Explorer Plus™
Scientific & Fraction Calculator

GUIDEBOOK

Texas Instruments

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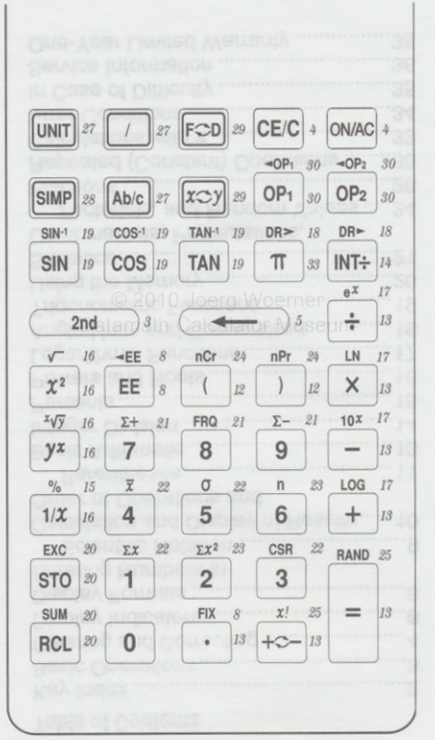
Key Index

To find information about a specific key, refer to the page number to the right of the key.



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The Explorer Plus is solar powered.

To turn the Explorer Plus on, expose the solar panel to light and press [ON/AC].

To turn the Explorer Plus off, cover the solar panel with the slide case.

Second Functions

Second functions are printed above the keys. Pressing [2nd] turns on the **2nd** indicator and instructs the Explorer Plus to perform the second function of the next key pressed.

For example, press [2nd] [TAN-1] to calculate the arctangent of the displayed value.

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Clearing and Correcting

Key	Function
ON/AC	Clears the calculator completely (clears the display, the memory, any error condition, the statistical registers, the constants, and all pending operations). Resets the angle unit to degrees and the display format to standard notation.
CE/C	Clears the display and any error condition. Clears an incorrect number entry (before you press an operation key) without affecting any calculation in progress. You can enter the correct number and continue your calculation. **Note:** Pressing CE/C (or CE/C CE/C) does not affect the memory, the statistical registers, the constants, the angle units, or the display format.

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Key	Function
CE/C CE/C	Clears the display and all pending operations. **Note:** Pressing CE/C (or CE/C CE/C) does not affect the memory, the statistical registers, the constants, the angle units, or the display format.
←	Clears the right-most digit of your last entry (before you press an operation key). This allows you to correct an entry without re-entering the entire number.

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Display Indicators

Note: Refer to **Error Conditions** for the error indicators.

Indicator	Meaning
M	The memory contains a value other than zero.
2nd	The calculator will access the second function (printed above the key) of the next key you press.
STAT	The statistical registers contain data.
RAD	The angle unit is set to radians. When you turn on the Explorer Plus, it is always set to degrees.
SIMP	The SIMP (simplify fraction) key has been pressed.
N/D→nd	The displayed fraction or mixed number can be further simplified.
OP1 or **OP2**	The first or second constant operator is active.

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Indicator	Meaning
/	Separates a numerator from a denominator.
U	Separates the whole number (units) from the fraction in a mixed number.
_ Q _ _ R _	Indicates the quotient and the remainder in an integer division result.

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Display Formats

The selected display format affects results only. You can enter a value in floating- or fixed-decimal notation, or scientific notation, regardless of the selected format.

Key	Function
[EE]	Selects scientific-notation format. Results are displayed with one digit to the left of the decimal point. Example: 777.588 [EE] 4 [=] **7.77588 06**
[2nd] [•EE]	Restores scientific notation to standard-notation format. Example: [2nd] [•EE] **7775880**
[2nd] [FIX] n	Sets the number of decimal places from 0 through 9 (the value you enter for n). Example: 12.345 [2nd] [FIX] 2 **12.35**
[2nd] [FIX] [.]	Removes the fixed-decimal setting. **12.345**

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Entering Numbers in Scientific Notation

1. Enter the mantissa or base (up to 10 digits). If it is negative, press [+/-] after entering the mantissa.
2. Press [EE] and enter the exponent (one or two digits). If it is negative, press [+/-] either before or after entering the exponent.

   If you press an incorrect digit key, re-enter the correct digits. (The Explorer Plus uses only the last two digits entered as the exponent.)

Example:

1.2345 [+/-] [EE] [+/-] 65 [=]	**-1.2345 -65**

Note: Entering a number in scientific notation does not change the display-format setting.

Calculation and Display of Results

The Explorer Plus allocates ten places for the number and the - sign. Therefore, the largest possible whole number is 9,999,999,999 (you can perform calculations on larger numbers using scientific notation).

When you enter a number, it is always displayed on the far left of the screen. After calculations, the result is always displayed on the far right of the screen.

For step-by-step calculations, you do not have to press [=] to obtain each intermediate result. (See **Order of Operations and Parentheses**.)

Display formats affect results only; so you can enter a value in any format, regardless of the one currently selected.

Order of Operations

The Explorer Plus uses the Algebraic Operating System (AOS™) standard algebraic rules in completing operations. The operational priorities are listed below. It stores up to five pending operations (three when statistical registers contain data or constant operators are active) and completes each according to AOS rules.

Priority	Functions
1 (highest)	Single-variable functions that immediately perform the calculation and display the result are completed first (square, angle conversion, square root, trigonometric, factorial, logarithmic, percent, random, and reciprocal).
2	Random integer is completed before combinations and permutations.
3	Combinations and permutations are completed before the functions in priorities 4, 5, and 6.
4	Exponentiation (y^x) and roots ($\sqrt[x]{y}$) are completed before the functions in priorities 5 and 6.

(continued)

Priority	Functions
5	Multiplication and division are completed before addition and subtraction.
6	Addition and subtraction are performed after all other operations are completed.
7	[=] completes all operations.

Parentheses

You can control the order of operations by using parentheses to group parts of an expression that you want evaluated as a unit.

Example:

12 [×] [(] 5 [+] 6 [)] [=]	**132**

Fifteen levels of open parentheses are allowed. After the last parenthesis is closed,] is no longer displayed, indicating that all of the parentheses have been closed.

When you open more than ten parentheses, the Explorer Plus displays [along with the number of open parentheses. Similarly, if you have more than ten parentheses to be closed, the Explorer Plus displays] along with the number of parentheses to be closed.

Key	Function
[+], [−], [×], [÷]	Performs addition, subtraction, multiplication, or division. Example: 60 [+] 5 [×] 12 [=] **120**
[=]	Calculates and displays the result.
[+/−]	Changes the sign. Example: 8 [+/−] [+] 12 [=] **4**
[.]	Enters a decimal point.
[2nd] [FIX]	Sets the number of decimal places from 0 through 9.

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Integer Division

[INT÷] divides a whole number by a whole number and displays the result as a quotient (**Q**) and a remainder (**R**).

If you use the result of integer division in another calculation, only the quotient is used. The remainder is dropped.

All numbers used with [INT÷] must be positive whole numbers.

Example:

11 [INT÷] 4 [=]	Q **2**	R **3**
Multiply the result. [×] 10 [=]		**20**

Note: The remainder (R) is not used.

Percents

Use [2nd] [%] to calculate percentages, ratios, add-ons, and discounts.

When there is no pending [+] or [−], pressing [2nd] [%] divides the displayed value by 100 and displays the result.

Percentage example:

250 [×] 5 [2nd] [%]	**0.05**
[=]	**12.5**

Ratio example:

250 [÷] 5 [2nd] [%]	**0.05**
[=]	**5000**

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With a pending [+] or [−], pressing [2nd] [%] divides the displayed value by 100, multiplies this calculation by the previous entry, and displays the result. This result is used as the second argument of the pending [+] or [−].

Add-on example:

250 [+] 5 [2nd] [%]	**12.5**
[=]	**262.5**

Discount example:

250 [−] 5 [2nd] [%]	**12.5**
[=]	**237.5**

Powers and Roots

Key	Function
[y^x]	Raises the displayed value (y) to a specified power (x). Example: 5 [y^x] 3 [=] **125**
[2nd] [$\sqrt[x]{y}$]	Finds the specified root (x) of the displayed value (y). Example: $\sqrt[3]{8}$ 8 [2nd] [$\sqrt[x]{y}$] 3 [=] **2**
[x²]	Squares the displayed value. Example: 6 [x²] [+] 2 [=] **38**
[2nd] [√‾]	Calculates the square root of the displayed value. Example: 256 [2nd] [√‾] [+] 4 [2nd] [√‾] [=] **18**
[1/x]	Calculates the reciprocal (x^{-1}) of the displayed value. Example: 8 [1/x] [+] 4 [1/x] [=] **0.375**

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Logarithmic Functions

Key	Function
2nd [LOG]	Calculates the common logarithm (base 10) of the displayed value. Example: 15.32 2nd [LOG] + 12.45 2nd [LOG] = **2.280428117**
2nd [10^x]	Calculates the common antilogarithm (10 raised to the power of the value) of the displayed value. Example: 2 2nd [10^x] − 10 [x^2] = **0**
2nd [LN]	Calculates the natural logarithm (base e) of the displayed value. (The value of e is 2.718281828.) Example: 15.32 2nd [LN] + 12.45 2nd [LN] = **5.250879787**
2nd [e^x]	Calculates the natural antilogarithm (e raised to the power of the value) of the displayed value. Example: .693 2nd [e^x] + 1 = **2.999705661**

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Changing the Angle-Unit Setting

Key	Function
2nd [DR>]	Cycles the angle-unit setting from degrees to radians, and then back to degrees without affecting the number in the display. **Note:** When you turn on the Explorer Plus, it is automatically set to degree mode, but no indicator is shown in the display.
2nd [DR▸]	Cycles the angle-unit setting from degrees to radians, and then back to degrees while affecting the number in the display. Example: (from degree angle unit) 45 2nd [DR▸] **RAD** **PI/4** 2nd [DR▸] **45** **Note:** In radian (**RAD**) mode, pi is shown in the display as **PI**.

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Trigonometric Functions

Before starting a trigonometric calculation, be sure to select the appropriate angle-unit setting (degree or radian). The calculator interprets values according to the current angle-unit setting.

Key	Function
[SIN], [COS], [TAN]	Calculates the sine, cosine, or tangent of the displayed angle. Example (in degree angle unit): 90 [SIN] [−] 30 [COS] [=] **0.133974596**
[2nd] [SIN^{-1}], [2nd] [COS^{-1}], [2nd] [TAN^{-1}]	Calculates the arcsine, arccosine, or arctangent of the displayed value. Example (in degree angle unit): 1 [2nd] [SIN^{-1}] [−] .5 [=] **89.5**

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Using the Memory

The memory allows you to store a number (even as a fraction) for later use. When the memory contains a number other than zero, you will see the **M** indicator to the left in the display.

To clear the memory, press [STO] while zero is displayed, or press [ON/AC] at any time.

Key	Function
[STO]	Stores the displayed value in memory, replacing any previously stored value. Example: 23 [STO] [+] 2 [=] **25** Stores 23 in memory.
[RCL]	Recalls (displays) the value stored in memory. Example: [RCL] **23** [+] 2 [=] **25**
[2nd] [SUM]	Adds the displayed value to the current contents of memory. Example: 2 [2nd] [SUM] [RCL] **25**
[2nd] [EXC]	Exchanges the displayed value with the contents of memory. Example: 15 [2nd] [EXC] **25** [2nd] [EXC] **15**

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Statistics

The Explorer Plus can perform statistical analysis of one-variable data.

Key	Function
2nd [Σ+]	Activates the statistical mode and enters data. The **STAT** indicator is displayed when you enter the first data point.
2nd [Σ−]	Removes data.
2nd [FRQ]	Lets you quickly add or remove repeated occurrences of a data point. Displays **Fr 00** and waits for you to enter the frequency (number of occurrences of the data value). The frequency must be in the range 1 through 99. When entering the frequency, the last two digits that you press are displayed and used.

(continued)

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Key	Function
2nd [FRQ] (continued)	• To add repeated occurrences of data, type the value, press 2nd [FRQ], enter the frequency value, and press 2nd [Σ+]. • To remove repeated occurrences of data, repeat the same steps above for adding except press 2nd [Σ-]. **Note:** An error will occur if you enter the total number of occurrences. • To cancel the frequency entry, press ←.
2nd [CSR]	Clears all statistical data and turns off the **STAT** indicator. If no data points are stored, causes an error.
2nd [Σx]	Calculates the sum of the data points.
2nd [$\bar{x}$]	Calculates the mean of the data.
2nd [σ]	Calculates the population standard deviation of the data (n weighting).

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Key	Function
[2nd] [Σx^2]	Calculates the sum of the squares of the data points.
[2nd] [n]	Displays the current number of data points.

Example:
Find the sum of the data, mean, and population standard deviation for the following data set:

45, 55, 55, 55, 60, 80

Note: In this example, the last data value is erroneously entered as 8, removed with [2nd] [Σ-], and then correctly entered as 80.

[2nd] [CSR] (if **STAT** is displayed)	
45 [2nd] [Σ+]	**n= 1**
55 [2nd] [FRQ] 3 [2nd] [Σ+]	**n= 4**
60 [2nd] [Σ+]	**n= 5**
8 [2nd] [Σ+]	**n= 6**
8 [2nd] [Σ-]	**n= 5**
80 [2nd] [Σ+]	**n= 6**
[2nd] [Σx] (sum)	**350**
[2nd] [$\bar{x}$] (mean)	**58.33333333**
[2nd] [σ] (deviation)	**10.67187373**

Combinations

A combination is an arrangement of objects in which the order is not important, as in a poker hand.

2nd [nCr] calculates the number of possible combinations of n items taken r at a time.

1. Enter n and press 2nd [nCr].
2. Enter r and press =.

Example: Calculate the number of five-card poker hands that can be dealt from a deck of 52 cards.

52 2nd [nCr] 5 =	**2598960**

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Permutations

A permutation is an arrangement of objects in which the order is important, as in a horse race.

2nd [nPr] calculates the number of possible permutations of n items taken r at a time.

1. Enter n and press 2nd [nPr].
2. Enter r and press =.

Example: Calculate the number of possible permutations for the first-, second-, and third-place finishers (no ties) in an eight-horse race.

8 2nd [nPr] 3 =	**336**

Factorials

A factorial is the product of all the positive integers from 1 to n.

Example: Using the digits 1, 3, 7, and 9 only one time each, how many four-digit numbers can you form?

4 [2nd] [x!]	24

Note: The argument used in the factorial function must be a positive whole number. Also, an argument greater than 69 will exceed the capacity of the Explorer Plus and cause an error overflow message.

Random Values

A random value is a value that has the same probability of occurring as every other member of a set of values.

To find a random decimal from 0 to .999, press [2nd] [RAND].

To find a random integer from 1 ≤ 100:

1. Press 1 [2nd] [RAND].

2. Enter 100 and press [=].

Example: Simulate the rolling of dice eight times.

Repeat 1 [2nd] [RAND] 12 [=] eight times.

Another method:

1 [2nd] [RAND] 12 [OP1] (or [OP2]), and then repeat 1 [OP1] (or [OP2]) eight times.

Fractions

Calculations involving fractions are displayed as follows:

- If any part of a fractional result requires more than three digits, the result will be shown as a decimal number.
- Both the numerator and the denominator must be whole numbers if the result is to be displayed as a fraction.
- The result of an operation on a series of fractions (not mixed numbers) will always be displayed as another fraction. The results of addition and subtraction involving mixed numbers will be displayed as mixed numbers. The results of multiplication and division involving fractions and mixed numbers will always be displayed as fractions.
- If you enter a number that is not a common factor when simplifying a fraction, the fraction will be displayed again with **N/D→nd** still in the display.
- When you multiply fractions or mixed numbers, the resulting numerator will be the product of the numerators, and the resulting denominator will be the product of the denominators.
- When you add or subtract fractions, the Explorer Plus will display the result with the lowest common denominator.

- When you multiply or divide fractions and decimals, the result will be displayed as a decimal. Pressing [F⇄D] converts a decimal to a fraction and vice versa. A decimal will not be converted to a fraction if the result would overflow the display.
- If **N/D→nd** is still displayed after you convert a fraction to a mixed number, you can simplify the fractional portion of the mixed number.
- If the decimal place is fixed to zero, the decimal equivalent for a fraction will not be displayed.

Key	Function
[UNIT]	Enters the whole number portion of a mixed number. Example: 6 [UNIT] 4 [/] 6 [=] **6 ⨿ 4/6**
[/]	Separates the numerator of a fraction from the denominator. Example: 3 [/] 8 [=] **3/8**
[Ab/c]	Changes a fraction to a mixed number. Example: 53 [/] 4 [Ab/c] **13 ⨿ 1/4**

(continued)

Key	Function
SIMP	Simplifies fractions and mixed numbers to lowest terms. You can simplify fractions and mixed numbers in two ways: • Let the Explorer Plus choose a common factor: Example: 18 / 24 **18/24** SIMP = N/D→nd **9/12** SIMP = **3/4** **Note:** Pressing x⇄y lets you view the factor. • You enter a common factor: Example: 18 / 24 **18/24** SIMP SIMP N/D→nd **18/24** 6 SIMP **6** = **3/4**

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Key	Function
F⊃D	Changes a fraction to its decimal equivalent. Changes a decimal to a fraction (provided the fraction would not overflow the display). Example: 5 / 4 **5/4** F⊃D **1.25** F⊃D **1 u 25/100** **Note:** When you use F⊃D to convert a decimal number to a fraction, the denominator of the result will always be a multiple of ten. The Explorer Plus cannot convert a number with more than three decimal places to a fraction because it would overflow the display.
x⊃y	Exchanges the entries. Example: 5 / 4 **5/4** F⊃D **1.25** x⊃y **5/4** (to see the original fraction) x⊃y **1.25** (to see the decimal value again)

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Repeated (Constant) Operations

Setting a constant

The constant register is set in conjunction with [OP1] or [OP2] when you perform a calculation that uses [+], [−], [×], [÷], [y^x], [INT÷], [2nd][x√y], [2nd][nCr], [2nd][nPr], or a random integer.

The operator and the number entered after the operator (for example, [+] 5 [OP1]) are stored for repeated use. The constant function works with whole numbers, decimals, and fractions.

When you repeat an operation using [OP1] or [OP2], a counter to the left in the display shows how many times it is repeated. If the number to the right in the display exceeds seven digits, the counter will not be shown. The counter returns to 0 after reaching 99.

Removing a constant

You can remove each constant separately by pressing [2nd] [-OP1] or [2nd] [-OP2], depending on which constant you want to remove.

Pressing [CE/C] does not affect the constants; however, pressing [ON/AC] clears both constants.

Example: **Showing multiple representations**

Enter +5 in OP_1 and subtract a -5 in OP_2. Begin at zero and build tables of values for OP_1, and then for OP_2.

ON/AC		
+ 5 OP_1		5
− 5 +/− OP_2		-5
0	0	
OP_1	1	5
OP_1	2	10
0	0	
OP_2	1	5
OP_2	2	10

Example: **Addition as "counting on"**

Show 4 + 2 by "adding on" 1 at a time.

ON/AC		
+ 1 OP_1		1
4	4	
OP_1	1	5
OP_1	2	6

Example: **Multiplication as "repeated addition"**

Using 2 x 10, show multiplication as repeated addition.

ON/AC		
+ 10	10	
OP_2		10
0	0	
OP_2	1	10
OP_2	2	20

(continued)

Example: **Powers as "repeated multiplication"**

Use the formula V= l x w x h and repeated multiplication to find the volume of a cube with a base of 5 meters.

ON/AC		
× 5 OP1		5
1	1	
OP1	1	5
OP1	2	25
OP1	3	125

Example: **Using y^x as a constant**

Use the formula V= base^3 to find the volume of two cubes with bases of 3 and 4.

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ON/AC		
y^x 3 OP1		3
3 OP1	1	27
4 OP1	1	64

Example: **Programming of advanced functions**

Solve y = 0.5x + 2, value of y for x = 0 and 1.

ON/AC		
× 0.5 OP1		0.5
+ 2 OP2		2
For (x=0):		
0 OP1	1	0
OP2	1	2
For (x=1):		
1 OP1	1	0.5
OP2	1	2.5

Calculations with π

Pressing [π] enters the value of pi rounded to 10 digits (3.141592654). Internally, pi is stored to 12 digits (3.14159265359).

When the Explorer Plus is in radian (**RAD**) mode, pi is shown in the display in the symbolic form **Pi**.

Example: Add 3π/2 and 5π/2 using symbolic pi.

[2nd] [DR>]	**RAD**	
3 [π] [/] 2 [+]	**RAD**	**3Pi/2**
5 [π] [/] 3 [=]	**RAD**	**19Pi/6**

Note: You can press [F⊃D] to see the result in decimal form and [x⊃y] to return to symbolic form.

If necessary, you can use [SIMP] to simplify results.

Error Conditions

The following ten error messages may be displayed.

Message	Explanation
Error AOS	Too many operations on hold (maximum of five levels).
Error OFL	The capacity of the Explorer Plus has been exceeded (number too large).
Error UFL	Number too small.
Error OP	Error in the definition of OP_1 or OP_2 operators, or trying to activate the statistical mode when a constant is defined.
Error -	Sign error (for example, attempting to calculate the square root of a negative number).
Error Ari	Arithmetical error in the broad sense (division by 0 or inaccurate argument for a function: for example, log 0).

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Message	Explanation
Error Int	Using a non-integer value when a whole number is required.
Error b/c	Incorrect use of fractions.
Error [ ]	Parenthesis error (for example, parenthesis not closed).
Error Sta	Incorrect use of statistical functions.

In most cases, pressing [CE/C] restores the last display before the error message appeared, enabling you to correct a calculation sequence without having to start it all over again. (See **Clearing and Correcting**.)

In Case of Difficulty

- If the display is blank, make sure the solar panel is exposed to an adequate light source. Press [ON/AC] and try the calculation again.
- Review the operating instructions to be certain the calculations were performed properly.

Service Information

If you have questions about service or the general use of your Explorer Plus, please call Customer Support toll-free at:

1-800-TI-CARES (1-800-842-2737)

Hours: 8:00 AM–4:30 PM CST
Monday–Thursday
9:30 AM–4:30 PM Friday.

You may also use Internet e-mail:

ti-cares@ti.com

Please contact Customer Support:

- Before returning the Explorer Plus for service.
- For general information about using the Explorer Plus.

Online Information

Texas Instruments offers online assistance through the Internet, including an anonymous FTP site for downloading files.

http://www.ti.com/calc

ftp://archive.ppp.ti.com/pub/graph-ti

Express Service

Texas Instruments offers an express service option for fast-return delivery. Please call Customer Support for information.

Returning Your Explorer Plus for Service

A defective Explorer Plus will be replaced with the same or comparable reconditioned model (at TI's option) when it is returned, postage prepaid, to a Texas Instruments service facility.

Texas Instruments cannot assume responsibility for loss or damage during incoming shipment. For your protection, carefully package the Explorer Plus for shipment and insure it with the carrier. Be sure to enclose the following items with your Explorer Plus:

- Your complete return address and daytime phone number.
- Any accessories related to the problem.
- A note describing the problem you experienced.
- A copy of your sales receipt or other proof of purchase to determine warranty status.

Please ship the Explorer Plus postage prepaid; COD shipments cannot be accepted.

In-Warranty Service — For an Explorer Plus covered under the warranty period, no charge is made for service.

Out-of-Warranty Service — A flat-rate charge by model is made for out-of-warranty service. To obtain the service charge for a particular model, call Customer Support **before** returning the product for service. (We cannot hold products in the service facility while providing charge information.)

Texas Instruments Service Facilities

U.S. Residents
Texas Instruments
2249 Cockrell Avenue
Dallas, Texas 75215

Canadian Residents Only
Texas Instruments
41 Shelley Road
Richmond Hill, Ontario L4C 5G4

One-Year Limited Warranty

This Texas Instruments electronic product warranty extends to the original consumer purchaser of the product.

Warranty Duration: This product is warranted to the original consumer purchaser for a period of one (1) year from the original purchase date.

Warranty Coverage: This product is warranted against defective materials or workmanship. This warranty is void if the product has been damaged by accident, unreasonable use, neglect, improper service, or other causes not arising out of defects in material or workmanship.

Warranty Disclaimers: **Any implied warranties arising out of this sale, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, are limited in duration to the above one-year period. Texas Instruments shall not be liable for loss of use of the product or loss of data or programs, and shall not be responsible for incidental or consequential costs, expenses, or damages incurred by the consumer or any other user.**

Some states do not allow the exclusion or limitations of implied warranties or consequential damages, so the above limitations or exclusions may not apply to you.

Legal Remedies: This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

Warranty Performance: During the above one-year warranty period, a defective product will be replaced with a comparable reconditioned model when the product is returned, postage prepaid, to a Texas Instruments service facility.

The replacement product will be in warranty for the remainder of the original warranty period or for six months, whichever is longer. Other than the postage requirement, no charge will be made for such replacement.

Texas Instruments strongly recommends that you insure the product for value prior to mailing.

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