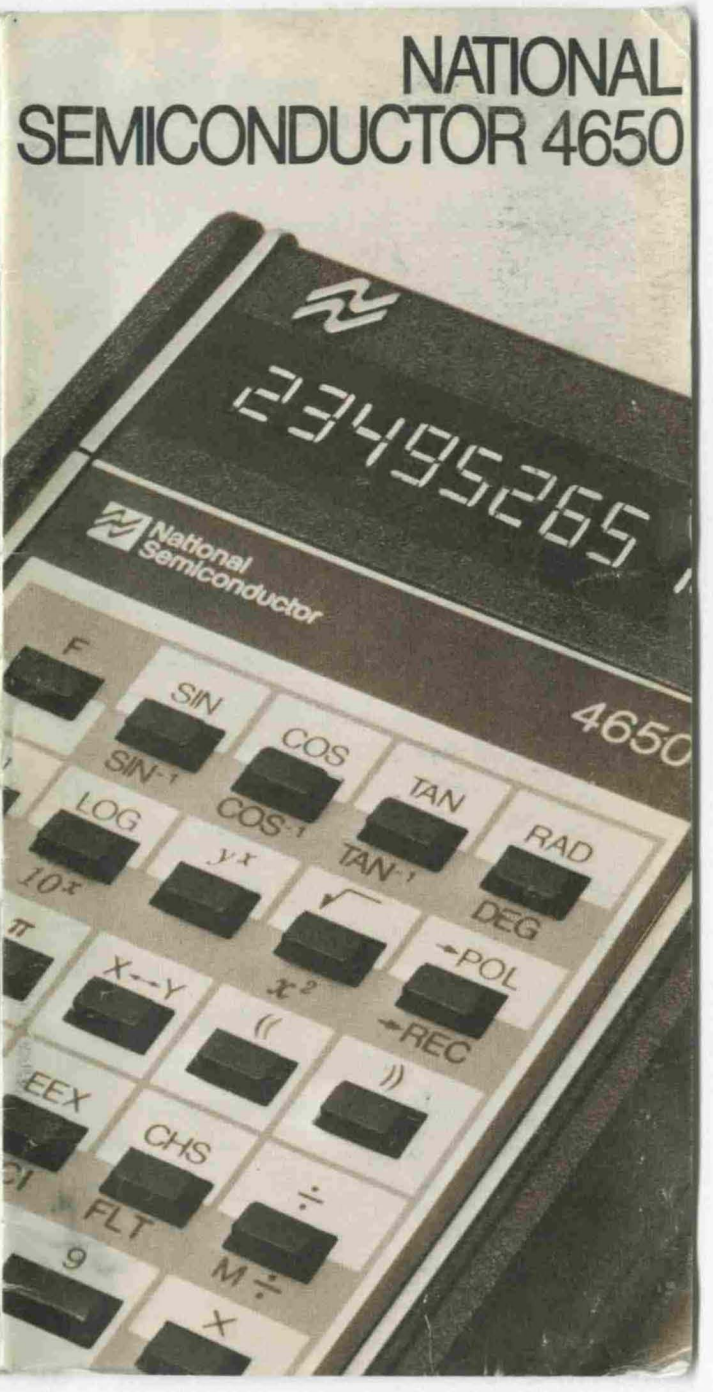
National Semiconductor
Consumer Products Division

p/n 102367

NATIONAL SEMICONDUCTOR 4650



CONTENTS

Getting Started

Your calculator is designed for easy learning and efficient operation. It is recommended that you charge your calculator for 3 hours before initial use. See Battery Information. To get started, turn your calculator on with the switch on the left side. The display will show a digit or digits. Depress C to clear the display. The display should now show a single zero. If it does not, the battery probably needs recharging.

Double Labeled Keys

Notice that many of the keys on your calculator have two labels, i.e., a designation appears above and below the key.

Doubly Labeled Key

This means that the key has two functions. When the key is depressed directly after the F, the lower function, e.g. M+ (memory plus) is accessed. In this manual, the F is illustrated as a required prefix to all secondary functions. The M+ (memory plus) for example, will be shown as F M+. If F has been depressed by mistake, depress = to clear the erroneous depression without affecting the display or calculation in progress.

Keying in Numbers

Floating Decimal

The standard format in which numbers within the range .0000001 to 99,999,999 are entered and displayed is the floating decimal point format. Numbers are entered in the normal calculator fashion, i.e., key in numbers by touching the number keys in the same sequence as if you were writing them down on paper. If a decimal appears in the number, key it in sequence as part of the number. The calculator accepts the first decimal keyed in as the decimal in the number. The decimal need not be keyed in when keying in whole numbers.

The decimal point in the result of a calculation is automatically positioned. This is known as "floating point" notation because the decimal point can "float" to any digit location.

Results of calculations which exceed 99,999,999 or are less than .0000001 are automatically displayed in scientific notation since the number of display digits cannot accommodate these very large or very small numbers in the floating point format.

Scientific Notation

Any number within the range 10^{-99} to 10^{99} may be entered into your calculator and displayed in scientific notation using EEX, Enter Exponent key. Entries in scientific notation are made as they are written, i.e., a decimal numeral (referred to as the mantissa) between 1 and 9.9999999 and a power of ten.

Scientific Notation Entry Procedure

1. Key in the mantissa as a decimal number between 1 and 9.9999999.
   Note: If the mantissa is keyed in as a number outside this range, the calculator will automatically adjust the mantissa and exponent upon depression of a function key. See example 2.
2. Depress EEX; 00 is displayed in the exponent display positions.
   Note: If a mantissa entry is not keyed in prior to depressing EEX, the calculator automatically assumes and displays a mantissa of 1.
3. Enter the power of ten exponent digit(s).
   Note: If more than two digit keys are depressed directly following EEX, the last two digits entered constitute the exponent and the earlier entered digits are discarded. See example 3.

Example 1: Solve $(4 \times 10^9) \times (3 \times 10^8)$

ENTER	DISPLAY
4 EEX	4. 00
9 ×	4. 09
3 EEX	3. 00
8 =	1.2 18

Example 2: Solve the preceding problem, except enter 40×10^8 instead of 4×10^9 to observe automatic normalization performed on mantissa entries outside the range 1 to 9.9999999.

ENTER	DISPLAY
40 EEX	40. 00
8 ×	4. 09
3 EEX	3. 00
8 =	1.2 18
C	0.

Example 3: Enter 2×10^{15} and then change the exponent to 27.

ENTER	DISPLAY
2 EEX	2. 00
1	2. 01
5	2. 15
2	2. 52
7	2. 27

Reformat Display Keys: SCI and FLT

When the calculator is turned on, it is in the floating decimal mode. Although amounts may be entered in scientific notation using EEX, upon depression of a function key they will be converted to floating decimal notation if capacity permits.

Example:

ENTER	DISPLAY	COMMENTS
5 EEX	5. 00	
3	5. 03	
×	5000.	Automatically converts to floating notation.
=	25000000.	

Depress F SCI to establish the Scientific Notation mode.

ENTER	DISPLAY	COMMENTS
F SCI		Sets scientific mode.
5 EEX	5. 00	
3	5. 03	
×	5. 03	
=	2.5 07	

Observe in the next example that in the scientific mode, entries and results of calculations are displayed in scientific notation even when you key in factors without an exponent.

ENTER	DISPLAY
F SCI	
5 ×	5.
2 =	1. 01
12345 ×	1.2345 04
2 =	2.469 04

To cancel Scientific Notation mode and set Floating Decimal mode, depress F FLT.
Observe in the example below that results which exceed 99,999,999 or are less than .0000001 are automatically converted to scientific notation.

ENTER	DISPLAY
F FLT	
123456 ×	123456.

789123 [=] 9.7421969 10

Calculator will display 97421969000 in scientific notation because it exceeds capacity.

Changing Signs: CHS

The CHS, change sign key, changes the algebraic sign of an entry or result from positive to negative and vice versa. Depress CHS after mantissa entry or after depression of EEX to enter these respective values as negatives.

Example:

ENTER	DISPLAY
456 CHS	−456.
EEX	−456. 00
CHS	−456. −00
2	−456. −02
CHS	−456. 02

Observe that CHS may be depressed at any time during exponent entry.

Clearing Mistaken Key Depressions: C

The C, clear key, is designed to keep operator decision to a minimum. Depress C directly following an erroneous key depression and the calculator will clear the affected register(s) only. More explicitly, C operates as follows:

Depressed directly following a digit key or EEX
Clears the digit key depression and displays the contents of the calculating register. Operations are not disturbed and may be continued. The purpose of this function is to enable correction of mistaken digit key depressions.

Depressed directly following F
Clears all registers including memory, i.e., the key sequence F C performs a "clear all."

Depressed directly following other keys (incl. C)
Clears display and calculating register.

Basic Arithmetic Operations

The procedure for performing simple addition, subtraction, multiplication or division is to key in the problem as it is written.

Enter first number; depress [+], [−], [×] or [÷].

Enter the second number; depress [=].

It is a good practice to depress C before performing calculations in order to clear any calculations pending from previous key depressions.

Multifactor (Chain) Calculations

The final result of any calculation may be used in further calculations, eliminating the need to re-enter the value.

Example: A piece of equipment costs $5000. The salvage value is $1200. Find the depreciation expense per year if the equipment has a lifetime of eight years.

Formula: $\frac{5000 - 1200}{8} = 475$

ENTER	DISPLAY	COMMENTS
5000 [−]	5000.	
1200 [=]	3800.	May be used in further calculations.
[÷]	3800.	
8 [=]	475.	

The same problem may be performed more efficiently, with fewer keystrokes, by using the *chaining*

feature. Perform the problem as you would say it, depressing [=] only once, on completion of the problem: 5000 minus ([—]) 1200 divided ([÷]) by 8 equals ([=]).

Short Method

ENTER	DISPLAY
5000 [—]	5000.
1200 [÷]	3800.
8 [=]	475.

Rule for performing chain calculations

Perform the problem as it is written with one exception; rewrite formulas which indicate multiplimation in the denominator portion of fractions as shown below.

Use parenthesis keys when necessary, i.e., when addition/subtraction is mixed with multiplication/division to form a parenthecated expression. See Parenthesis Keys section of this manual.

Perform on calculator this way:

$$144 \div 2 \div 12 = 6$$

Do not perform on calculator as written here:

$$\frac{144}{2 \times 12} = 6$$

ENTER	DISPLAY
144 [÷]	144.
2 [÷]	72.
12 [=]	6.

Since your calculator uses true algebraic logic, no guess work or knowledge of mathematical hierarchy is required to perform long, complex problems. An infinite number of problems may be chained together. The calculator displays an intermediate answer upon depression of [+], [—], [×], [÷], [Y^x]; for information purposes and to remind you that

upon depression of these keys any pending add, subtract, multiply, divide, or power command is executed.

Example: $\frac{5 \times 2 \times 3 \times 4}{6} + 7 + 8 - 3 = 32$

ENTER	DISPLAY	COMMENTS
5 [×]	5.	
2 [×]	10.	Previous instruction executed, intermediate answer displayed.
3 [×]	30.	
4 [÷]	120.	
6 [+]	20.	"
7 [+]	27.	"
8 [—]	35.	"
3 [=]	32.	"

Two Factor Function Keys

The following keys require the entry of two (or more) factors: [+] [—] [×] [÷] [Y^x]. The first factor is entered on one of these keys. The second factor is entered on [=] to complete the calculations.

Although you already know how to add, subtract, multiply and divide from previous sections, the following functional description of [+] [—] [×] and [÷] is given along with a description of [Y^x] for a complete understanding of the relationship of the two factor function keys.

[÷] Divide Key

Enters the dividend (first number in division). For chain calculations it completes a "pending two factor calculation" (i.e., a "+, —, ×, ÷, Y^x" calculation which is in progress, not yet terminated by a depression of [=]). When depression of this key completes a pending calculation, the intermediate result is displayed and set up as a dividend.

× Times Key

Enters the multiplicand (first number in multiplication). For chain calculations, completes a pending two factor calculation and sets up intermediate result as a multiplicand; displays intermediate result.

− Minus Key

Enters the minuend (top or first number in subtraction). For chain calculations, completes a pending two factor calculation and sets up the intermediate result as a minuend, displays intermediate result.

+ Plus Key

Enters the addend. For chain calculations, completes a pending two factor calculation and sets up the intermediate result as an addend; displays the intermediate result.

= Equals Key

Terminates a two factor calculation, +, −, ×, ÷, Y^x, and displays the final result. Causes the value entered on = to be stored as a constant divisor, multiplier, subtrahend or addend depending upon the operation. If no algebraic operation is pending, numbers entered on = will be used for calculations with the constant.

Y^x Y to the x^{th} Power Key

Raises a number entered on Y^x to a power entered on =

Example 1: Compute $5^3 = 125$

ENTER	DISPLAY
5 Y^x	5.
3 =	125.

Example 2: Compute $(125 \div 5)^{-3.2} = .00003361$

ENTER	DISPLAY
125 ÷	125.
5 Y^x	25.
3.2 CHS	−3.2
=	.00003361

The example above illustrates that Y^x functions just like +, −, × and ÷ in that it completes a pending two factor calculation which in this case is "125 divided by 5" and sets up the intermediate result, 25, as "Y".

Y must be positive ($Y > 0$). X value is unrestricted.

Correcting Mistaken Function Key Depressions

When you depress an incorrect two factor function key, a depression of the correct two factor function key will change the mode of operation to that which you originally intended. It is therefore not necessary to clear the calculator and re-enter your problem.

For example, if you depress + instead of −, just depress − directly after + to change the mode of operation to subtract.

Performing Constant Calculations

The second factor in a two factor calculation is retained as a constant in the calculating register.

To use the constant:

Perform an addition, subtraction, multiplication or division problem in the usual manner remembering to enter the constant value last, on =.

Enter variable numbers; depress =, display shows answers.

ENTER	DISPLAY	COMMENTS
5 ×	5.	Problem performed in standard manner.
2 =	10.	
3 =	6.	$3 \times 2 = 6$
4 =	8.	$4 \times 2 = 8$
5 =	10.	$5 \times 2 = 10$

To record a new constant, simply perform another addition, subtraction, multiplication, division or power problem in the usual manner.

When [Y^x] is used, the power, "x" is retained as a constant.

ENTER	DISPLAY	COMMENTS
13 [Y^x]	13.	
2 [=]	169.	$13^2 = 169$
5 [=]	25.	$5^2 = 25$
3 [=]	9.	$3^2 = 9$

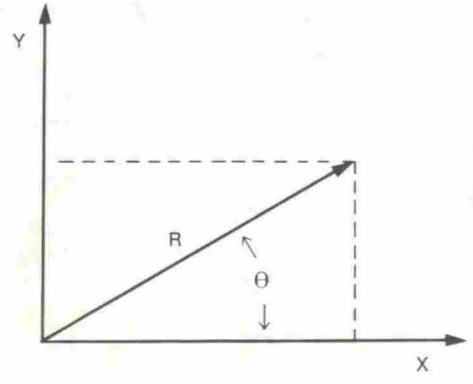
Polar, Rectangular Conversion

[→POL]

Converts rectangular coordinates to polar coordinates. The "Y", northing coordinate is entered on [×]; the "x", easting coordinate is entered on the [→POL] key. The θ angle expressed in degrees is displayed. Depress [x–y] to read the radius.

[F] [→REC]

Converts polar coordinates to rectangular coordinates. The radius is entered on [×]; the angle expressed in degrees is entered on [F] [→REC]. The "x", easting coordinate is displayed. Depress [x–y] to read the "Y", northing coordinate.



Example: Convert the following rectangular coordinates to polar coordinates:

Y = 5 X = 3
Y = 2.6 X = 10

ENTER	DISPLAY	COMMENTS
5 [×]	5.	
3 [→POL]	59.036244	Angle θ
[x–y]	5.8309518	Radius
2.6 [×]	2.6	
10 [→POL]	14.574216	Angle θ
[x–y]	10.332473	Radius

Example: Convert the following polar coordinates to rectangular coordinates:

Radius = 10.5 θ = 55°
Radius = 7 θ = 30°

ENTER	DISPLAY
10.5 [×]	10.5
55 [F] [→REC]	6.0225525
[x–y]	8.6010964
7 [×]	7.
30 [F] [→REC]	6.0621778
[x–y]	3.4999999*

**Important Note:* The internal polar/rectangular conversion routine does not incorporate automatic rounding techniques. You must round off answers at the 7th decimal place for greater accuracy, e.g. 3.4999999 must be rounded to 3.5.

One Factor Function Keys

The single factor function keys are the easiest to use and understand. These keys are:

[SIN] [SIN^{-1}] [COS] [COS^{-1}] [TAN] [TAN^{-1}] [LN]
[e^x] [LOG] [10^x] [$\sqrt{}$] [X^2] [1/x] [DEG] [RAD]

A general procedural statement can be applied to these keys:

With a value entered into the display, depression of a one factor function key executes the indicated, sin, cos, $\sqrt{}$ etc., function and instantly displays the answer.

These keys may be depressed at any time during a calculation without disturbing any two factor calculation in progress. This feature provides great flexibility in problem solving as shown in the examples on subsequent pages.

A brief description of One Factor Function Keys:

SIN Sine Key
Enter into the display a decimal angle within the range –8999.9999° to 8999.9999°.* Depress this key; display shows sine (x).

F SIN^{-1} Arc Sine Key
Enter into the display a sine within the range –1 to 1. Depress these keys; display shows the principal value, –90° ≤ result ≤ 90°, of the arc sine (x).

COS Cosine Key
Enter into the display a decimal angle within the range –8999.9999° to 8999.9999°.* Depress this key; display shows cosine (x).

F COS^{-1} Arc Cosine Key
Enter into the display a cosine within the range –1 to 1. Depress these keys; display shows the principal value, 0° ≤ result ≤ 180°, of the arc cosine (x).

TAN Tangent Key
Enter into the display a decimal angle within the range –8999.9999° to 8999.9999°.* Depress this key; display shows tangent (x). Error will be displayed on entries of 90°, 270° etc.

*Very small numbers, e.g., .00000001 or 1 x 10^{-50} are interpreted as zero when entered on trigonometric keys.

F TAN^{-1} Arc Tangent Key
Enter into the display a tangent of unrestricted magnitude. Depress these keys; display shows the principal value, –90° ≤ result ≤ 90°, of arc tangent.

LN Natural Logarithm Key
Enter into the display a value greater than zero. Depress this key; display shows the base e, natural logarithm (x).

F e^x Natural Antilogarithm Key
Enter a natural logarithm within the range –227.9 to 230.2. Depress these keys; display shows e raised to the power entered.

LOG Common Logarithm Key
Enter into the display a value greater than zero. Depress this key; display shows the base 10, common logarithm (x).

F 10^x Common Antilogarithm Key
Enter a common logarithm within the range –99.999999 to 99.999999. Depress these keys; display shows 10^x.

$\sqrt{}$ Square Root Key
Enter a positive radicand into the display. Depress this key; display shows the square root.

F X^2 "X" Squared Key
Enter a value less than or equal to 10^{50} into the display. Depress these keys; display shows the value squared.

1/x Reciprocal Key
Enter a non zero value into the display. Depress this key; display shows the result of 1 divided by (x).

RAD Radian to Degree Conversion Key
Enter a value expressed in degrees into the display. Depress this key; display shows equivalent value expressed in radians.

F DEG Degree to Radian Conversion Key
Enter a value expressed in radians into the display. Depress this key; display shows equivalent value expressed in degrees.

Example: Compute $5.12^{\log 2.3}$

ENTER	DISPLAY	COMMENTS
5.12 Y^x	5.12	
2.3 LOG	.36172784	
=	1.805355	

Observe in the examples above and below, that one factor function keys may be depressed while a two factor operation is pending without affecting the pending calculation.

Example: Find the cube root of 125

Formula: $\sqrt[3]{125} = 125^{1/3}$

ENTER	DISPLAY	COMMENTS
125 Y^x	125.	
3 1/x	.33333333	
=	5.	

Example: $(\sin 30 \times \sin 60) + \sqrt{144}$

ENTER	DISPLAY	COMMENTS
30 SIN ×	.5	
60 SIN	.8660254	
+	.4330127	
144 $\sqrt{}$	12.	
=	12.433013	

Example Problem: What is the equivalent resistance of a 220-ohm resistor, a 145-ohm resistor, and a 175-ohm resistor connected in parallel using the following equation?

$$R_{eq} = \frac{1}{1/R_1 + 1/R_2 + 1/R_3}$$

$$= \frac{1}{1/220 + 1/145 + 1/175}$$

ENTER	DISPLAY
220 1/x	.00454545
+	.00454545
145 1/x	.00689655
+	.01144200
175 1/x	.00571428
=	.01715629
1/x	58.287653

Memory Operations

The memory keys operate as follows:

MS
Memory Store key stores the amount in the display into the memory, writing over previous contents.

MR
Memory Recall key copies memory contents into the display allowing you to view memory contents, but not clearing memory.

F CM
Clear Memory key. Clears the memory.

F C
Clears memory and all other registers.

F M+, F M−, F M×, F M÷
Adds, subtracts, multiplies, divides memory contents with display register and stores results in memory. These operations are performed internally and do not affect the display.

F X–M
"X" (Display) and Memory Register Exchange. Exchanges display contents with memory contents.

Example: The following quantity of parts for construction of a device are priced as follows:

PART NO.	QUANTITY	PRICE
A	152	$7.41
B	76	$6.73
C	45	$2.55

Find the total cost of construction.

ENTER	DISPLAY
152 ×	152.
7.41 = MS	1126.32
76 ×	76.
6.73 = F M+	511.48
45 ×	45.
2.55 = F M+	114.75
MR	1752.55

Using Parentheses Keys

The calculator is capable of handling two levels of parentheses which, in combination with the independent calculator register and memory, allows very complex problems to be solved efficiently.

Think of the function of ((and)) in terms of internal machine registers which are accessed upon depression of ((.

((

The open parentheses key, when depressed, signals the calculator to save results of subsequent key depressions in a special internal register. There are two such registers permitting double nesting of parentheses.

))

The close parentheses key, when depressed, causes the calculator to execute the key depressions made from the time of the last ((depression. The intermediate result of these operations is displayed.

=

The equals key is used in conjunction with the parentheses keys to finally complete the equation.

Example: 28 − [(13 + 7) ÷ (6 − 2)] = 23

Key in: 28 − ((((13 + 7)) ÷ ((6 − 2)))) =. Display shows: 23.

Register Action

28 −
28 minus instruction in calculator register.

((
Opens 1st level parens.

((
Opens 2nd level parens.

13 + 7
Performs in parens level 2.

))
Clears parens level 2 and brings result, 20, to display register.

÷
Displays contents, 20, set up to divide in parens level 1.

((6 − 2))
Executes in parens level 2 and displays result, 4.

))
Takes displayed result, 4, and operates on instructions stored in parens level 1, displays result of 20 ÷ 4 = 5.

=
Takes display contents, 5, completes pending operation in calculator register. Displays final result, 23.

Rules for Using Parentheses:

Let math symbols represent keys; (indicates ((depression,) indicates)) depression.

No: (5 + 2) (4 − 2) = Yes: (5+ 2) × (4 − 2) =
Operator (× depression) required.
No "implied" times.

No: 2 (5 + 3) = Yes: 2 × (5 + 3) =
Operator (× depression) required.
No "implied" times.

No: ((5 + 2) + 3^2) = Yes: (5 + 2) + (3^2) =
or 3^2 + 5 + 2 =

Since Y^X is a two factor function key and thereby completes a pending calculation, the left most method performs $(5+2+3)^2$. Display shows 100. Also, this key sequence allows no equals key depression.

No: (...(...(... Yes: (...(...)..(.

An error condition will occur when there are more than two open parentheses key depressions without an intervening close parentheses key depression during a calculation.

Example: Find the standard deviation of the data point 10, 11, and 10.6.

Formula: $SD = \sqrt{\frac{\Sigma X^2 - (\Sigma X)^2 \div n}{n-1}}$

ENTER	DISPLAY	COMMENTS
10 MS	10.	
F X^2 +	100.	
11 F M+	11.	
F X^2 +	221.	
10.6 F M+	10.6	
F X^2 −	333.36	ΣX^2
MR F X^2	998.56	$(\Sigma X)^2$
((÷	998.56	
3))	332.85333	$(\Sigma X)^2 \div n$
÷ 2 =	.253335	
$\sqrt{}$	.50332395	SD

Example: Find the vertical stress at a point in a soil which is 4.5 feet deep and located 5 feet horizontally from a concentrated surface load of 12,800 pounds.

$$\text{Vertical Stress} = \frac{3 \times 12{,}800}{2\pi \times (4.5)^2}\,[1 + (5/4.5)^2]^{5/2}$$

Rewrite formula as discussed in Basic Arithmetic Operations section:

$$\frac{\dfrac{3 \times 12{,}800}{2}}{\dfrac{\pi}{4.5^2}}\,[1 + (5/4.5)^2]^{5/2} = 2252.7356$$

ENTER	DISPLAY	COMMENTS
3 ×	3.	$\frac{3 \times 12{,}800}{2 \times (4.5)^2}$
12800 ÷	38400.	
2 ÷ π ÷	6111.5497	
4.5 F X^2	20.25	
× ((((	301.80492	
5 ÷	5.	$(5/4.5)^2$
4.5 Y^X	1.1111111	
2)) MS	1.234568	
1 F M+	1.	$1 + (5/4.5)^2$
5 ÷	5.	
2 Y^X MR	2.234568	Sets up $(5/2)^{1+(5/4.5)^2}$
x–y))	7.464211	X–Y changes order of pending power operation factors to $[1+(5/4.5)^2]^{5/2}$
=	2252.7356	

Example: Solve

$25.6 + 5.3 - [(12.3 + 8) \div (2+6.5/4)] = 21.347059$

ENTER	DISPLAY	COMMENTS
25.6 +	25.6	
5.3 − ((((	30.9	Problem performed exactly as written.
12.3 +	12.3	
8)) ÷ ((	20.3	
2 +	2.	
6.5 ÷	8.5	
4)))) =	21.347059	

Other Keys: π , X–Y

π

The π pi key rounds off to seven decimal places, 3.1415927 into the display.

Example: Calculate the area of a circle of radius 5 using the formula: Area = $r^2\pi$

ENTER	DISPLAY	COMMENTS
5 ×	5.	
=	25.	r^2
×	25.	
π	3.1415927	
=	78.539818	

This problem may also be performed:

ENTER	DISPLAY
π	3.1415927
×	3.1415927
5 =	15.707964
=	78.53982

Example: Calculate the circumference of a circle of radius 5 using the formula: Circumference = $2\pi r$

ENTER	DISPLAY
2 ×	2.
π	3.1415927
×	6.2831854
5 =	31.415927

x–y

The x–y swaps contents of the display and calculator registers. It is used primarly for:

- Recalling the radius or y coordinate after depression of →POL or F →REC.
- With Y^x utilization. See example 1.
- For solving formulas consisting of fractions

whose denominators are sums or differences. See example 2.

Example 1: Solve: $2.6^{LN(5.6 \times 2.1 \times 3.3)}$

ENTER	DISPLAY	COMMENTS
5.6 ×	5.6	
2.1 ×	11.76	
3.3 = LN Y^x	3.6586264	
2.6 x–y	3.6586264	To reverse order of operation from: $LN(5.6 \times 2.1 \times 3.3)^{2.6}$
=	32.97862	

Example 2: Solve: $\frac{12}{2+3+5} = 1.2$

ENTER	DISPLAY
2 +	2.
3 +	5.
5 ÷	10.
12 x–y	10.
=	1.2

Overflow and Error Indicators

Any result larger than 9.9999999×10^{99} or smaller than 1×10^{-99} or logic errors (e.g. division by zero) will result in the error indicator *Error* being displayed. Touching C will clear the affected registers. Touching any other key permits continuation of the calculation with the calculator assuming that the contents of the display are zero.

Results and operations resulting in an *Error* indication.

Results $> 9.9999999 \times 10^{99}$

Results $> 1. \times 10^{-99}$

Division by zero

LOG, LN < 0

SIN, COS, TAN $\geq$ 25 revolutions (9000°)

TAN 90°, 270° etc. TAN of 89.99999

SIN^{-1}, $COS^{-1} > |1|$

SIN^{-1}, $COS^{-1} \leq 10^{-50}$

$\sqrt{x} < 0$

Y^x where $Y \leq 0$

More than two ((((depressions without a)) during calculation

Battery Information

Your calculator is powered by rechargeable NiCad batteries. It is important to charge your battery for a minimum of 3 hours before initial use because if the batteries are completely drained from a long storage period, using the calculator in this state can permanently damage the batteries. The display will blank when batteries need charging. To charge the battery, connect the AC charger to the jack at the top of the machine. A full charge takes five hours and lasts approximately five hours. You can use your machine while the charger is plugged in but it will charge faster if you turn it off. The machine will not overcharge. BE SURE TO TURN YOUR CALCULATOR OFF BEFORE CONNECTING THE AC CHARGER.

If your calculator is left on for an extended period of time, the batteries may be drained to the extent that the calculator will not operate after being recharged for a few minues. The batteries can usually be restored by charging overnight.

Repeated extensive draining of batteries causes permanent damage to batteries.

Mailing Instructions

Should your calculator need servicing, pack it carefully in a sturdy box for shipping. Proof of original purchase date must be enclosed. Be sure to include your name and return address. The package should be mailed postpaid to the nearest National Semiconductor Service Center. If your calculator is returned for warranty repairs more than ninety days after the original purchase date, you must enclose the appropriate service charge (if the service charge during the POST WARRANTY period has been changed, National Semiconductor will request you to supply the additional amount, if any is needed, or make the appropriate refund, if there is any difference, by check or money order payable to National Semiconductor).

Product Service Locations

United States
N.C.P.S.—Central U.S.
P.O. Box 1000
West Jordan, UT 84084

Canada
N.C.P.S.
286 Wildcat Road
Downsview
Ontario M3J-2N5
Canada

Australia
N.S. Electronics
Corner Stud Road and
Mountain Highway
Bayswater
Victoria 3153
Australia

Asia
N.S. Electronics
4 Hing Yip Street
Kwaun Ton
Hong Kong
China

Great Britain
NS—UK Ltd.
National Semiconductor
Product Service
Larkfield Industrial Estate
Greenock PA16 OEQ,
Great Britain

Germany
National Semiconductor GmbH
Product Service
D808 Furstenfeldbruck
Industriestrasse 10
Bundesrepublik
Deutschland

Consumer Warranty Claim Certificate

Should your calculator ever require repair, please return this form with the unit.

Model 4650

Purchase Date_____
(month/day/year)
Purchased from_____

Address_____

City, State, Zip_____

Your Name_____

Your Address_____

City, State, Zip_____

Description of problem:

_____

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