CASI

SCIENTIFIC CALCULATOR
CALCULADORA CIENTIFIC/

fx-135

ARTS MASTER

英 西

Dear customer,
Thank you very much for purchasing our electronic calculator. To fully utilize its features no special training is required, but we suggest you study this operation manual to become familiar with its many abilities. To help ensure its longevity, do not touch the inside of the calculator, avoid hard knocks and unduly strong key pressing. Extreme cold (below 32°F or 0°C), heat (above 104°F or 40°C) and humidity may also affect the functions of the calculator. Never use volatile fluid such as lacquer thinner, benzine, etc. when cleaning the unit. For servicing contact your retailer or nearby dealer.

** Special care should be taken not to damage the unit by bending or dropping. For example, do not carry it in your hip pocket.*

INDEX

1/GENERAL GUIDE

1-1 The keys

In order to keep your calculator as compact as possible, each key has more than one use. You can change the function of a key by pressing certain other keys before it, or by setting the calculator in a certain mode.
The following pages will give you a more detailed explanation of the use and functions of each key.

[INV] Inverse key

Some of the keys have brown lettering above or below them. To use a function that is brown lettering, press [INV]. INV will appear on the Display. Then press the key that the brown lettering identifies. INV will disappear from the Display.

[MODE] Mode key

To put the calculator into a desired operating mode, or to select a specific angular unit, press [MODE] first, then [·], [0], [1],... or [9].

- [MODE] [·] – SD is displayed. Calculate standard deviation. Page 48
- [MODE] [0] – DEC mode. Carry out ordinary arithmetic and functional calculations. Page 28
- [MODE] [1] – BIN is displayed. Carry out arithmetic and logical operations in base 2. Page 35
- [MODE] [2] – OCT is displayed. Carry out arithmetic and logical operations in base 8. Page 35
- [MODE] [3] – HEX is displayed. Carry out arithmetic and logical operations in base 16. Page 35
- [MODE] [4] – DEG is displayed. Use degrees as the unit of angle measurement. Page 41
- [MODE] [5] – RAD is displayed. Use radians as the unit of angle measurement. Page 41
- [MODE] [6] – GRA is displayed. Use grads as the unit of angle measurement. Page 42
- [MODE] [7] – Press any number from 0 to 9 to indicate how many decimal places you want displayed (FIX is displayed). Page 44
- [MODE] [8] – Press any number from 1 (1 digit) to 0 (10 digits) to indicate how many significant digits you want displayed (SCI is displayed). Page 45
- [MODE] [9] – Releases instructions entered in [MODE] [7] and [MODE] [8]. Page 44

General keys

[0]–[9], [·] Data entry keys

To enter numerical values into the calculator, press these keys in their logical sequence. Page 28

[+], [−], [×], [÷], [=] Basic calculation keys

For addition, subtraction, multiplication, division and to display answers, press these keys in their logical sequence. Page 28.

[AC] All clear key

Press [AC] to clear everything except the contents of the Memory.

C Clear key
Press C to erase wrong entries (including exponential notation) and to erase functional results during mixed calculations. The process of calculation remains unerased.

+/- Sign change key
+/- changes the displayed number from positive to negative or from negative to positive. If you press +/- after EXP, the sign of the exponent will change. Page 9

Memory keys

MR Memory recall key
Press MR to display the contents of the Memory. (MR does not clear the contents of the memory.) Page 30

Min Memory in key
Press Min to put the displayed value into the Memory. The previous value in the Memory will be automatically erased. Page 30

M+, INV M- Memory plus and Memory minus key
Press M+ to add the displayed value to the value in the Memory. Press INV M- to subtract the displayed value from the value in the Memory.
M+ (INV M-) also obtains an answer of 4 basic calculations, x^y and $\sqrt[x]{y}$, and automatically adds (subtracts) it to (from) the contents of the Memory. The answer obtained by this addition or subtraction will be the new value in the Memory. Pages 30 and 31.

Special Keys

(,) Parentheses keys
This calculator calculates in this order: 1) functions, 2) x^y and $\sqrt[x]{y}$, 3) multiplication and division and 4) addition and subtraction. To change this order enclose the parts that must be calculated first with (and). In a single expression, a maximum of 18 nesting parentheses at 6 levels can be used. Page 29

EXP Exponent key
To enter a number in scientific notation, press the correct numbers for the mantissa, EXP and the correct numbers for the exponent. Page 9

π Pi key
Press π to display the value of π (ratio of the circumference of a circle to its diameter – 3.141592654). Page 41

D.MS, INV D.MS Sexagesimal notation / decimal notation conversion keys
To change from sexagesimal (base 60) notation (degree, minute, second) to decimal notation (degree), enter the degree, press D.MS, enter the minute, press D.MS, enter the second and press D.MS. To change from decimal notation to sexagesimal notation, press the correct number keys for the degree and then press INV D.MS. Page 41

x⇄y Register exchange key
Press x⇄y to exchange the displayed value (X-register) with the contents of the working register (Y-register). Press x⇄y again to exchange them again, so that the value that had been displayed previously is displayed again. Page 28

INV x⇄M Register exchange key
To exchange the displayed number (X-register) with the contents of the Memory (M-register), press INV x⇄M. Press the same keys again to display the originally displayed value. Page 31

INV AND Rounding off internal value key
To round off the internal value (held in the Y-register) so as to be equal to the displayed value. Page 44

A – F (Use in the HEX mode only)
Enters hexadecimal numbers A through F. Page 36

AND And key
OR Or key
XOR Exclusive Or key
NEG Negative key

*These keys are used for logical operations. Pages 39 and 40.

Function keys

sin, cos, tan Sine, cosine, tangent keys
Use sin, cos and tan to calculate the trigonometric functions. Page 41 and 42

[INV] [sin], [INV] [cos], [INV] [tan] Arc sine, arc cosine, arc tangent keys

To calculate the inverse trigonometric functions of the displayed value, press [INV] [sin], [INV] [cos] and [INV] [tan]. Page 42

[hyp] [sin], [hyp] [cos], [hyp] [tan] Hyperbolic keys

Press [hyp] [sin], [hyp] [cos] and [hyp] [tan] to calculate the hyperbolic functions of the displayed value. Page 42

[INV] [hyp] [sin], [INV] [hyp] [cos], [INV] [hyp] [tan] Inverse hyperbolic keys

Press [INV] [hyp] and [sin], [cos] or [tan] to calculate an inverse hyperbolic function of the displayed value. Page 42

[log], [INV] [10^x] Common logarithm and common antilogarithm key

To obtain the common logarithm of the displayed value, press [log]. To obtain the common antilogarithm of the displayed value (to raise 10 to x powers), press [INV] [10^x]. Page 43

[ln], [INV] [e^x] Natural logarithm and natural antilogarithm key

To obtain the natural logarithm of the displayed value, press [ln]. To obtain the natural antilogarithm of the displayed value (to raise e (2.718281828) to x powers), press [INV] [e^x]. Page 43

[√], [INV] [x²] Square root and square key

Press [√] to find the square root of the displayed value. To square the displayed value, press [INV] [x²]. Page 44

[a b/c], [INV] [d/c] Fraction key

To enter fractions in fraction form, press the correct number(s) for the integer (if any), [a b/c], the correct number(s) for the numerator, [a b/c] and the correct number(s) for the denominator. By pressing [INV] [d/c] in succession, the displayed value will be converted to the improper fraction. Pages 32 and 33.

[INV] [∛] Cube root key

Press [INV] [∛] to find the cube root of the displayed value. Page 44

[INV] [1/x] Reciprocal key

Press [INV] [1/x] to obtain the reciprocal of the displayed value. Page 44

[INV] [x!] Factorial key

To find the factorial of the displayed value, press [INV] [x!]. Page 44

[x^y] Power key

Press any number x, [x^y], any number y and [=] to raise x to the y power. Page 43

[INV] [x^1/y] Root key

Press any number x, [INV] [x^1/y], any number y and [=] to display the y root of x. Page 43

[INV] [R→P] Rectangular to polar key

To convert displayed rectangular coordinates to polar coordinates, press [INV] [R→P]. Page 46

[INV] [P→R] Polar to rectangular key

To convert displayed polar coordinates to rectangular coordinates, press [INV] [P→R]. Page 46

[INV] [%] Percent key

To find a percent of a displayed number, press the correct numbers for the percent and [INV] [%]. Page 33

[INV] [RAN#] Random number key

Press [INV] [RAN#] to generate a random number between 0.000 and 0.999. Page 45

[INV] [nPr] Permutation key

Press [INV] [nPr] to perform permutation calculations. Page 47

[INV] [nCr] Combination key

Press [INV] [nCr] to perform combination calculations. Page 47

Statistical keys (Use in the SD mode only)

[INV] [SAC] Statistical register clear key

Before beginning statistical calculations, press [INV] [SAC] to clear the statistics registers. Page 48

[DATA], [INV] [DEL] Data entry and delete key

In the SD mode, enter data by pressing the correct numbers and [DATA]. If you enter incorrect data and don't notice your mistake until after you have pressed [DATA], enter the same incorrect data and then press [INV] [DEL] to delete the data. Pages 48 and 50.

[INV] [$\bar{x}$] Arithmetic mean key

Press [INV] [$\bar{x}$] in the SD mode to get the arithmetic mean ($\bar{x}$) of the data. Page 48

[INV] [σn] Population standard deviation key

Press [INV] [σn] in the SD mode to display the population standard deviation (σn) of the data. Page 48

[INV] [$\sigma n-1$] Sample standard deviation key

Press [INV] [$\sigma n-1$] in the SD mode to display the sample standard deviation ($\sigma n-1$) of the data. Page 48

[INV] [Σx^2] Sum of square value key

Press [INV] [Σx^2] in the SD mode to display the sum of the square value (Σx^2) of the data. Page 49

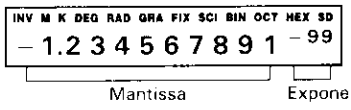
[INV] [Σx] Sum of value key

Press [INV] [Σx] in the SD mode to display the sum of the value (Σx) of the data. Page 49

[INV] [n] Number of data key

Press [INV] [n] to display the number of data (n). Page 48

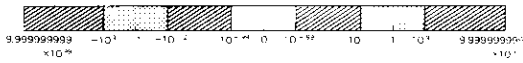
1-2 The display



The Display shows input data, interim results and answers to calculations. The mantissa section displays up to 10 digits. The exponent section displays up to ±99.

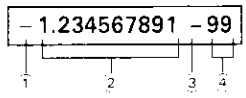
-E- or -[-	Error indication – see page 9.
INV	Pressing of [INV] – see page 1.
M	Something is being stored in the Memory – see page 30.
K	A constant is being used in calculations – see page 29.
DEG or RAD or GRA	Angular unit – see pages 41 and 42.
FIX	Decimal places of a displayed value is being designated – see page 44.
SCI	Significant digits of a displayed value is being designated – see page 45.
SD	Standard deviation calculation – see page 48.
BIN	Binary (base 2) mode – see page 35.
OCT	Octal (base 8) mode – see page 35.
HEX	Hexadecimal (base 16) mode – see page 35.
45⌟12⌟23.	45-12/23 – see page 32.
12°3'45.6	12°3'45.6" – see page 41.

2/CALCULATION RANGE AND SCIENTIFIC NOTATION



Normal display Scientific notation

When the answer exceeds the normal display capacity, it is automatically shown by scientific notation, 10-digit mantissa and exponents of 10 up to ±99.



1. The minus (–) sign for mantissa
2. The mantissa
3. The minus (–) sign for exponent
4. The exponent of ten

The whole display is read:
$-1.234567891 \times 10^{-99}$

*Entry can be made in scientific notation by using the [EXP] key after entering the mantissa

EXAMPLE	OPERATION	READ-OUT
$-1.234567891 \times 10^{3}$ $(=-0.001234567891)$		
	1 ⊡ 234567891 +/-	-1.234567891
	EXP	-1.234567891 00
	3 +/-	-1.234567891 -03

3/OVERFLOW OR ERROR CHECK

Overflow or error is indicated by the "-E-" or "-E -" sign and stops further calculation.

Overflow or error occurs:

a) When an answer, whether intermediate or final, or accumulated total in the memory is more than 1×10^{100} ("-E-" sign appears).
b) When function calculations are performed with a number exceeding the input range ("-E-" sign appears).
c) When binary, octal and hexadecimal calculations are performed improperly. (For example, when the allowable number of digits is exceeded after binary, octal or hexadecimal conversion.) ("-E-" sign appears).
d) When unreasonable operations are performed in statistical calculations ("-E-" sign appears).
e) When the total number of levels of explicity and/or implicity (with addition-subtraction versus multiplication-division including "(" and ")") nested parentheses exceeds 6, or more than 18 pairs of parentheses are used ("-E -" sign appears).
Ex.) You have pressed the (key 18 times continuously before designating the sequence of 2 + 3 ×.

To release these overflow checks:

a), b), c), d)..... Press the AC key.
e)..... Press the AC key. Or press the C key, and the intermediate result just before the overflow occurs is displayed and the subsequent calculation is possible.

Memory protection:

The content of the memory is protected against overflow or error and the accumulated total is recalled by pressing the MR key after the overflow check is released by the AC key.

4/POWER SOURCE

This calculator operates on either dry batteries or AC (with the AC adaptor).

Dry battery operation:

Two AA size manganese dry batteries (UM-3) give approximately 24 hours continuous operation (approx. 28 hours on type R6P (SUM-3)).
When battery power decreases, the whole display darkens. Batteries should then be renewed. Be sure to switch OFF the power before changing.

Replacement of batteries:

1) Slide open the battery compartment lid on the back of the unit.
2) Remove dead batteries.
3) Insert new batteries with polarity as indicated.
4) Replace the battery compartment lid.

*Be sure to replace both batteries.
*Never leave dead batteries in the battery compartment as they may cause malfunctions.
*It is recommended that batteries be replaced every 2 years to prevent the chance of malfunctions due to battery leakage.

AC operation:

Use only an adaptor (AD-2S) with the same voltage rating (100, 117, 220 or 240V) as your power supply to prevent component damage. Plug the AC adaptor into the AC outlet and the cord into the unit, this automatically cuts off battery power supply.

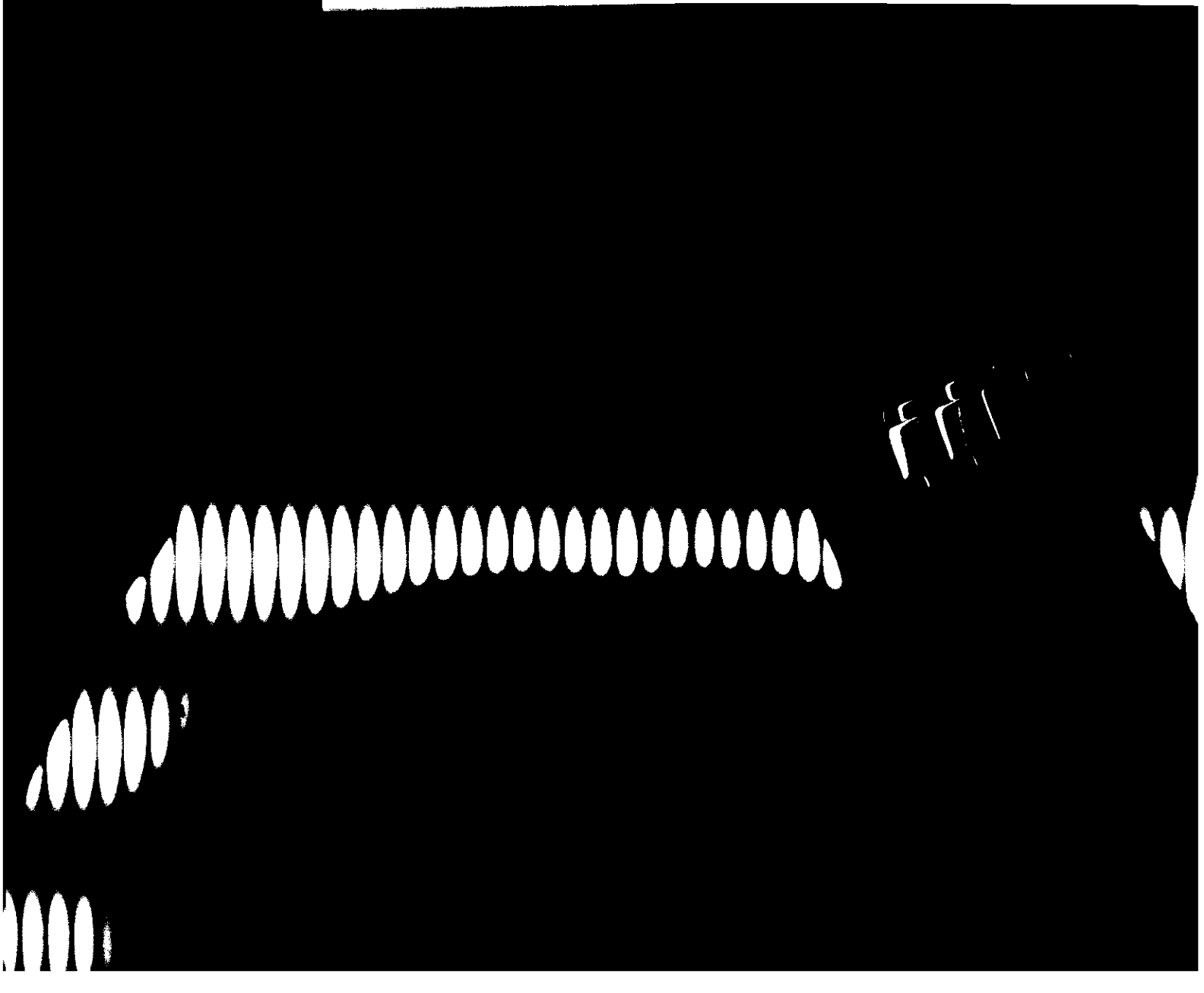
**WHERE USED FROM THE MAINS THIS CALCULATOR MUST ONLY BE USED WITH A CASIO MAINS ADAPTOR. THIS IS DUE TO THE RISK OF DAMAGE TO THE CALCULATOR SHOULD IT BE USED WITH A MAINS ADAPTOR OTHER THAN A CASIO MAINS ADAPTOR.*

The following misuse may lead to battery burst.

1. Use of an AC adaptor other than a genuine Casio adaptor.
2. Insertion of batteries with incorrect polarities (+ , -).

Auto power-off

If the calculator is left with the power switch at the ON position, the auto power-off function automatically turns off the power in approximately 6 minutes, thereby saving battery life.



Power is resumed either by pressing the AC key or by re-operating the ON-OFF switch.
When the power is resumed by the AC key, contents of the memory are protected. However, when it is resumed by re-operating the ON-OFF switch the memory will be cleared.

5/SPECIFICATIONS

BASIC OPERATIONS

4 basic calculations, constants for $+, -, \times, \div, x^y, \sqrt[x]{}$, AND/OR/XOR, parenthesis calculations and memory calculations.

BUILT-IN FUNCTIONS

Trigonometric/inverse trigonometric functions (with angle in degrees, radians or grads), hyperbolic/inverse hyperbolic functions, common/natural logarithms, exponential functions (common antilogarithms, natural antilogarithms), powers, roots, square roots, cube roots, squares, reciprocals, factorials, conversion of coordinate system (R→P, P→R), permutations, combinations, random number, π, fractions, percentages, binary, octal, and hexadecimal calculations and logical operations.

STATISTICAL FUNCTIONS

Population standard deviation, sample standard deviation, arithmetic mean, sum of square value, sum of value and number of data.

CAPACITY

Entry/basic calculations

10-digit mantissa, or 10-digit mantissa plus 2-digit exponent up to $10^{\pm 99}$.

Fraction calculations

Max. 3-digit mantissa for each integer, numerator or denominator and at the same time max. 8-digit mantissa for the sum of each part.

Scientific functions	Input range
$\sin x/\cos x/\tan x$	$\lvert x \rvert < 1440^\circ \left(\begin{matrix} \leqq 8\pi \text{ rad} \\ < 1600 \text{ gra} \end{matrix} \right)$
$\sin^{-1}x/\cos^{-1}x$	$\lvert x \rvert \leqq 1$
$\tan^{-1}x$	$\lvert x \rvert < 10^{100}$
$\sinh x/\cosh x$	$\lvert x \rvert \leqq 230.2585092$
$\tanh x$	$\lvert x \rvert < 10^{100}$
$\sinh^{-1}x$	$\lvert x \rvert < 5 \times 10^{99}$
$\cosh^{-1}x$	$1 \leqq x < 5 \times 10^{99}$
$\tanh^{-1}x$	$\lvert x \rvert < 1$
$\log x/\ln x$	$10^{-99} < x < 10^{100}$
e^x	$-10^{100} < x \leqq 230.2585092$
10^x	$-10^{100} < x < 100$
x^y	$x > 0 \rightarrow -10^{100} < y \cdot \log x < 100$ $x = 0 \rightarrow y > 0$ $x < 0 \rightarrow y$: integer or $1/2n-1$ (n : integer)
$x^{1/y}$	$x > 0 \rightarrow y \neq 0 \ ; \ -10^{100} < 1/y \cdot \log x < 100$ $x = 0 \rightarrow y > 0$ $x < 0 \rightarrow y$: odd number or $\pm 1/n$ (n : natural number)
$\sqrt{x}$	$0 \leqq x < 10^{100}$
x^2	$\lvert x \rvert < 10^{50}$
$\sqrt[3]{x}$	$\lvert x \rvert < 10^{100}$
$1/x$	$\lvert x \rvert < 10^{100}$ $(x \neq 0)$
$x!$	$0 \leqq x \leqq 69$ (x : integer)
$n\mathrm{P}r/n\mathrm{C}r$	$0 \leqq r \leqq n < 10^{10}$ (n, r : positive integer) *Certain combinations or permutations may cause errors due to overflow during internal calculations.
REC→POL	$\sqrt{x^2+y^2} < 10^{100}$
POL→REC	$\lvert \theta \rvert < 1440^\circ \left(\begin{matrix} \leqq 8\pi \text{ rad} \\ < 1600 \text{ gra} \end{matrix} \right)$, $r < 10^{100}$
$^\circ\,'\,''$	up to second
π	10 digits

***Output accuracy**

±1 in the 10th digit.

*Errors are cumulative with such internal continuous calculations as x^3, x^{-1}, $x!$, $\sqrt[3]{}$, so accuracy may be adversely affected.

DECIMAL POINT
Full floating with underflow.

NEGATIVE NUMBER
Indicated by the floating minus (-) sign for mantissa. The minus sign appears in the 3rd column for a negative exponent.

OVERFLOW OR ERROR
Indicated by an " E " or " E " sign, locking the calculator.

DISPLAY
Transmissive liquid crystal display

BACKLIGHT
Electroluminescence

POWER CONSUMPTION
0.25W

POWER SOURCE
AC: 100, 117, 220 or 240V (± 10V), 50/60Hz, with an AC adaptor (AD-2S) 3VDC, tip negative.

DC: Two AA size manganese dry batteries (UM-3) give approximately 24 hours continuous operation (28 hours on type R6P (SUM-3)).

AMBIENT TEMPERATURE RANGE
0°C – 40°C (32°F – 104°F)

DIMENSIONS
25.2mmH × 85mmW × 155mmD
(1"H × 3⅜"W × 6⅛"D)

WEIGHT
124 g (4.4 oz) including batteries.

Estimado cliente
[illegible] de esta [illegible] [illegible] [illegible] habilidades. Para ayudar a asegurar su [illegible] interior, evite golpes fuertes y el presionar de teclas con fuerza. [illegible] 40°C [illegible] de la calculadora. Cuando [illegible] distribuidor más cercano.

* *Debe tenerse mucho cuidado en no dejar caer o doblar la unidad porque podria romperse. No la lleve, por ejemplo, en los bosillos interiores del pantalón.*

INDICE

1/GUIA GENERAL

1-1 El teclado
Para hacer el teclado lo más compacto posible, cada tecla tiene más de una función. La función de cada tecla se puede seleccionar presionando cierta tecla junto o antes que la misma, o poniendo la calculadora en determinado modo de funcionamiento.
En las páginas que siguen, se detallan el uso y funciones de cada tecla.