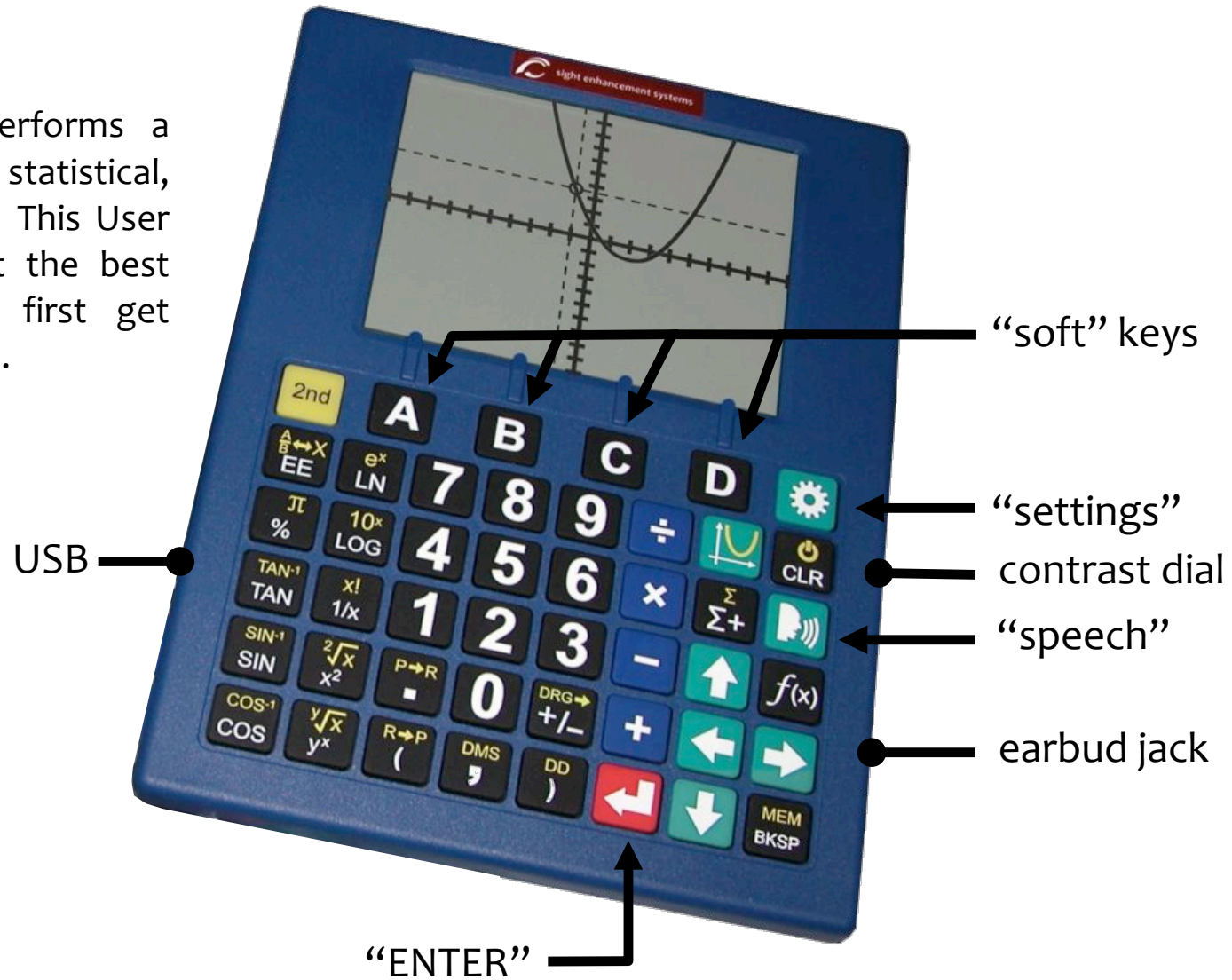
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## Getting Started

The SciPlus-2500 calculator performs a wide variety of mathematical, statistical, and trigonometric calculations. This User Guide will explain how to get the best from your calculator. Let's first get familiar with the SciPlus controls.



## Charging your SciPlus-2500

Charging the calculator is easy. Simply plug the USB wall charger into a regular outlet, and plug the USB cable to the SciPlus-2500. The calculator will receive a good charge overnight, although to completely charge the battery may take a couple of days. The SciPlus-2500 will operate for many weeks between charges. Note that, if you regularly use the backlight, the battery will deplete much more quickly. This is not a problem; just charge it up and you're good to go. Your SciPlus-2500 calculator includes a USB wall charger, USB cable, and earbuds. Please ensure that these items are in the box.

When the SciPlus-2500 is charging, you will notice the battery symbol is animated. The battery is completely charged if, with the charger still plugged in, you turn on the battery and the animation shows three bars.

**Note:** If your SciPlus has been unused for a long time, you may need to charge it for a while before it will even turn on. When this happens, make sure you “RESET” the SciPlus by carefully inserting a paperclip into the hole on the back of the calculator. This restores factory settings to ensure proper operation.

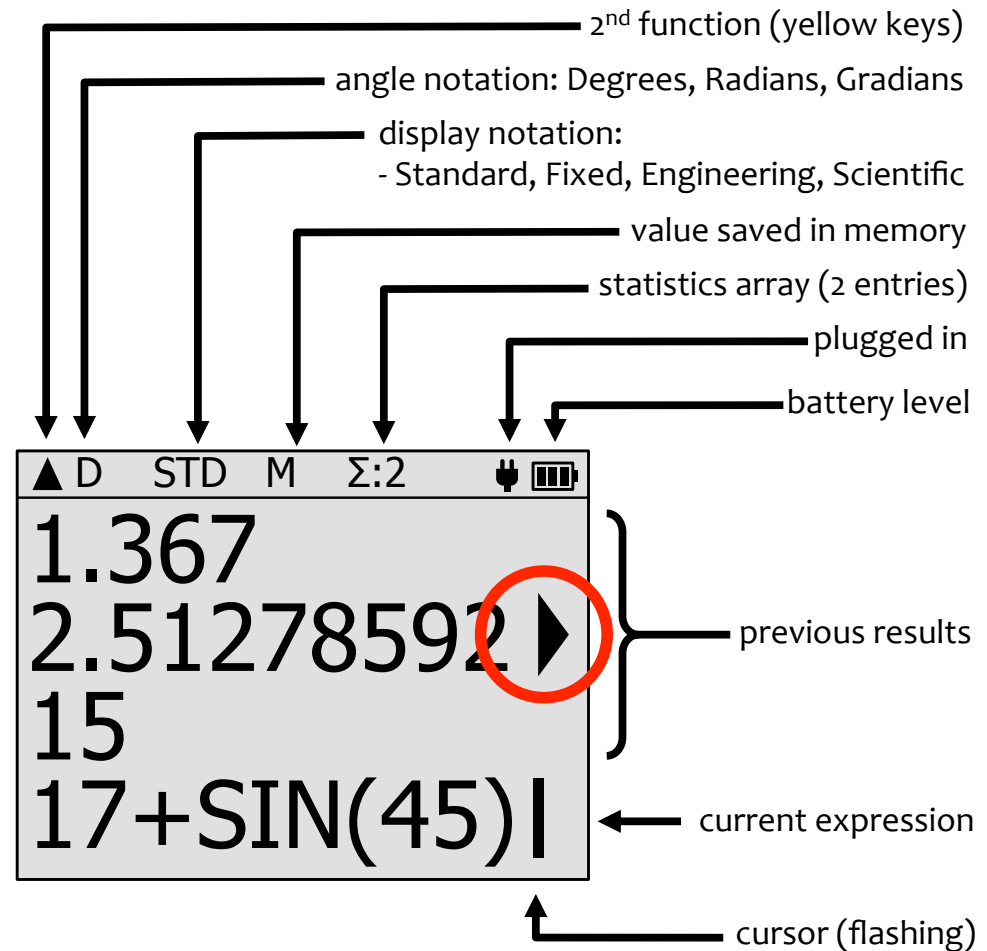
## The SciPlus-2500 Display

The SciPlus-2500 screen has four lines. The bottom line is where you enter expressions. The other three lines show the results of previous operations. Once you press  $\leftarrow$ , an expression is evaluated and its result is moved up a line, leaving the bottom line empty to enter another expression.

**Note:** As shown by the red circle, a right arrow symbol indicates that a number that is wider than the screen. BE CAREFUL: This number may have a  $\times 10^n$  component, so it may be a very small or very large number! Use the  $\uparrow$   $\downarrow$   $\leftarrow$   $\rightarrow$  keys to view the entire result.

The characters above the horizontal line at the top of the screen show the **status line** of the calculator. If the battery symbol is animated, this indicates that the battery is being it is currently charging.

Some of the characters in the status line may not appear at all times. For example, if there is no entry in memory, or if the statistics register is currently empty, these items will not appear in the status line.




## SciPlus-2500 Operations

The SciPlus-2500 follows the “BEDMAS” rule for order of operations:

Brackets → Exponents → Divide → Multiply → Addition → Subtraction

Most of the SciPlus-2500 keys have two functions. The lower function appears in a white font. The alternate, or **2<sup>nd</sup>** function, when present, appears in a yellow font. To access this function, the **2<sup>nd</sup>** key must first be pressed. Throughout the key descriptions below, if a key symbol appears in a yellow background, this indicates that the **2<sup>nd</sup>** key must be pressed before this key is pressed.

Notes regarding nomenclature:

1. Throughout this manual, a key press is indicated in blue. For example,  indicates the red ENTER key on the keyboard.
2. In the examples below, the key press (in blue) is shown the way it appears in the display, which is not necessarily the way it appears on the key.


**Note:** Some keys, such as **DRG→** , **P→R** , and **R→P** sometimes operate on values in the second line.








## Adjusting the Display Contrast

There is a dial on the right hand side of the SciPlus-2500 that you can use to adjust the contrast of the display. Note that this does NOT adjust the brightness of the backlight; that is done through the settings menu. You may find that adjusting the contrast will help maintain optimal visibility of the display.

## Soft Keys

The keys **A** , **B** , **C** and **D** do not have a specific function. Instead, labels at the bottom of the display define the function of these keys. If there are no labels, these keys will not do anything. You will use these keys when adjusting the SciPlus-2500's settings, for memory and statistics operations, and when using the  $f(x)$  and  (graphing) features.

## Working with Previous Results

When entering expressions in the bottom line, it's very easy to use the results of previous calculations displayed in the lines above it. Using the  and  arrows, position the cursor at the location in the expression where you wish to insert a previous result. Now, using the  and  arrows, select the previous result that you wish to insert into the current expression, and press .




## Auto Shutoff

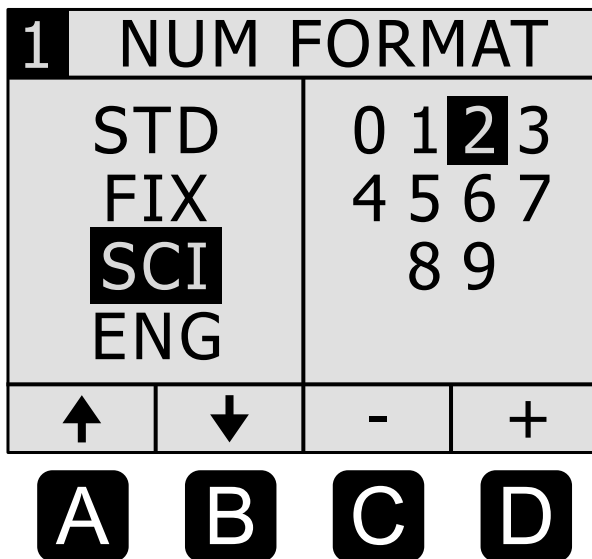
Your SciPlus-2500 calculator will automatically shut off after five minutes of inactivity. Many of the calculator's current settings such as the angle mode, number format, etc., will be saved, so that it will turn on again in the same state. Values stored in memory and the statistics table are also saved.

Note that if the backlight is on when the calculator is turned off, it will be off when the calculator is again turned on.

If the calculator is left off for an extended period (typically many weeks), these settings will be lost.

## Settings

There are five settings screens in the SciPlus-2500, accessed by the  key. Cycle through the five screens using the  and  arrows, or by entering **1** through **5**. Change settings in any of the screens using the **A** - **D** soft keys.



### Number Format:

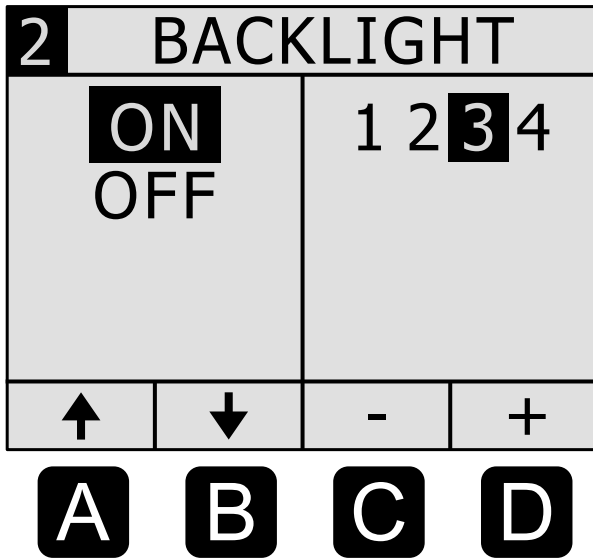
There are four number formats supported by the SciPlus-2500:

**Standard:** Numbers show up to ten-digit precision.  
*Examples: 101, 41250.5, 0.33333333*

**Fixed Notation:** Number of decimals is fixed.  
*Examples: 101.00, 41250.50, 0.33*

**Scientific Notation:** Numbers are displayed in powers of ten, with a fixed number of decimals.  
*Examples: 1.01E+02, 4.13E+04, 3.30E-01*

**Engineering Notation:** Numbers displayed in powers of ...  $10^{-6}$ ,  $10^{-3}$ ,  $10^0$ ,  $10^3$ ,  $10^6$ ..., with fixed decimal precision. These steps express values corresponding with “micro, milli, kilo, mega, etc.”.  
*Examples: 101, 41.25E+03, 333E-03*

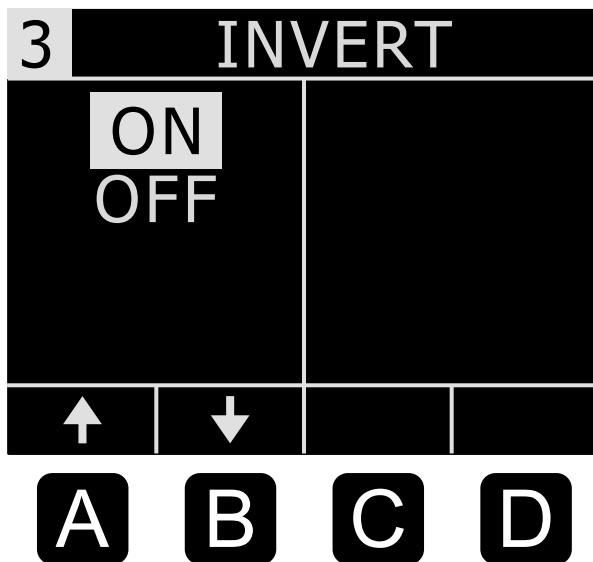


### **Backlight:**

Use the **A** and **B** soft keys to turn the backlight on/off.

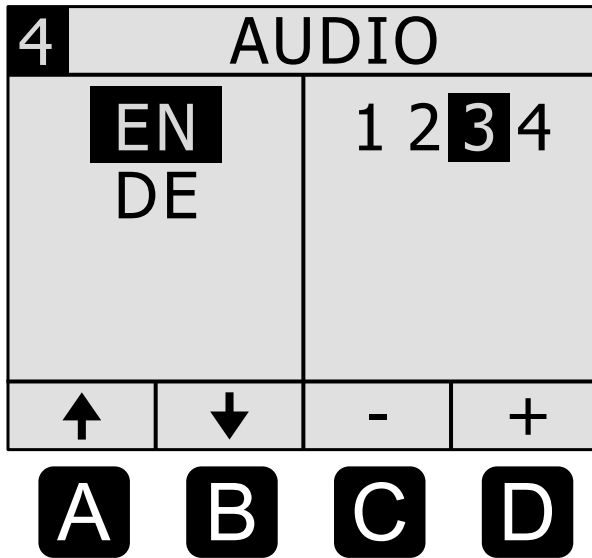
The **C** and **D** keys adjust the brightness.

Note that the backlight will significantly shorten the duration of a battery charge from weeks to hours. For this reason, the SciPlus-200 always powers on with the backlight turned off.



### **Screen Inversion:**

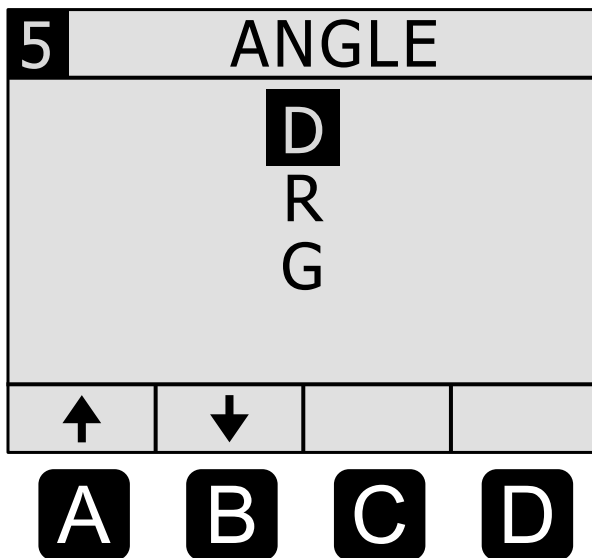
Often, people with low vision are able to benefit from an inverted screen. The **A** and **B** keys simply invert the display between black/white and white/black.



**Speech Output:**

Use the **A** and **B** softkeys to select the language. Normally, your SciPlus-2500 will speak in English (EN) and one additional language as ordered from the factory (German in this example).

The **C** and **D** softkeys will adjust the output volume.














**Angle:**

Use the **A** and **B** softkeys to select the angle mode. Trigonometry functions and graphing will use degrees, radians, or gradians based on this setting.

You will see “D”, “R”, or “G” in the status line.

## Basic Functions

KEY	NAME	DESCRIPTION
	2 <sup>nd</sup> Function	Press this key before any dual-function key to access the upper (yellow) function. You will notice the ▲ symbol appear in the status line.
	ON/Clear	Turn calculator ON. The cursor will appear on the bottom line. Most of the settings from the previous session will remain as they were.
	OFF	Save settings, memory and statistics data, and turn calculator OFF.
	Backspace	Delete last entry or function.
	Enter (=)	Resolves the current expression, displaying the result in the second line. If the expression contains errors, an error message will appear.
	Clear Screen	Pressing the 2 <sup>nd</sup> key followed by ↵ clears the current expression and all previous results.
	Open Parentheses	Open parentheses. Note that some expressions will automatically include the opening parentheses.

KEY	NAME	DESCRIPTION
	Close Parentheses	Close parentheses.
	Change Sign	Change the sign of the operand. After some operands (e.g. $\times$ $\div$ ), this operation will insert a negative sign into the expression.
	Scientific Notation	This is equivalent to “ $\times 10$ raised to the power...”
	Settings	Manage settings (see section on Settings). Toggles on/off.

## Mathematical Functions


KEY	NAME	DESCRIPTION
$\pi$ %	Pi	Enters the symbol $\pi$ into an expression. If you simply enter $\pi$ ↵, the result 3.141592654 will be displayed.
x! 1/x	Factorial	Calculates the factorial of the value to the left. Enter this <i>after</i> you enter the value of 'x'.
$\sqrt{x}$ x <sup>2</sup>	X <sup>2</sup>	Squares the value to the left. Enter 'x' first. e.g.: <b>10 ^2</b> followed by ↵ yields a result of 10 <sup>2</sup> , or 100.
$\sqrt[y]{x}$ y <sup>x</sup>	y <sup>x</sup>	Raises the value to the left, to an exponent. Enter 'y' first. Shown as '^'. e.g.: <b>2 ^ 3</b> followed by ↵ yields a result of 2 <sup>3</sup> or 8.
x! 1/x	Reciprocal	Calculates the reciprocal of an expression. e.g.: <b>1/( 25 × 4 )</b> followed by ↵ yields 1/100, or 0.01.
$\sqrt{x}$ x <sup>2</sup>	Square Root	Calculates the square root of a value. e.g.: <b>2√ 4</b> followed by ↵ yields √4, or 2.
$\sqrt[y]{x}$ y <sup>x</sup>	n <sup>th</sup> Root	Calculates the n <sup>th</sup> root of a value. e.g.: <b>3 <sup>n</sup>√ 8</b> followed by ↵ yields the <sup>3</sup> √8, or 2.



KEY	NAME	DESCRIPTION
<b>10<sup>x</sup></b> LOG	LOG	Calculates the base10 logarithm of an expression. e.g.: <b>LOG( 25 × 4 )</b> followed by ↵ yields $\log_{10}(100)$ , or 2.
<b>e<sup>x</sup></b> LN	LN	Calculates the natural logarithm of an expression. e.g.: <b>LN( 25 × 4 )</b> followed by ↵ yields $\ln(100)$ , or 4.605170186.
<b>e<sup>x</sup></b> LN	e <sup>x</sup>	Calculates the value of e (2.2.718282) raised to an expression. e.g.: <b>EXP( 2+3 )</b> followed by ↵ yields $e^5$ , or 148.4131591.
<b>10<sup>x</sup></b> LOG	10 <sup>x</sup>	Calculates the value of 10 raised to a value. e.g.: <b>10^ 5</b> followed by ↵ yields $10^5$ , or 100000.
<b>π</b> %	Percentage	<p>The behavior of the % function depends upon context.</p> <p>If the expression is simply a number with the % operator, the result of the expression is the number divided by 100.</p> <p>If the % operator is appended to a number which is itself to the right of the + - × or / operator, the percentage is added to, subtracted from, multiplied by, or divided by the number to the left of the operator. e.g.: <b>3 + 50 %</b> followed by ↵ yields a result of 4.5.</p> <p>If the % operator is followed by another operator, a Syntax Error results.</p>


## Memory Operations

Note that memory operations with the SciPlus-2500 use the soft keys **A – D**.

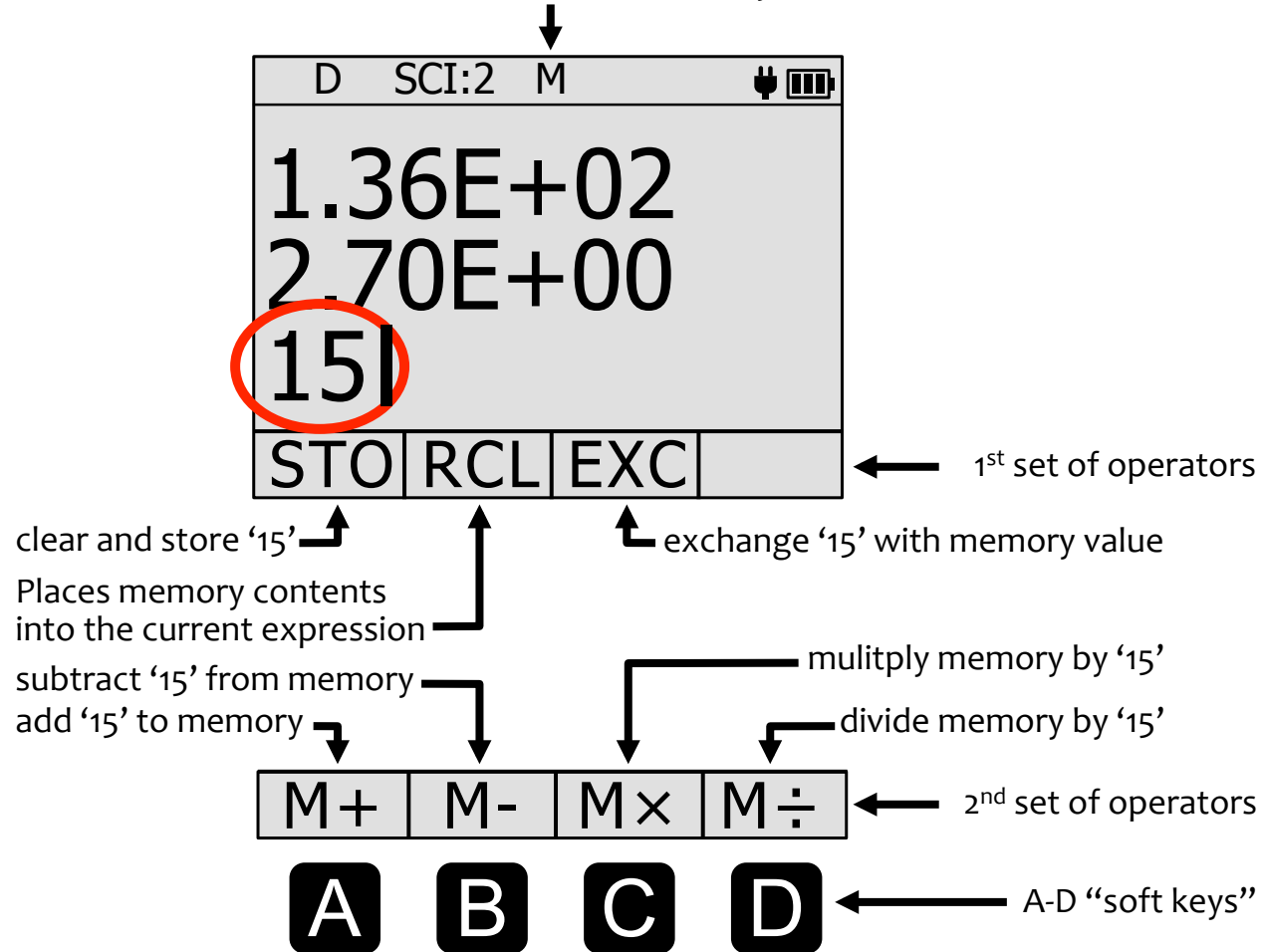
KEY	NAME	DESCRIPTION
	Display Memory Soft Keys	This key causes the memory soft keys to be displayed. Note that there are two sets. Pressing this <b>2<sup>nd</sup> MEM</b> a second time will bring up the second set of memory soft keys. A third time will disable the soft keys.

Soft keys **A - D** are used to clear the memory, swap the value in memory with the current line, and perform simple arithmetic operations (  $+ - \times \div$  ) on the value stored in memory using the current line. Memory soft keys are shown on the opposite page. In this example, the value ‘15’ resides in the current line. Note that storing a value of ‘0’ clears the memory.

Note that if **STO** (softkey **A**), if pressed at the end of an expression, will solve the expression and store the result. The **EXC M+ M- M×** and **M÷** all work in the same manner.

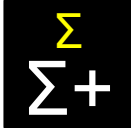

Pressing **RCL** (softkey **B**) will add “RCL” to the current expression. When the expression is evaluated, the value currently stored in memory is used. To display the value currently in memory, simply enter **RCL** by itself, followed by .

“M” indicates there is a value in memory



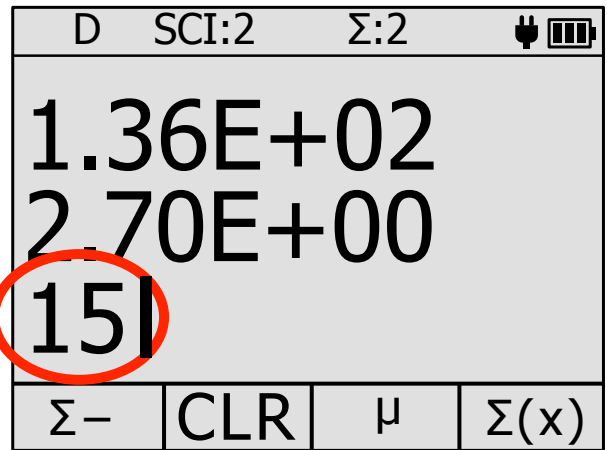
## Statistical Operations

The SciPlus-2500 performs statistical operations on a table of up to 99 entries. Note that most statistical operations with the SciPlus-2500 use the soft keys **A – D**.

KEY	NAME	DESCRIPTION
	Add Data Point in Stats Register	<p>Adds the current value into the statistics table. If pressed at the end of an expression, the expression is solved, and the result added. Note that if a value already exists in the table, it will be added a second time.</p> <p>e.g.: <b>2</b> <math>\Sigma+</math> <b>3</b> <math>\Sigma+</math> <b>5</b> <math>\Sigma+</math> <b>3</b> <math>\Sigma+</math> will create a table (2, 3, 5, 3)</p>
	Display Statistics Soft Keys	<p>This key causes the statistics soft keys to be displayed. Note that there are two sets. Pressing this <b>2<sup>nd</sup></b> <math>\Sigma</math> a second time will bring up the second set of soft keys. A third time will disable the soft keys.</p>

Soft keys **A - D** are used to perform various statistical operations. Statistics soft keys are shown on the opposite page. Note that  $\mu$   $\Sigma(x)$   $\Sigma(x^2)$   $\sigma$   $\sigma^2$  and  $M$  can all be used in expressions.

indicates there are two entries in the statistics table



← 1<sup>st</sup> set of operators

delete 15 from table (if present) ↗  
 clear table ↗  
 standard deviation ↘  
 sum of squares ↘

sum of entries ↗  
 mean (average) of entries ↗  
 variance ↘  
 median (middle entry) ↘







← 2<sup>nd</sup> set of operators



← A-D “soft keys”







## Trigonometry

Trigonometry functions are very straightforward with the SciPlus-2500. Note that the values used in trigonometry functions, and the result, are expressed in Degrees, Radians, or Gradians, as indicated by 'D' 'R' or 'G' in the status line. Remember, use the  key, menu #5 to change the DRG setting. DRG is also changed when converting angles, is described in the table below.



KEY	NAME	DESCRIPTION
	Sine	Calculates the sine of an expression. e.g. (assume degrees): <b>SIN( 30 )</b> followed by ↵ yields 0.5.
	Arcsine	Calculates the inverse sine (arcsine) of an expression. e.g. (assume degrees): <b>ASIN( 0.5 )</b> followed by ↵ yields 30.
	Convert Angle	Converts the current value displayed in the <b>second line</b> , and changes the status line parameter.

The Cosine and Tangent functions, and their inversions, work the same way.

## Converting Angles




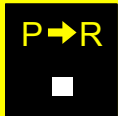


KEY	NAME	DESCRIPTION
	Decimal Degrees to DMS	<p>Converts decimal degrees into degrees, minutes, seconds. e.g.: <b>DMS( 45.5 )</b> followed by  yields (45,30,0.00).</p> <p>Note that if the second line is in DD format, entering <b>DMS(</b> followed by  converts that value into DMS format.</p>
	DMS to Decimal Degrees	<p>Converts degrees, minutes, seconds into decimal degrees. e.g.: <b>DD( 45,30,0 )</b> followed by  yields (45.5)</p> <p>Note that if the second line is in DMS format, entering <b>DD(</b> followed by  converts that value into DD format.</p>

## Working With Fractions

KEY	NAME	DESCRIPTION
	Enter a Fraction	<p>Use this key to enter a fractional amount into an expression. The result is displayed as a fractional amount ONLY if all the operands in the expression are entered as either fractions or integer numbers.</p> <p>e.g.: <math>2 + X^Y/z(4,3/6)</math> followed by <math>\leftarrow</math> yields <math>6 \frac{1}{2}</math></p> <p><math>2.0 + X^Y/z(4,3/6)</math> followed by <math>\leftarrow</math> yields 6.5</p> <p>Note that the fraction command always requires the following syntax: an integer number, followed by a comma, then another number followed by the <math>\div</math> operator, and finally, a third integer number. If the fraction has no integer portion, you must enter <b>0</b>.</p>
	Convert Between Fraction and Decimal	<p>Simply press this key followed by <math>\leftarrow</math> without any arguments, and the result shown in the line above will be converted from fraction to decimal (or vice versa)</p>



## Converting Coordinates between Polar and Rectangular

KEY	NAME	DESCRIPTION
	Rectangular to Polar	<p>Converts rectangular (x,y) coordinates into polar (r,θ). Note that angles are expressed in degrees, radians or gradians as indicated on the status line.</p> <p>e.g.: <b>R→P( 1 , 1 )</b> followed by  yields (1.41,45.00)</p> <p>Note that if the result line is in rectangular (x,y) format, entering <b>P→R(</b> followed by  converts that value into polar (r,θ) format.</p>
	Polar to Rectangular	<p>Converts polar (r,θ) coordinates into rectangular (x,y). Note that angles are entered as degrees, radians or gradians as indicated on the status line.</p> <p>e.g.: <b>P→R( 1.41 , 45 )</b> followed by  yields (1.00,1.00)</p> <p>Note that if the second line is in polar (r,θ) format, entering <b>R→P(</b> followed by  converts that value into rectangular (x,y) format.</p>

## Using the SciPlus-2500 to Evaluate Mathematical Functions

When you select the  $f(x)$  key, the display will look like the picture on the opposite page. Note that, while in functions mode, the following features of the SciPlus-2500 are not accessible:

- Fraction calculations
- $(x,y) \leftrightarrow (r,\theta)$  conversions
- DMS  $\leftrightarrow$  DD conversions
- Memory operations (the value stored in memory is maintained)
- Statistical operations (the statistics table is maintained)

When in  $f(x)$  mode, the three lines displayed each have unique meaning:

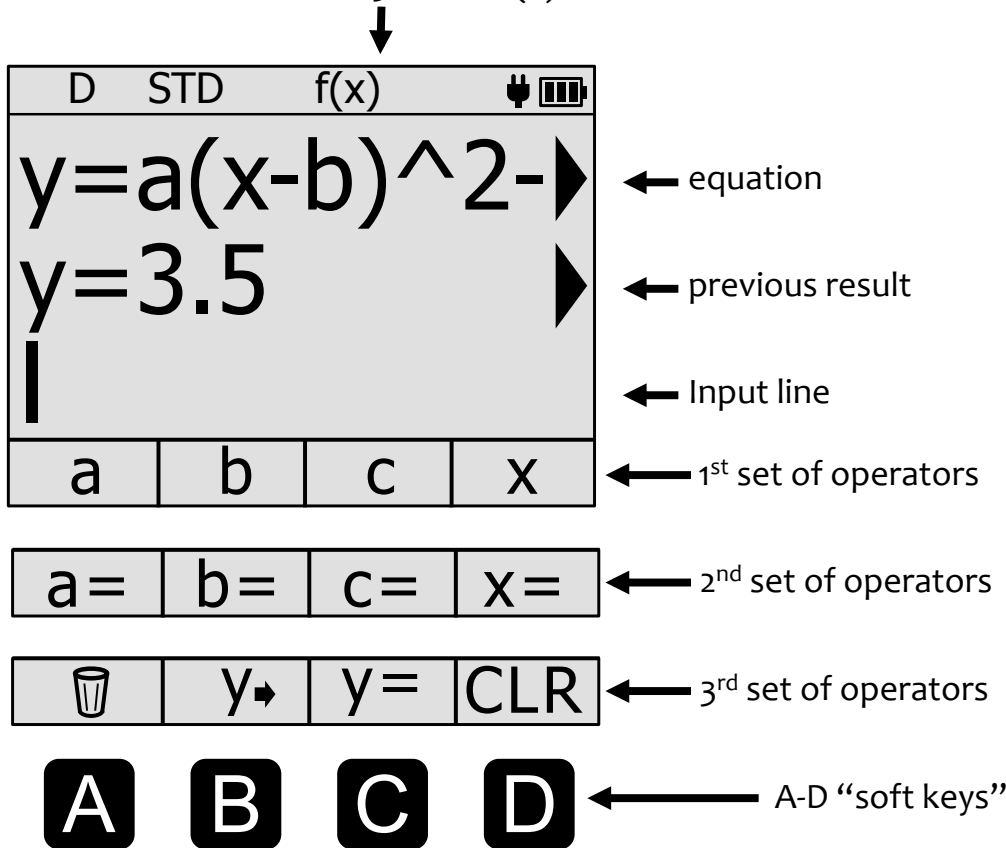
**Equation Line:** The top line shows the equation that is being evaluated. Note that equations are in the form  $y=f(a,b,c,x)$ , and can have up to four variables  $a$ ,  $b$ ,  $c$ , and  $x$ . Of course, convention normally considers  $a$ ,  $b$ , and  $c$ , to be “constants”,  $x$  the “independent variable”, and  $y$  the “dependent variable”.

**Results Line:** The middle line shows the result of the most recent calculation. This may be the entry (or query) of one of the of the variables  $a$ ,  $b$ ,  $c$ ,  $x$ , or the result of the equation for a given set of variables.

**Input Line:** This is the line in which you enter the equation using the various mathematical functions of the SciPlus-2500. You also enter values  $a$ ,  $b$ ,  $c$ , and  $x$ .

The “soft keys” of the SciPlus-2500 have the following meaning while in functions mode:

indicates the SciPlus-2500 is in f(x) mode



**First set of operators:** Push  $f(x)$  once. The four soft keys allow you to use the variables a, b, c, x to define a function in the form  $y=f(a,b,c,x)$ .

**Second set of operators:** Push  $f(x)$  again. This second set of soft keys allows you to define values for the variables a, b, c, x.

**Third set of operators:** Push  $f(x)$  a third time. This third set of soft keys allows you to enter, edit and clear the equation, find y, and CLR all the stored information related to f(x) mode.

## Calculating values of $f(x)$

Let's investigate how to use the SciPlus-2500 in functions mode by evaluating the expression:

$$y=a(x-b)^2-c$$

1. **Enter functions mode:** First, press  $f(x)$  to enter functions mode.
2. **Enter the equation:** Push  $f(x)$  two more times to access the “y=” soft key (C), and push it. The bottom line of the display will now show “y=”. Now push  $f(x)$  again to get back to the variables list a, b, c, x. Enter the expression as follows, using the soft keys A-D (note that ‘D’ is ‘x’ in this case), as follows:

$$a \times ( x - b ) y^x 2 - c$$

Once you press the  $\leftarrow$  key, the equation will be displayed in the top line. Of course, if the equation contains a syntax error, you will get an error message when you attempt to get a result.

For now, the middle line will remain blank.

3. **Entering values for the variables:** Push  $f(x)$  again so that the soft keys show “a=”, “b=”, etc. Now let's enter specific values for a, b, c and x as follows:

$$a= 0.5 \leftarrow \quad b= 2 \leftarrow \quad c= \text{TAN}(45) \leftarrow \quad x= -1 \leftarrow$$

Note from the above example that it's perfectly acceptable to enter a variable as an expression (e.g. TAN(45)). Provided the expression can be resolved, it'll just enter the result as that variable.

You will notice that, as these values are entered they appear in the middle “results” line.

At any time, you can query a variable by simply selecting the ENTER key without a value or expression after the variable. For example, **a=** ↵ will display 0.5 in the results line. If you have not yet entered a value for a, then “a=...” will be displayed in the results line.

You can clear any variable using the garbage can. E.g.: **a=** 🗑️ ↵


4. **What's the answer?** Once all four variables have been entered, you can select, **y=** ↵ to display the result of  $y = 0.5(x-2)^2 - \text{TAN}(45)$  in the middle line (3.5 in this example as shown).

If the equation contains a divide by zero condition, **INFINITE RESULT** will be displayed.

If you get an **UNDEFINED VARIABLE** message, it means that not all of the necessary variables have been entered yet. Zero values must be entered as such.

5. **Changing variables:** At any point, you can change one of the values of a, b, c, x by repeating step '3' above. A new value of y will be calculated each time a variable is entered.


For example, to find the value of  $y = a(x-b)^2 - c$  for a new value of  $x=4$ , simply enter **x= 4** ↵.

- 6. Editing the equation:** To edit the equation, use the softkey key **y→** to put the equation into the input line. Move the cursor to the location you wish to edit. Remember BKSP removes operators from the equation. Use **y→**  to clear the equation.
- 7. Entering a new equation:** You can easily enter a new equation by repeating step 2 above. The values for a, b, c, x will remain unchanged until you change them as explained in step 3.
- 8. Clearing everything:** You can use **CLR** to clear all the constants as well as the equation and start fresh.

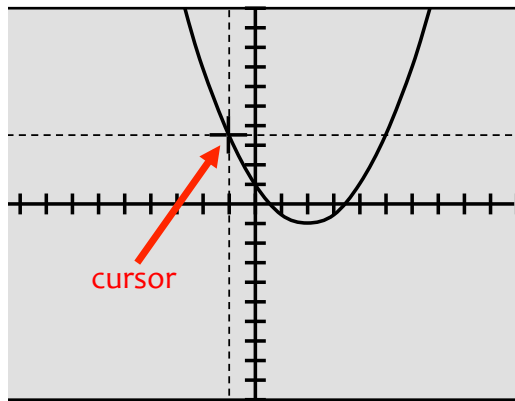
### *Exiting functions mode*

You can exit function mode by simply pressing the **2<sup>nd</sup>** key followed by **f(x)**.


### *Some guidelines while in functions mode*

- Note that you don't need to enter the equation first and the variables second. You can start by entering variables. If you enter variables that are not in the equation, they will be ignored. If you don't enter all the variables required by the equation, you get will an **UNDEFINED VARIABLE** message when you enter **y=** .
- You can also change the equation and keep the same variables.

## Graphing with Your SciPlus-2500





Let's use  $y=a(x-b)^2-c$  from the previous section, with the values of  $a=0.5$ ,  $b=-2$ , and  $c=\text{TAN}(45)$  as before:  $y=0.5(x-2)^2-1$ .





Pressing  will display the graph shown at left. Note the default scales on the graph are as follows:





x-axis:  $x_{\text{MIN}} = -10$ ,  $x_{\text{MAX}} = 10$ ,  $x_{\text{STEP}} = 1$



y-axis:  $y_{\text{MIN}} = -10$ ,  $y_{\text{MAX}} = 10$ ,  $y_{\text{STEP}} = 1$

To exit graphing mode, press  


### Viewing the Graph

When you are viewing the graph, you can use the     keys to move the entire graph up/down/left/right.

If you press the soft key **C** (think “C for cursor”) you will notice that the crosshairs indicating the current cursor position will begin to flash. In this mode, the   keys will move the graph up/down as before, but the   keys will now move the cursor left/right along the graph. Holding these keys down will cause the cursor to move more quickly. Pressing the soft key **C** again will turn this mode off.

To zoom in/out on the graph, use the   keys.

## Using the Cursor


To display the cursor in the graph as shown above, press  again and you will see the screen at right with the CURSOR icon at the top (you can also get to this screen by pressing **1**). Use the soft key **A** to navigate to the top line, then use the soft keys **C** and **D** to select Cartesian coordinates (x,y) or polar coordinates (r,θ). Note that θ will be in the units for which the SciPlus is currently set (degrees, radians, gradians).

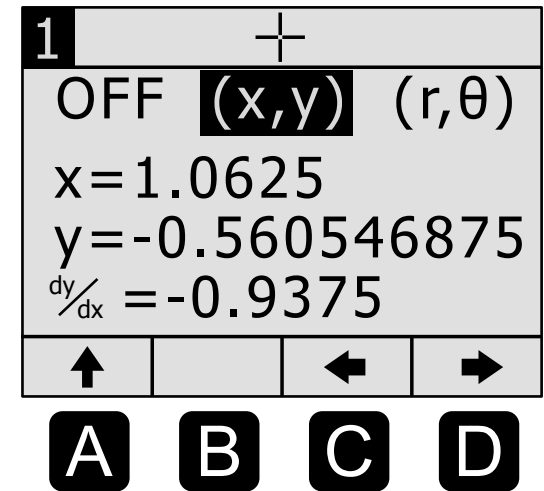
The next two lines indicate the value of x and y (or r and θ) for the current cursor position. Note that you can edit the x value to move the cursor to a new position. You can only edit the x value (independent variable). The y value (dependent variable) cannot be edited.

**Note:** You may only enter x values that are within the current displayed range. If you attempt to enter an x value outside this range, the SciPlus-2500 will default to a point close to the edge of the display.

**Note:** If you enter an x value for which there is no valid y value, the SciPlus-2500 will default to a nearby x value that is valid for the equation.

**Note:** You cannot edit the x value when in polar coordinates mode. This must be done from the graph itself, as described on page 27.





The last line  $\frac{dy}{dx}$  shows the slope of the graph at the current cursor location. To view the graph, just press  again.

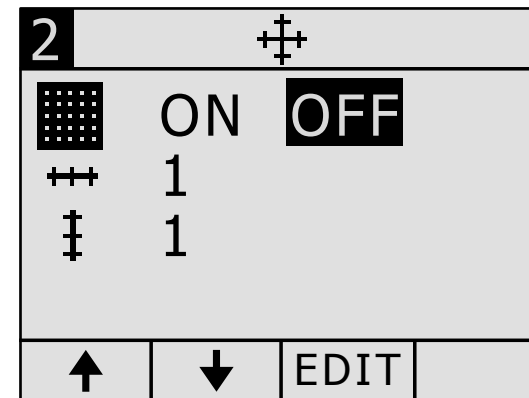





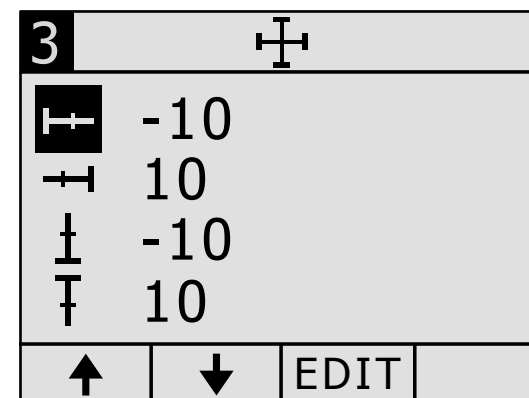
## Adjusting the Axes

There are three screens that you can use to manipulate the scales of the graph.


Press the  and **2** or use the   arrows to get to the second screen, indicated by the  symbol. On this screen you can turn the grid on/off. You can also adjust the size of the x and y tick marks.




The third screen, indicated by the  symbol, is used to manually adjust the range for the x and y axis. Note that the SciPlus will never allow you to enter a minimum value that is larger than the maximum value for the x or y axis. Just use the soft keys **A** and **B** to get to the axis end point you wish to adjust, and select soft key **C** to edit the value.




**Note:** If you are graphing a trigonometric function, the x scale values will be in degrees, radians, or gradians. You can use  $\pi$  when you define x and y tick mark values and axis ranges


To view the graph, just press  again.



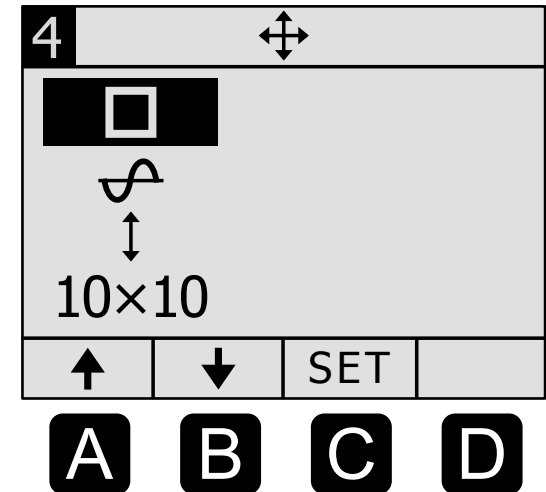
The fourth screen is the RANGE screen, indicated by . Here you can automatically set the size of the x and y axis as appropriate for the equation that is being graphed. The four settings are as follows:

“Square” mode. This mode sets the x and y axis ranges so that the grid lines and tick marks are square. The SciPlus-2500 optimizes the scales to show the graph in the most appropriate size.

 “Trigonometry” mode: In this mode, the x-axis range is set to  $-360^\circ$  to  $+360^\circ$ ,  $-2\pi$  to  $+2\pi$ , or  $-400$  to  $+400$  radians, depending on whether the SciPlus is set to D, R, or G.

 “Auto-Y” mode: In this mode, the y-axis range is set so that the minimum and maximum points of the graph within the current x-axis range, occupy the vertical height of the display.

$0 \times 10$  In “ $10 \times 10$ ” mode, the x-axis and y-axis are both set to the range of  $-10$  to  $+10$ .




**Note:** Sometimes the above selections will not show a meaningful picture of the graph. For example, if you set the graph to “ $10 \times 10$ ” mode for the equation  $y = \sin(x)$ , with the angle set to degrees, this will show a y-axis that is about 1 twenty times too large, and a x-axis that goes from be  $-10^\circ$  to  $+10^\circ$ , which is not suitable for this equation. Experiment to become familiar with which settings are most suitable for different types of equations.

## Solving for Zeros (Poles)

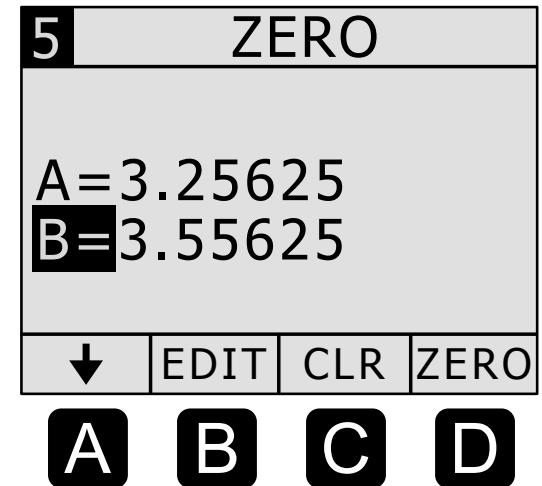
With the SciPlus-2500, you can find the points along a graph for which  $y=0$ . These are called the “zeros” or “poles” of a function. Note that some functions, such as a sine wave, will have multiple zeros. Others may have none.

To find a zero, you need to give the SciPlus-2500 a hint, by telling it two values along the curve near the zero. The easiest way to do this is by moving the cursor left/right (see “Using the Cursor” on page 28).


When you have the cursor slightly to the left of a pole, push the soft key **A**. Then move the cursor right, so that it is positioned just to the right of the pole and push the soft key **B**. This defines two x-values, one on either side of the pole.



Press  and **2** to view the last screen, called “ZERO”, shown at right. You can see that the A and B x-values you selected when moving the cursor are displayed. You can also enter or edit values for A and B on this screen directly.


Now push the soft key **D** “ZERO” to solve for the zero value. The SciPlus-2500 will display the x-value at which the graph meets the x-axis ( $y=0$ ).




## A Graphing Example

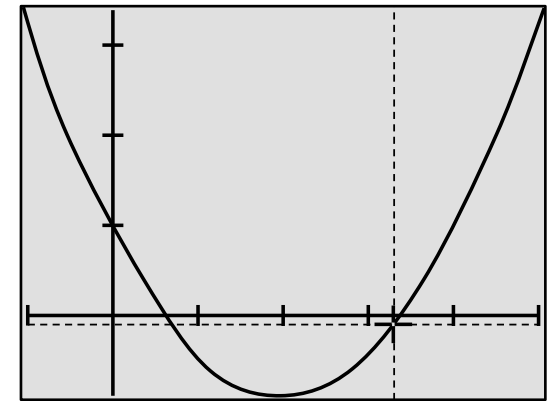
Let's try an example using the same equation as before:  $y=0.5(x-2)^2-1$ . With the axis set to "10x10" mode this will display the graph shown on page 27. Let's first adjust the axes to get a closer look: Press  then **3** to change the x-axis range to -1 to +5.

Now press **4** to select the RANGE screen , followed by  which will set the y-axis range to maximize the size of the graph for the x-range you specified.

When you again push  you will see the graph at right. Notice that there are two zeros. Let's find the one on the right. First, make sure the cursor is flashing (the soft key **C**). Then, move the cursor just to the left of the zero as shown, and push the soft key **A**. This sets one of the two search limits for the zero finding algorithm. Now, move the cursor just to the right of the zero and push the soft key **B**.

Now push  and then **5** to get to the ZERO screen. It will appear something like the picture at right, although the A and B values may be slightly different.

If you now push the soft key **D** (ZERO), the SciPlus-2500 will find the x-value for the right zero crossing. You should see  $x=3.414213562$ .





<b>5</b>	ZERO		
A=3.25625			
B=3.55625			
↓	EDIT	CLR	ZERO
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>

## Speech Output

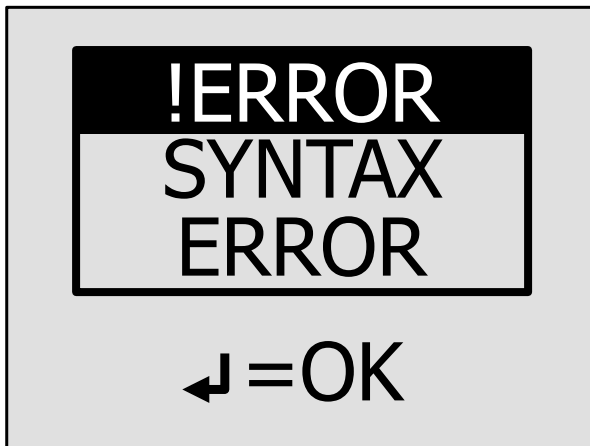
Your SciPlus-2500 will automatically read the results of expressions when they are evaluated. You will also notice that the speech output describes settings screens, etc., when they appear. At any time, pressing a button to continue operations will halt the speech output.

Turn speech output on/off:  

Read status line:  




**HINT:** Always ensure that the volume control on your earbuds is turned up.

## Errors



Sometimes you'll enter things incorrectly, such as not closing a bracket or dividing by zero. In this case, you'll get a **SYNTAX ERROR** message like the image at left.

You might see other types of error messages such as "INVALID ARGUMENT" or "INFINITE RESULT".

To correct the error, simply press  which will return you to the entry line. Use the   **BKSP** keys to correct the error.

## Troubleshooting

### **Battery does not recharge:**

The SciPlus battery may fully discharge after a month or more of inactivity. Simply plug in the calculator as if to recharge, for about half an hour. Next, perform a reset by inserting a paper clip into the small hole on the underside of the calculator, and gently push until you hear/feel a small click. Then keep the calculator plugged in at least overnight to fully recharge. Note: After a reset, the language will default to English. See page 9 to change the language.

If a reset does not resolve the problem, determine whether it is an issue with the USB charger or cord by attempting to recharge with another USB charger and /or cord.

### Service

If for any reason you require service or support for your SciPlus-2500, please contact the authorized dealer from whom it was purchased.

If you purchased directly from Sight Enhancement Systems, contact **service@sightenhancement.com** and include the following information:

- The serial number of the SciPlus-2500 (see the label on the underside of the calculator).
- A description of the problem.

The robustness of Sight Enhancement Systems SciPlus calculator is legendary, and you should enjoy years of reliable operation.

### Warranty

The SciPlus-2500 is covered by a one year limited warranty from the date of purchase. Warranty includes parts, labour and shipping costs. Goods may be returned only upon authorization by SES. Warranty covers "normal wear and tear", and does not cover damage resulting from obvious misuse of the product. Examples of misuse include, but are not limited to, damage due to exposure to moisture or extreme heat, damage due to dropping the device, and physical damage to connectors and plugs.







Calculator  
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