ENGLISH

SHARP

SCIENTIFIC CALCULATOR

WriteView

MODEL **EL-W550TG**

OPERATION MANUAL

23LSC21E1

SHARP CORPORATION

INTRODUCTION

About the **calculation examples (including some formulas and tables)**, refer to the reverse side of this manual.
After reading this manual, store it in a convenient location for future reference.

Operational Notes

- Do not carry the calculator around in your back pocket, as it may break when you sit down. The display is made of glass and is particularly fragile.
- Keep the calculator away from extreme heat such as on a car dashboard or near a heater, and avoid exposing it to excessively humid or dusty environments.
- Since this product is not waterproof, do not use it or store it where fluids, for example water, can splash onto it. Raindrops, water spray, juice, coffee, steam, perspiration, etc. will also cause malfunction.
- Clean with a soft, dry cloth. Do not use solvents or a wet cloth. Avoid using a rough cloth or anything else that may cause scratches.
- Do not drop it or apply excessive force.
- Never dispose of batteries in a fire.
- Keep batteries out of the reach of children.
- For the sake of your health, try not to use this product for long periods of time. If you need to use the product for an extended period, be sure to allow your eyes, hands, arms, and body adequate rest periods (about 10–15 minutes every hour).
  If you experience any pain or fatigue while using this product, discontinue use immediately. If the discomfort continues, please consult a doctor.
- This product, including accessories, may change due to upgrading without prior notice.

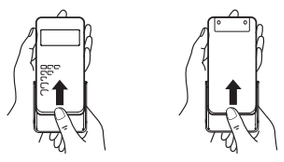
NOTICE

- SHARP strongly recommends that separate permanent written records be kept of all important data. Data may be lost or altered in virtually any electronic memory product under certain circumstances. Therefore, SHARP assumes no responsibility for data lost or otherwise rendered unusable whether as a result of improper use, repairs, defects, battery replacement, use after the specified battery life has expired, or any other cause.
- SHARP will not be liable nor responsible for any incidental or consequential economic or property damage caused by misuse and/or malfunctions of this product and its peripherals, unless such liability is acknowledged by law.

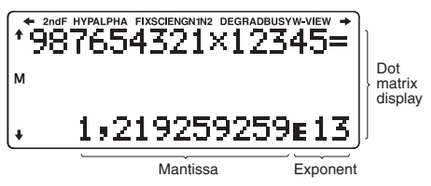
♦ Press the RESET switch (on the back), with the tip of a ball-point pen or similar object, only in the following cases.
Do not use an object with a breakable or sharp tip. Note that pressing the RESET switch erases all data stored in memory.
- When using for the first time
- After replacing the battery
- To clear all memory contents
- When an abnormal condition occurs and all keys are inoperative

♦ If service should be required on this calculator, have the calculator serviced in the region (country) where you purchased it.

Hard Case



DISPLAY



- During actual use, not all symbols are displayed at the same time.
- Only the symbols required for the usage under instruction are shown in the display and calculation examples.

←/→: Indicates that some contents are hidden in the ↑/↓ directions shown.

2ndF: Appears when 2ndF is pressed, indicating that the functions shown in the same color as 2ndF are enabled.

HYP: Indicates that hyp has been pressed and the hyperbolic functions are enabled. If 2ndF arc hyp is pressed, the symbols "**2ndF HYP**" appear, indicating that inverse hyperbolic functions are enabled.

ALPHA: Appears when ALPHA is pressed, indicating that the functions shown in the same color as ALPHA are enabled. Appears when STO or RCL is pressed, and entry (recall) of memory contents can be performed.

FIX/SCI/ENG/N1/N2: Indicates the notation used to display a value and changes by SET UP menu. **N1** is displayed on-screen as "NORM1", and **N2** as "NORM2".

DEG/RAD/GRAD: Indicates angular units.

BUSY: Appears during the execution of a calculation.

W-VIEW: Indicates that the WriteView editor is selected.

M: Indicates that a numerical value is stored in the independent memory (M).

BEFORE USING THE CALCULATOR

Turning On and Off

Press ON/C to turn the calculator on. The data, that was on-screen when the power was automatically turned off, will appear on the display.
Press 2ndF OFF to turn it off.

Notice
The turning off operations (2ndF OFF)* will erase all data stored in memory, except for the calculator's user settings (SET UP).
* When the calculator will turn itself off by automatic power off function, it will retain all data stored in memory.

Key Notations Used in this Manual

eˣ E / ln — To specify e^x: 2ndF e^x; To specify ln: ln; To specify E: ALPHA E

- Functions that are printed in gray adjacent to the keys are effective in specific modes.
- The multiplication operator "×" is differentiated from the letter "X" in this manual as follows:
  To specify the multiplication operator: ×
  To specify the letter "X": ALPHA x
- In certain calculation examples, where you see the **LINE** symbol, the key operations and calculation results are shown as they would appear in the Line editor.
- In each example, press ON/C to clear the display first. Unless otherwise specified, calculation examples are performed in the WriteView editor (SET UP 2 0 0) with the default display settings.

Clearing the Entry and Memories

Operation	Entry (Display)	A–F, M, X, Y	ANS	STAT*1	f(x) g(x)
ON/C	O	X	X	X	X
2ndF CA	O	X	O	O	O
Mode selection (MODUS)	O	X	X	X*2	X
2ndF M-CLR 0	O	X	X	X	X
2ndF M-CLR 1 0	O	O	O	O	O
2ndF M-CLR 2 0 *3	O	O	O	O	O
2ndF OFF *4	O	O	O	O	O
RESET switch*3	O	O	O	O	O

O: Clear X: Retain

*1 Statistical data (entered data)
*2 Cleared when changing between sub-modes in STAT mode.
*3 The RESET operation will erase all data stored in memory and restore the calculator's default settings.
*4 Pressing 2ndF OFF will erase all data stored in memory, except for the calculator's user settings (SET UP).

Memory clear key

Press 2ndF M-CLR to display the menu.
- To initialize the display settings, press 0. The parameters set as follows:
  - Angular unit: DEG
  - Display notation: NORM1
  - Recurring decimal: AUS

Mode Selection

NORMAL mode: MODUS 0
Used to perform arithmetic operations and function calculations.

STAT mode: MODUS 1
Used to perform statistical operations.

TABLE mode: MODUS 2
Used to illustrate the changes in values of functions in table format.

DISTR mode: MODUS 3
Used to perform distribution calculations.

HOME Key

Press HOME to return to NORMAL mode from other modes.
Note: Equations and values currently being entered will disappear, in the same way as when the mode is changed.

SET UP Menu

Press SET UP to display the SET UP menu.
Press ON/C to exit the SET UP menu.
Note: You can press ◄ to return to the previously displayed parent menu.

Determination of the angular unit (degrees, radians, and grades)

DEG (°): SET UP 0 0 (default)
RAD (rad): SET UP 0 1
GRAD (g): SET UP 0 2

Selecting the display notation and decimal places ❶

Two settings of Floating point (NORM1 and NORM2), Fixed decimal point (FIX), Scientific notation (SCI), and Engineering notation (ENG).
- When SET UP 1 0 (FIX) or SET UP 1 2 (ENG) is pressed, the number of decimal places can be set to any value between 0 and 9.
- When SET UP 1 1 (SCI) is pressed, the number of significant digits can be set to any value between 0 and 9. Entering 0 will set a 10-digit display.

Setting the floating point number system in scientific notation

NORM1 (the default) and NORM2. A number is automatically displayed in scientific notation outside a preset range:
NORM1 (SET UP 1 3): $0{,}000000001 \leq |x| \leq 9.999.999.999$
NORM2 (SET UP 1 4): $0{,}01 \leq |x| \leq 9.999.999.999$

Selecting the editor and setting the answer display ❷

This calculator has the following two editors in NORMAL mode: WriteView and Line.
Set the display format for numerical calculation results in WriteView editor.

The WriteView editor
EXAKT(a/b,√,π) SET UP 2 0 0 (default)
DEZIMAL SET UP 2 0 1
The Line editor SET UP 2 1

Notes:
- When "EXAKT(a/b,√,π)" is set, results will appear in fraction format or irrational number format (including π and √) when display is possible.
- When "DEZIMAL" is set, results will be decimal display except for fractional calculation, and will be not shown in irrational number format (including π and √).
- Press CHANGE to change the calculation results to another format that can be displayed.

Insert and overwrite entry methods

When using the Line editor, you can change the entry method from "EINFUEGEN" (the default) to "UEBERSCHREIBEN".
After you switch to the overwrite method (by pressing SET UP 3 1), the triangular cursor will change to a rectangular one, and the number or function underneath it will be overwritten as you make entries.

Setting the recurring decimal ❸

In NORMAL mode, calculation results can be shown in a recurring decimal format.
Recurring decimal is AUS: SET UP 4 0 (default)
Recurring decimal is AN: SET UP 4 1
- In the WriteView editor, the recurring part is indicated by "‾". In the Line editor, the recurring part is indicated in parentheses.
- If over 10 digits, including the recurring part, the result cannot be displayed in recurring decimal format.

Adjusting the display contrast

Press SET UP 5, then + or − to adjust the contrast. Press ON/C to exit.

ENTERING, DISPLAYING, AND EDITING THE EQUATION ❹

The WriteView Editor

Entry and display

In the WriteView editor, you can enter and display fractions or certain functions as you would write them.
- The WriteView editor can be used in NORMAL mode.

Displaying calculation results (when EXAKT is selected)

When possible, calculation results will be displayed using fractions, √, and π. When you press CHANGE, the display will cycle through the following display styles:
- Improper fractions (with or without π) → decimal numbers
- Proper fractions (with or without π) → decimal numbers
- Irrational numbers (square roots, fractions made using square roots) → decimal numbers

Notes:
- In the following cases, calculation results may be displayed using √:
  - Arithmetic operations and memory calculations
  - Trigonometric calculations
- In trigonometric calculations, when entering values such as those in the table to the right, results may be shown using √.

	Entry value
DEG	multiples of 15
RAD	multiples of $\frac{1}{12}\pi$
GRAD	multiples of $\frac{50}{3}$

- Improper/proper fractions will be converted to and displayed as decimal numbers if the number of digits used in their expression is greater than nine.
- If the number of digits in the denominator of a fractional result that uses π is greater than three, the result is converted to and displayed as a decimal number.

The Line Editor

Entry and display

In the Line editor, you can enter and display equations line by line.
Notes:
- Up to three lines of text may be viewed on the screen at one time.
- In the Line editor, calculation results are displayed in decimal form or line fraction notation if possible.
- Use CHANGE to switch the display format to fractional form or decimal form (if possible).

Editing the Equation

Just after obtaining an answer, pressing ◄ brings you to the end of the equation and pressing ► brings you to the beginning. Press ◄, ►, ▲, or ▼ to move the cursor. Press 2ndF ◄ or 2ndF ► to jump the cursor to the beginning or the end of the equation.

Back space and delete key

To delete a number or function, move the cursor to the right of it, then press ◄. You can also delete a number or function that the cursor is directly over by pressing 2ndF ENTF.
Note: In a multi-level menu, you can press ◄ to back to the previous menu level.

Multi-line Playback Function ❺

This calculator is equipped with a function to recall previous equations and answers in NORMAL mode. Pressing ▲ will display the previous equation. The number of characters that can be saved is limited. When the memory is full, stored equations will be deleted to make room, starting with the oldest.
- To edit an equation after recalling it, press ◄ or ►.
- The multi-line memory will be cleared by the following operations: 2ndF CA, mode change, RESET, editor change (SET UP 2 0 0, SET UP 2 0 1 or SET UP 2 1), and memory clear (2ndF M-CLR 1 0).
- Storing a function to f(x) or g(x) are not saved in the multi-line memory.

Priority Levels in Calculation

This calculator performs operations according to the following priority:
① Fractions (1┌4, etc.) ② Functions preceded by their argument (x^{-1}, x^2, n!, etc.) ③ y^x, $\sqrt[x]{}$ ④ Implied multiplication of a memory value (2Y, etc.) ⑤ Functions followed by their argument (sin, cos, etc.) ⑥ Implied multiplication of a function (2sin30, $A\frac{1}{4}$, etc.) ⑦ nCr ⑧ ×, ÷, int÷ ⑨ +, − ⑩ =, M+, M−, ⇒M, and other calculation ending instructions
- If parentheses are used, parenthesized calculations have precedence over any other calculations.

SCIENTIFIC CALCULATIONS

- Press MODE 0 to select NORMAL mode.

Arithmetic Operations ❻

- The closing parenthesis) just before = or M+ may be omitted.

Functions ❼

- Refer to the calculation examples for each function.
- In the Line editor, the following symbols are used:
  - ▪▫: to indicate an expression's power. (y^x, 2ndF e^x, 2ndF 10^x)
  - ▪/▫: to separate numerators and denominators. (a/b)
- When using $\log_a x$ or 2ndF $\lfloor x \rfloor$ in the Line editor, values are entered in the following way:
  - logn (*base*, *value*)
  - abs *value*

Σ Function ❽

The Σ function returns the cumulative sum of a given expression from an initial value to an end value in NORMAL mode.

Performing Σ calculations

1. Press Σ.
2. Specify the following parameters: initial value, end value, function with variable x, and increment (n).
   You do not need to specify the increment. If the increment is not specified, the default value of n = 1 will be used.
3. Press =.

Note: Parameters are entered in the following way:
WriteView editor:
end value
$\sum$(*function*[, *increment*])
x= *initial value*
Line editor:
$\sum$(*function, initial value, end value*[, *increment*])

Π Function ❾

The Π function returns the product of a given expression from an initial value to an end value in NORMAL mode.

Performing Π calculations

1. Press 2ndF Π.
2. Specify the following parameters: initial value, end value, function with variable x, and increment (n).
   You do not need to specify the increment. If the increment is not specified, the default value of n = 1 will be used.
3. Press =.

Note: Parameters are entered in the following way:
WriteView editor:
end value
Π(*function*[, *increment*])
x= *initial value*
Line editor:
Π(*function, initial value, end value*[, *increment*])

Random Function

The random function has four settings. To generate further random numbers in succession, press ENTER. Press ON/C to exit.

Random numbers

A pseudo-random number, with three significant digits from 0 up to 0.999, can be generated by pressing 2ndF ZUFALL 0 ENTER.
Note: In the WriteView editor, the result will be a fraction or 0.

Random integer

You can specify a range for the random integer with "R.Int(".
R.Int(*minimum value, maximum value*)
For example, if you enter 2ndF ZUFALL 1 1 (,) 99) ENTER, a random integer from 1 to 99 will be generated.

Random dice

To simulate a die-rolling, a random integer between 1 and 6 can be generated by pressing 2ndF ZUFALL 2 ENTER.

Random coin

To simulate a coin flip, 0 (heads) or 1 (tails) can be randomly generated by pressing 2ndF ZUFALL 3 ENTER.

Memory Calculations ❿

Memory calculations can be performed in NORMAL and STAT modes.
Note: For functional memories f(x) and g(x), see "USING THE FUNCTIONAL MEMORY".

Temporary memories (A–F, X and Y)

Press STO and a variable key to store a value in memory.
Press RCL and a variable key to recall the value from that memory. To place a variable in an equation, press ALPHA and a variable key.

Independent memory (M)

In addition to all the features of temporary memories, a value can be added to or subtracted from an existing memory value.
Press ON/C STO M to clear the independent memory (M).

Last answer memory (ANS)

The calculation result obtained by pressing = or any other calculation ending instruction is automatically stored in the last answer memory.

Notes: Use of RCL or ALPHA will recall the value stored in memory using up to 14 digits.

Memory List

Press ALPHA MEMORY to display a list of the values saved in memory. The values are shown in a 9-character range.
Applicable memories: A, B, C, D, E, F, X, Y, M

Chain Calculations ⓫

The previous calculation result can be used in the subsequent calculation. However, it cannot be recalled after entering multiple instructions.

Fraction Calculations ⓬

Arithmetic operations and memory calculations can be performed using fractions. In NORMAL mode, conversion between a decimal number and a fraction can be performed by pressing CHANGE.
Notes:
- Improper/proper fractions will be converted to and displayed as decimal numbers if the number of digits used in their expression is greater than nine.

Physical Constants ⓭

To recall a constant, press 2ndF KONST, then select a physical constant from the list. (Each item is labeled with a 2-digit number.)
- To scroll up or down the list of constants, press ▲ (◄) or ▼ (►).
  Use 2ndF ▲ (◄) or 2ndF ▼ (►) to jump to the first or last page.
- Enter the first digit of the 2-digit item number to jump to the page containing the number that begins with that digit.
- When you enter the second digit, the constant is displayed automatically according to the display and decimal placement settings.
- Physical constants can be recalled in NORMAL and STAT modes.

Note: Physical constants and metric conversions are based on the 2018 CODATA recommended values, or on the 2008 Edition of the "Guide for the Use of the International System of Units (SI)" released by NIST (National Institute of Standards and Technology).

No.	Constant	No.	Constant
01	Speed of light in vacuum	27	Stefan-Boltzmann constant
02	Newtonian constant of gravitation	28	Avogadro constant
03	Standard acceleration of gravity	29	Molar volume of ideal gas (273,15 K, 101,325 kPa)
04	Electron mass		
05	Proton mass	30	Molar gas constant
06	Neutron mass	31	Faraday constant
07	Muon mass	32	Von Klitzing constant
08	Atomic mass unit-kilogram relationship	33	Electron charge to mass quotient
		34	Quantum of circulation
09	Elementary charge	35	Proton gyromagnetic ratio
10	Planck constant	36	Josephson constant
11	Boltzmann constant	37	Electron volt
12	Vacuum mag. permeability	38	Celsius Temperature
13	Vacuum electric permittivity	39	Astronomical unit
14	Classical electron radius	40	Parsec
15	Fine-structure constant	41	Molar mass of carbon-12
16	Bohr radius	42	Reduced Planck constant
17	Rydberg constant	43	Hartree energy
18	Magnetic flux quantum	44	Conductance quantum
19	Bohr magneton	45	Inverse fine-structure constant
20	Electron magnetic moment	46	Proton-electron mass ratio
21	Nuclear magneton	47	Molar mass constant
22	Proton magnetic moment	48	Neutron Compton wavelength
23	Neutron magnetic moment	49	First radiation constant
24	Muon magnetic moment	50	Second radiation constant
25	Compton wavelength	51	Characteristic impedance of vacuum
26	Proton Compton wavelength	52	Standard atmosphere

Modify Function ⓮

Decimal calculation results are internally obtained in scientific notation, with up to 14 digits in the mantissa. However, since calculation results are displayed in the form designated by the display notation and the number of decimal places indicated, the internal calculation result may differ from that shown in the display. By using the modify function (2ndF ROUND), the internal value is converted to match that of the display, so that the displayed value can be used without change in subsequent operations.
- When using the WriteView editor, if the calculation result is displayed using fractions or irrational numbers, press CHANGE to convert it to decimal form first.

Various functions ⓯

- Refer to the calculation examples for each function

int÷

- "Q" indicates "Quotient", and "R" indicates "Remainder".
- Pressing 2ndF int÷ cannot be followed by pressing a key for another operation such as (+, −, ×, ÷), otherwise an error will result.
- The quotient and remainder are shown in "NORM1" format. If not all digits can be displayed in "NORM1" format, normal division is performed.

int

Returns the highest integer value that does not exceed the value specified.

BinKo (Binomialkoeffizient)

Find the number of combinations that choose "r" out of "n" (regardless of order).

STATISTICAL CALCULATIONS ⓰ ⓱

Statistical calculations can be performed in STAT mode.
There are two sub-modes within STAT mode. Press MODUS 1, then press the number key that corresponds to your choice:
0 : Single-variable statistics
1 : Two-variable statistics

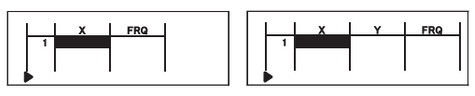
The statistical data input screen appears.

After entering statistical data from the input screen, press DATA or ON/C and close the input table. You can then check statistical values from the STAT menu (ALPHA STAT) and specify statistical variables.

Data Entry and Correction

Data entry

Entry field



Single-variable data table — Two-variable data table

- After entering the data, press ENTER. The input is finalized and the cursor moves to the next line. If data was not entered in an x or y, 0 is entered, 1 is entered in FRQ (frequency), and the cursor moves to the next line.
- You can use (x,y) to enter X and FRQ (or X, Y, and FRQ) at once.
- In the input table, up to 6 digits are displayed for each value, including the sign and decimal point. Any values that exceed 6 digits in length are displayed in exponent notation.
- Up to 100 data items can be entered. With single-variable data, a data item with an assigned frequency of one is counted as one data item, while an item with an assigned frequency of 2 or higher is stored as a set of two data items. With two-variable data, a set of data items with an assigned frequency of one is counted as two data items, while a set of items with an assigned frequency of 2 or higher is stored as a set of three data items.
- To execute statistical calculation, press DATA or ON/C and close the input table.

Data correction

Use ◄, ►, ▲, or ▼ to move the cursor and select the desired data. Press 2ndF ▲ or 2ndF ▼ to jump the cursor to the beginning or end of the data.

Data correction
Move the cursor to the data that you want to correct, enter the numeric value, and press ENTER.

Data insertion
To insert a line in front of the cursor position, press 2ndF INS-D. The initial values entered in the inserted data are 0 in x and y, and 1 in FRQ.

Data deletion
To delete the entire line where cursor is positioned, press 2ndF ENTF.
Notes:
- In STAT mode, all statistical data will be erased if the submode is changed or 2ndF CA is pressed.
- In STAT mode, press DATA to display the input table.

Statistical Calculations and Variables

The following statistics can be obtained for each statistical calculation (refer to the table below):

Single-variable statistical calculation

Statistics of ①.

Two-variable statistical calculation

Statistics of ① and ②.

①	n	Number of samples
	Σx	Sum of samples (x data)
	Σx^2	Sum of squares of samples (x data)
②	Σy	Sum of samples (y data)
	Σy^2	Sum of squares of samples (y data)
	Σxy	Sum of products of samples (x, y)

STAT Menu

After closing the input table, you can view statistical values and specify statistical variables from STAT menu (ALPHA STAT).
ALPHA STAT 0: Display statistical values
ALPHA STAT 1: Specify statistical value variables

USING THE FUNCTIONAL MEMORY ⓲

You can store a function using X variable in functional memories (f(x) and g(x)). The stored function can be used in NORMAL mode or TABLE mode.
And also, in NORMAL mode, press f( ) or g( ) to enter an arbitrary X value to calculate.
- In a function, only "X" can be used as a variable, and other variables are all regarded as numbers (stored into the variables).
- Σ and Π cannot be used in functions for f(x) and g(x).
- If editor changed (SET UP 2 ~), the stored functions will be deleted.
- f(x) and g(x) cannot be used in STAT mode or DISTR mode.

TABLE MODE ⓳

You can see the changes in values of one or two functions (f(x) and g(x)) using TABLE mode.

Setting a table

1. Press MODUS 2 to enter TABLE mode.
2. Enter a function (f(x)), and press ENTER.
   - If there is a function already stored in the functional memory f(x), that function is displayed. And the entered or modified function is overwritten in the functional memory f(x).
3. If needed, enter the 2nd function (g(x)) and press ENTER.
   - If there is a function already stored in the functional memory g(x), that function is displayed. And the entered or modified function is overwritten in the functional memory g(x).
4. Enter a starting value (X_Start:), and press ENTER.
   The default starting value is 0.
5. Enter a step value (X_Schritt:). The default step value is 1.
   - You can use ▲ and ▼ to move the cursor between the starting value and step value.
6. Press ENTER when you finish entering a step value. A table with a variable X and the corresponding values (f(x)) appears, displaying 3 lines below the starting value.
   If you entered two functions, the f(x) and g(x) columns appear.
   You can use ▲ and ▼ to change the X value and see its corresponding values in table format.

- The table is for display only and you cannot edit the table.
- The values are displayed up to 7 digits, including signs and a decimal point.
- Press ◄ or ► to move the cursor to f(x) column (f(x) and g(x) columns if you entered two functions) or X column.
- Full digits of the value on the cursor are displayed on the bottom right.
- After step 4 above, you can press ALPHA f( ) or ALPHA g(x)= to return to the function (f(x) or g(x)) and make corrections.

Notes:
- It is also possible to recall g(x) within an f(x) function and f(x) within a g(x) function.
- In a function, only "X" can be used as a variable, and other variables are all regarded as numbers (stored into the variables).
- Irrational numbers such as √ and π can also be entered into a starting value or a step value. You cannot enter 0 or a negative number as a step value.
- You can use WriteView editor when inputting a function.
- It may take time to make a table, or "-------" may be displayed, depending on the function entered or conditions specified for the variable X.
- Please note that when making a table, the values for variable X are rewritten.
- Press 2ndF CA or mode selection to return to the initial screen of the mode, and return to the default values for the starting value and step value.

DISTRIBUTION FUNCTIONS ⓴

The calculator has distribution features to find statistical calculations.
Press MODUS 3, and then select the desired distribution function.
Note: Calculation results are stored in ANS memory.

Normal Distribution

Normal cdf

Calculates the probability of a specified intervals x1-x2 for the normal distribution with the specified mean (μ) and standard deviation (σ).

Binomial Distribution

Binomial pdf

Calculates a probability density at x for the discrete binomial distribution with the specified trial number (n) and probability of success (p) on each trial.

Binomial cdf

Calculates a cumulative probability at x for the discrete binomial distribution with the specified trial number (n) and probability of success (p) on each trial.

Binomial cdf2

Calculates the probability of a specified intervals x1-x2 for the discrete binomial distribution with the specified trial number (n) and probability of success (p) on each trial.

Poisson Distribution

Poisson pdf

Calculates a probability at x for the Poisson distribution with the specified mean (μ) .

Poisson cdf

Calculates a cumulative probability at x for the Poisson distribution with the specified mean (μ).

ERRORS AND CALCULATION RANGES

Errors

An error will occur if an operation exceeds the calculation ranges, or if a mathematically illegal operation is attempted. When an error occurs, pressing ◄ or ► automatically moves the cursor back to the place in the equation where the error occurred. Edit the equation or press ON/C to clear the equation.
Note: For errors related to f(x) or g(x), when "in f(x)" or "in g(x)" is displayed under error type, pressing ◄ or ► will move the cursor to the position of the closing parenthesis instead of where the error occurred.

Error codes and error types

FEHLER 01: Syntax
- An attempt was made to perform an invalid operation.
  Ex. 2 + − 5 =

FEHLER 02: Mathematik Fehler
- The absolute value of an intermediate or final calculation result equals or exceeds 10^{100}.
- An attempt was made to divide by zero (or an intermediate calculation resulted in zero).
- The calculation ranges were exceeded while performing calculations.
- 0 or a negative number was entered as a step value in TABLE mode. The absolute value of a starting value or a step value equals or exceeds 10^{100} in TABLE mode.
- When the number to be factored into primes is greater than 2 and other than a 10-digit positive integer, or when the result of prime factorization is a negative number, decimal, fraction, √, or π.

FEHLER 03: Schachtelung
- The available number of buffers was exceeded. (There are 10 buffers for numeric values and 64 buffers for calculation instructions).
- When each of f(x)/g(x) refers to itself in NORMAL mode.

FEHLER 04: Daten Ende
- Data items exceeded 100 in STAT mode.

FEHLER 10: Nicht definiert
- Undefined f(x)/g(x) used in the expression. (in NORMAL mode)

Alert Messages

Kann Nicht löschen!
- The selected item cannot be deleted by pressing ◄ or 2ndF ENTF in the WriteView editor.
  Ex. √ 5 ► x^2 ◄ ◄
  In this example, delete the exponent before attempting to delete the parentheses.

Kann Nicht speichern!
- It can't store a function to f(X)/g(x).
  Ex. When the expression contains a function that is prohibited in TABLE mode, such as Σ or Π, an attempt was made to store it in TABLE mode.

Puffer voll!
- The equation (including any calculation ending instructions) exceeded its maximum input buffer (159 characters in the WriteView editor or 161 characters in the Line editor). An equation may not exceed its maximum input buffer.

Calculation Ranges ㉑

- **Within the ranges specified, this calculator is accurate to ±1 of the 10th digit of the mantissa. However, a calculation error increases in continuous calculations due to accumulation of each calculation error. (This is the same for y^x, $\sqrt[x]{}$, n!, e^x, ln, etc., where continuous calculations are performed internally.) Additionally, a calculation error will accumulate and become larger in the vicinity of inflection points and singular points of functions.**
- Calculation ranges
  $\pm 10^{-99}$ to $\pm 9{,}999999999 \times 10^{99}$ and 0.
  If the absolute value of an entry or a final or intermediate result of a calculation is less than 10^{-99}, the value is considered to be 0 in calculations and in the display.

Display of results using √ (when EXACT is selected)

Calculation results may be displayed using √ when all of the following conditions are met:
- When intermediate and final calculation results are displayed in the following form:
  $\pm\frac{a\sqrt{b}}{e} \pm \frac{c\sqrt{d}}{f}$
- When each coefficient falls into the following ranges:
  $1 \leq a < 100$; $1 < b < 1.000$; $0 \leq c < 100$;
  $1 \leq d < 1.000$; $1 \leq e < 100$; $1 \leq f < 100$
- When the number of terms in the intermediate and final calculation results is one or two.

Note: The result of two fractional terms that include √ will be reduced to a common denominator.

BATTERY REPLACEMENT

Notes on Battery Replacement

Improper handling of batteries can cause electrolyte leakage or explosion. Be sure to observe the following handling rules:
- Make sure the new battery is the correct type.
- When installing, orient the battery properly as indicated in the calculator.
- The battery is factory-installed before shipment, and may be exhausted before it reaches the service life stated in the specifications.

Notes on erasure of memory contents
When the battery is replaced, the memory contents are erased. Erasure can also occur if the calculator is defective or when it is repaired. Make a note of all important memory contents in case accidental erasure occurs.

When to Replace the Battery

If the display has poor contrast or nothing appears on the display when ON/C is pressed in dim lighting, even after adjusting the display contrast, it is time to replace the battery.

Cautions

- Fluid from a leaking battery accidentally entering an eye could result in serious injury. Should this occur, wash with clean water and immediately consult a doctor.
- Should fluid from a leaking battery come in contact with your skin or clothes, immediately wash with clean water.
- If the product is not to be used for some time, to avoid damage to the unit from a leaking battery, remove it and store in a safe place.
- Do not leave an exhausted battery inside the product.
- Keep batteries out of the reach of children.
- An exhausted battery left in the calculator may leak and damage the calculator.
- Explosion risk may be caused by incorrect handling.
- Do not throw batteries into a fire as they may explode.

Replacement Procedure

1. Turn the power off by pressing 2ndF OFF.
2. Remove two screws. (Fig. 1)
3. Lift the battery cover to remove.
4. Remove the used battery by prying it out with a ball-point pen or other similar pointed device. (Fig. 2)
5. Install one new battery. Make sure the "+" side is facing up.
6. Replace the cover and screws.
7. Press the RESET switch (on the back) with the tip of a ball-point pen or similar object.
8. Adjust the display contrast. See "Adjusting the display contrast". And then press ON/C.
- Make sure that the display appears as shown below. If the display does not appear as shown, remove the battery, reinstall it, and check the display once again.

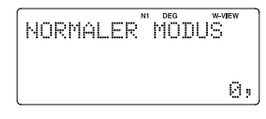
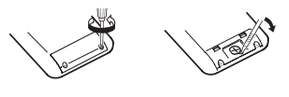


Fig. 1 Fig. 2



Automatic Power Off Function

This calculator will turn itself off to save battery power if no key is pressed for approximately 10 minutes.

SPECIFICATIONS

Display:	96 × 32 dot matrix liquid crystal display
Display of calculation results:	Mantissa: 10 digits Exponent: 2 digits
Internal calculations:	Mantissas of up to 14 digits
Pending operations:	64 calculations 10 numeric values
Power source:	Built-in solar cells 1,5 V ⎓ (DC): Backup battery (Alkaline battery (LR44 or equivalent) × 1)
Operating time: (varies according to use and other factors)	Approx. 3.000 hours when continuously displaying 55555 at 25°C (77°F), using the alkaline battery only
Operating temperature:	0°C–40°C (32°F–104°F)
External dimensions:	80 mm (W) × 166 mm (D) × 15 mm (H)
Weight:	Approx. 113 g (including battery)
Accessories:	Battery × 1 (installed), operation manual, and hard case

SHARP
SHARP CORPORATION

ENGLISH

CALCULATION EXAMPLES

WriteView EL-W550TG

1 SET UP (ANZGE)

100000 ÷ 3 =

[NORM1]	ON/C 100000 ÷ 3 = CHANGE	33'333,33333
→ [FIX: NACHKOMMASTELLEN 2]	SET UP 1 0 2	33'333,33
→ [SCI: ANZ.EFF.STELLEN 2]	SET UP 1 1 2	3,3E04
→ [ENG: ANZ.DEZ.STELLEN 2]	SET UP 1 2 2	33,33E03
→ [NORM1]	SET UP 1 3	33'333,33333

2 SET UP (EDITOR)

→ [DEZIMAL]	ON/C SET UP 2 0 1	0,
1 ÷ 2 =	1 ÷ 2 =	0,5
→ [EXAKT(a/b,√,π)]	SET UP 2 0 0	0,
1 ÷ 2 =	1 ÷ 2 =	$\frac{1}{2}$

3 SET UP (PERIOD)

→ [AN]	ON/C SET UP 4 1	0,
611 ÷ 495 =	611 ÷ 495 =	$\frac{611}{495}$
	CHANGE	$1,2\overline{34}$
	CHANGE	1,234343434
	CHANGE	$\frac{611}{495}$
LINE	611 ÷ 495 =	1,2(34)
	CHANGE	1,234343434
	CHANGE	611r495
	CHANGE	1,2(34)
→ [AUS]	ON/C SET UP 4 0	0,

4 CHANGE

$\frac{2}{5}+\frac{3}{4}=$	ON/C 2 a/b 5 ▶ + a/b 3 ▶ 4 =	$\frac{23}{20}$
	CHANGE	1,15
	CHANGE	$\frac{23}{20}$
$\sqrt{3}\times\sqrt{5}=$	√ 3 ▶ × √ 5 =	$\sqrt{15}$
	CHANGE	3,872983346
sin 45 =	sin 45 =	$\frac{\sqrt{2}}{2}$
	CHANGE	0,707106781

5 ▲ ▼

	2ndF CA	0,
① 3(5 + 2) =	3 (5 + 2) =	21,
② 3 × 5 + 2 =	3 × 5 + 2 =	17,
③ (5 + 3) × 2 =	(5 + 3) × 2 =	16,
→ ①	2ndF ▲	21,
→ ②	▼	17,
→ ①	▲	21,
→ ③	2ndF ▼	16,

6 + − × ÷ ( ) (−) Exp

45 + 285 ÷ 3 =	ON/C 45 + 285 ÷ 3 =	140,
$\frac{18+6}{15-8}=$	(18 + 6) ÷ (15 − 8 =	$\frac{24}{7}$
42 × −5 + 120 =	42 × (−) 5 + 120 =	-90,
$(5\times10^3)\div(4\times10^{-3})=$	5 Exp 3 ÷ 4 Exp (−) 3 =	1'250'000,

7 sin cos tan sin⁻¹ cos⁻¹ tan⁻¹ π hyp arc hyp ln log $\log_a x$ e^x e 10^x x^{-1} x^2 x^3 y^x √ $\sqrt[x]{}$ $\sqrt[3]{}$ n! |x|

sin 60 [°] =	ON/C SET UP 0 0 sin 60 =	$\frac{\sqrt{3}}{2}$
	CHANGE	0,866025403
$\cos\frac{\pi}{4}$ [rad] =	SET UP 0 1 cos π a/b 4 =	$\frac{\sqrt{2}}{2}$
	CHANGE	0,707106781
$\tan^{-1}1$ [g] =	SET UP 0 2 2ndF tan⁻¹ 1 =	50,
	SET UP 0 0	
$(\cosh1,5+\sinh1,5)^2=$	ON/C (hyp cos 1,5 + hyp sin 1,5) x^2 =	20,08553692
$\tanh^{-1}\frac{5}{7}=$	2ndF arc hyp tan (5 ÷ 7) =	0,895879734
ln 20 =	ln 20 =	2,995732274
log 50 =	log 50 =	1,698970004
$\log_2 16384=$	$\log_a x$ 2 ▶ 16384 =	14,
LINE	$\log_a x$ 2 $(x;y)$ 16384) =	14,
$e^3=$	2ndF e^x 3 =	20,08553692
1 ÷ e =	1 ÷ ALPHA e =	0,367879441
$10^{1,7}=$	2ndF 10^x 1,7 =	50,11872336
$\frac{1}{6}+\frac{1}{7}=$	6 2ndF x^{-1} + 7 2ndF x^{-1} =	$\frac{13}{42}$
	CHANGE	0,309523809
$8^{-2}-3^4\times5^2=$	8 y^x (−) 2 ▶ − 3 y^x 4 ▶ × 5 x^2 =	$-\frac{129599}{64}$
	CHANGE	-2'024,984375
LINE	8 y^x (−) 2 − 3 y^x 4 × 5 x^2 =	-2'024,984375
	CHANGE	-129599r64

8 Σ

$\sum_{x=1}^{5}(x+2)$	ON/C Σ 1 ▶ 5 ▶ ALPHA X + 2	
$n=1$	=	25.
$n=2$	◀ ◀ $(x;y)$ 2 =	15.

9 ∏

$\prod_{x=1}^{5}(x+2)$	ON/C 2ndF ∏ 1 ▶ 5 ▶ ALPHA X + 2	
$n=1$	=	2'520.
$n=2$	◀ ◀ $(x;y)$ 2 =	105.

10 ALPHA RCL STO M+ M− ANS

8 × 2 ⇒ M	ON/C 8 × 2 STO M	16,
24 ÷ (8 × 2) =	24 ÷ ALPHA M =	$\frac{3}{2}$
(8 × 2) × 5 =	ALPHA M × 5 =	80,
0 ⇒ M	ON/C STO M	0,
$150 × 3 ⇒ M_1$	150 × 3 M+	450,
+) $250: M_1 + 250 ⇒ M_2$	250 M+	250,
−) $M_2 \times 0,05$	RCL M × 0,05 2ndF M−	35,
M =	RCL M	665,
$\frac{24}{4+6}=\frac{12}{5}$…(A)	24 ÷ (4 + 6) =	$\frac{12}{5}$
3 × (A) + 60 ÷ (A) =	3 × ALPHA ANS + 60 ÷ ALPHA ANS =	$\frac{161}{5}$

11

6 + 4 = ANS	ON/C 6 + 4 =	10,
ANS + 5 =	+ 5 =	15,
8 × 2 = ANS	8 × 2 =	16,
$ANS^2=$	x^2 =	256,

12 a/b

$\frac{1}{2}+\frac{4}{3}=$	ON/C a/b 1 ▼ 2 ▶ + a/b 4 ▼ 3 =	$\frac{11}{6}$
	CHANGE	1,833333333
LINE	1 a/b 2 + 4 a/b 3 =	11r6
	CHANGE	1,833333333

13 KONST

V_0 = 15,3 m/s	ON/C 15,3 × 10 +	
t = 10 s	2 2ndF x^{-1} × 2ndF	
$V_0t+\frac{1}{2}gt^2$= ? m	KONST 03 × 10 x^2 = CHANGE	643,3325

14 ROUND

→ [FIX, NACHKOMMASTELLEN = 1]

	ON/C SET UP 1 0 1	0,0
5 ÷ 9 = ANS	5 ÷ 9 =	$\frac{5}{9}$
	CHANGE	0,6
ANS × 9 =	× 9 = *1	5,0
	5 ÷ 9 =	$\frac{5}{9}$
	CHANGE	0,6
→ [ROUND]	2ndF ROUND	$\frac{3}{5}$
ANS × 9 =	× 9 = *2	$\frac{27}{5}$
	CHANGE	5,4
→ [NORM1]	SET UP 1 3	5,4

*1 $\frac{5}{9}\times9=5,5555555555555\times10^{-1}\times9$

*2 $\frac{3}{5}\times9=0,6\times9$

15 int÷ int BinKo

23 ÷ 5 =	ON/C 23 2ndF int÷ 5 =	Q: 4, R: 3,
9,5 ÷ 4 =	9,5 2ndF int÷ 4 =	Q: 2, R: 1,5
-32 ÷ (-5) =	(−) 32 2ndF int÷ (−) 5 =	Q: 6, R: −2,
-34,5 → [int]	2ndF int (−) 34,5 =	-35,
$_5C_2=$	5 2ndF BinKo 2 =	10,

16 MODUS (STAT) INS-D

DATA: 20, 30, 40, 40, 50

MODUS 1 0

	X	FRQ
1		

20 ENTER 30 ENTER 40 $(x;y)$ 2 ENTER 50 ENTER

	X	FRQ
3	40	2
4	50	1
5		

DATA: 30, 40, 40, 45, 45, 45, 60

2ndF ▲ 2ndF ENTF ▼ ▼ 2ndF INS-D

45 $(x;y)$ 3 ENTER 60 ENTER

	X	FRQ
3	45	3
4	60	1
5		

17 MODUS (STAT) DATA STAT

DATA: 95, 80, 80, 75, 75, 75, 50

MODUS 1 0 2ndF CA DATA

95 ENTER 80 $(x;y)$ 2 ENTER 75 $(x;y)$ 3 ENTER 50 ENTER

	X	FRQ
3	75	3
4	50	1
5		

DATA: Stat [1-Var] 0,

ALPHA STAT 0: n = 7, Σx = 530, Σx^2 = 41'200,

DATA

x	y
2	5
2	5
12	24
21	40
21	40
21	40
15	25

MODUS 1 1 2 $(x;y)$ 5 $(x;y)$ 2 ENTER 12 $(x;y)$ 24 ENTER 21 $(x;y)$ 40 $(x;y)$ 3 ENTER 15 $(x;y)$ 25 ENTER

	X	Y	FRQ
3	21	40	3
4	15	25	1
5			

DATA: Stat [2-Var] 0,

ALPHA STAT 0: n = 7, Σx = 94, Σx^2 = 1'700, $\downarrow\Sigma y$ = 179,

▼: $\uparrow\Sigma y^2$ = 6'051, Σxy = 3'203,

Σx = ON/C ALPHA STAT 1 1 = 94,

18 f( ) g( ) f(x)= g(x)=

$\frac{\sqrt{x}}{2}\Rightarrow f(x)$	ON/C √ ALPHA X ▶ a/b 2 STO f(x)=	⇒f(X)
12 ⇒ X	12 STO X	12,
$\frac{\sqrt{x}}{2}\times3=$	RCL f(x)= × 3 =	$3\sqrt{3}$
$x^2+1\Rightarrow g(x)$	ALPHA X x^2 + 1 STO g(x)=	⇒g(X)
$f(12)\times g(5)=$	f( ) 12) × g( ) 5) =	$26\sqrt{3}$

19 MODUS (TABLE)

$f(x)=x^2+1$: MODUS 2 ALPHA X x^2 + 1 ENTER ENTER

X_Start: -2 (−) 2 ENTER

X_Schritt: 1 1 ENTER

	X	f(X)
	-2	5
	-1	2
↓	0	1

-2,

▼ ▼ ▼ ▼

	X	f(X)
	0	1
	1	2
↓	2	5

2,

$f(x)=x^2+1$: MODUS 2 ENTER

$g(x)=x+5$: ALPHA X + 5 ENTER

X_Start: 1 1 ENTER

X_Schritt: 1 1 ENTER

	X	f(X)	g(X)
	1	2	6
	2	5	7
↓	3	10	8

1,

$f(x)=2x-1$: MODUS 2 2ndF CA 2 ALPHA X − 1 ENTER

$g(x)=f(x)^2+1$: f( ) ALPHA X) x^2 + 1 ENTER

X_Start: 0 0 ENTER

X_Schritt: 2 2 ENTER

	X	f(X)	g(X)
	0	-1	2
	2	3	10
↓	4	7	50

0,

$f(x)=g(\sin x)^2+1$: MODUS 2 2ndF CA 2 g( ) sin ALPHA X) x^2 + 1 ENTER

$g(x)=2x+1$: 2 ALPHA X + 1 ENTER ENTER

X_Start: 5 5 ENTER

X_Schritt: 1 1 ENTER

	X	f(X)	g(X)
	5	2,37900	11
	6	2,46181	13
↓	7	2,54688	15

5,

20 MODUS (DISTR)

Calculate the probability of range x = 54 to 66 in the above sample. — MODUS 3 0: Normal cdf; 54 ENTER 66 ENTER 60 ENTER 6; $x1$: 54, $x2$: 66, μ: 60, σ: 6_; ENTER: ANS = 0,682689492

Find the probability density for 15 trials with x = 7, for the binomial distribution with success probability of 30%. — MODUS 3 1: Binomial pdf; 7 ENTER 15 ENTER 0,3; x: 7, n: 15, p: 0,3_; ENTER: ANS = 0,081130033

Calculate the probability of range up to x = 7 (success number) in the above sample. — MODUS 3 2: Binomial cdf; 7 ENTER 15 ENTER 0,3; x: 7, n: 15, p: 0,3_; ENTER: ANS = 0,949987459

Calculate the probability of range x = 2 to 7 in the above sample. — MODUS 3 3: Binomial cdf2; 2 ENTER 7 ENTER 15 ENTER 0,3; $x1$: 2, $x2$: 7, n: 15, p: 0,3_; ENTER: ANS = 0,91471986

Find the probability density of x = 4, for the mean of a Poisson distribution of 3.6. — MODUS 3 4: Poisson pdf; 4 ENTER 3,6; x: 4, μ: 3,6_; ENTER: ANS = 0,191222339

Find the probability within the range up to x = 4. — MODUS 3 5: Poisson cdf; 4 ENTER 3,6; x: 4, μ: 3,6_; ENTER: ANS = 0,706438449

21

Function	Dynamic range
sin x, cos x, tan x	DEG: $\lvert x\rvert<10^{10}$ ($\tan x: \lvert x\rvert\neq90(2n-1)$)* RAD: $\lvert x\rvert<\frac{\pi}{180}\times10^{10}$ ($\tan x: \lvert x\rvert\neq\frac{\pi}{2}(2n-1)$)* GRAD: $\lvert x\rvert<\frac{10}{9}\times10^{10}$ ($\tan x: \lvert x\rvert\neq100(2n-1)$)*
$\sin^{-1}x$, $\cos^{-1}x$	$\lvert x\rvert\leq1$
$\tan^{-1}x$, $\sqrt[3]{x}$	$\lvert x\rvert<10^{100}$
ln x, log x, $\log_a x$	$10^{-99}\leq x<10^{100}$, $10^{-99}\leq a<10^{100}$ $(a\neq1)$
y^x	• $y>0$: $-10^{100}<x\log y<100$ • $y=0$: $0<x<10^{100}$ • $y<0$: $x=n$ $(0<\lvert x\rvert<1: \frac{1}{x}=2n-1, x\neq0)$*, $-10^{100}<x\log\lvert y\rvert<100$
$\sqrt[x]{y}$	• $y>0$: $-10^{100}<\frac{1}{x}\log y<100$ $(x\neq0)$ • $y=0$: $0<x<10^{100}$ • $y<0$: $x=2n-1$ $(0<\lvert x\rvert<1: \frac{1}{x}=n, x\neq0)$*, $-10^{100}<\frac{1}{x}\log\lvert y\rvert<100$
e^x	$-10^{100}<x\leq230,2585092$
10^x	$-10^{100}<x<100$
sinh x, cosh x, tanh x	$\lvert x\rvert\leq230,2585092$
$\sinh^{-1}x$	$\lvert x\rvert<10^{50}$
$\cosh^{-1}x$	$1\leq x<10^{50}$
$\tanh^{-1}x$	$\lvert x\rvert<1$
x^2	$\lvert x\rvert<10^{50}$
x^3	$\lvert x\rvert<2,15443469\times10^{33}$
$\sqrt{x}$	$0\leq x<10^{100}$
x^{-1}	$\lvert x\rvert<10^{100}$ $(x\neq0)$
n!	$0\leq n\leq69$*
$_nC_r$	$0\leq r\leq n\leq9999999999$*
R,Int(m, n)	$\lvert m\rvert\leq9999999999$* $\lvert n\rvert\leq9999999999$* $m<n,\ n-m<10^{10}$

* m, n, r: integer

ENGLISH

Information on the Disposal of this Equipment and its Batteries

Attention: Your product is marked with this symbol. It means that used electrical and electronic products should not be mixed with general household waste. There is a separate collection system for these products.

1. In the European Union

Attention: If you want to dispose of this equipment, please do not use the ordinary dust bin!

Used electrical and electronic equipment must be treated separately and in accordance with legislation that requires proper treatment, recovery and recycling of used electrical and electronic equipment.

Following the implementation by member states, private households within the EU states may return their used electrical and electronic equipment to designated collection facilities free of charge*. In some countries* your local retailer may also take back your old product free of charge if you purchase a similar new one.

*) Please contact your local authority for further details.

If your used electrical or electronic equipment has batteries or accumulators, please dispose of these separately beforehand according to local requirements.

By disposing of this product correctly you will help ensure that the waste undergoes the necessary treatment, recovery and recycling and thus prevent potential negative effects on the environment and human health which could otherwise arise due to inappropriate waste handling.

2. In other Countries outside the EU

If you wish to discard this product, please contact your local authorities and ask for the correct method of disposal.

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SHARP CORPORATION
1 Takumi-cho, Sakai-ku, Sakai City,
Osaka 590-8522, Japan

For EU only:

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