



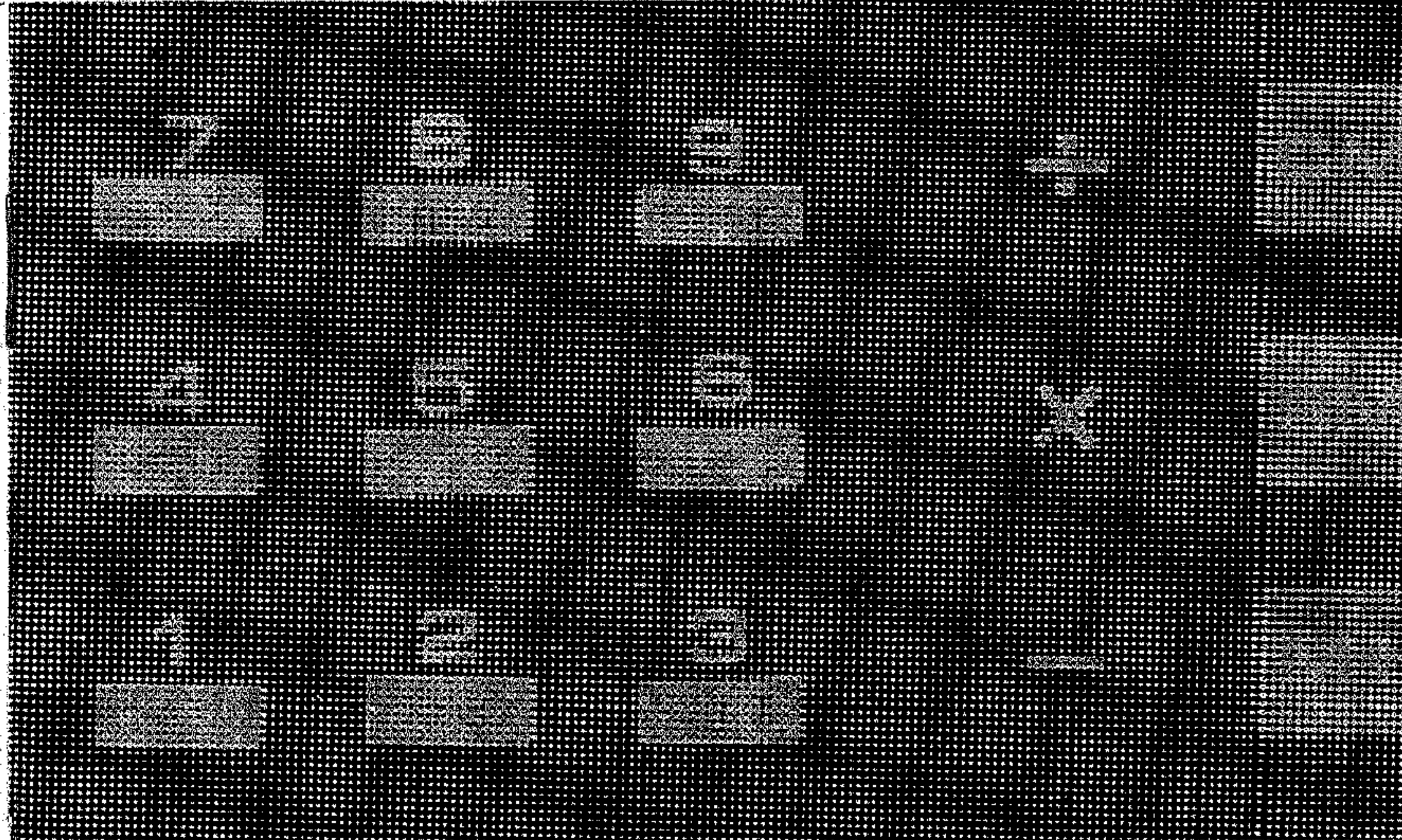
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SHARP COMPET DIGITAL RULE

PC-1802 INSTRUCTION MANUAL



Printed in Japan

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WARRANTY

This Sharp calculator was inspected and thoroughly tested before shipment. It is important that the operating instructions be read carefully before using this calculator. For a period of one (1) year from the date of purchase, we will repair without charge, any part of this product found to be defective due to materials or workmanship if it is returned either to the place of purchase or to a Sharp Factory Service Center on the back. After one (1) year from date of purchase, a reasonable charge will be made for repair. This warranty is void if this product has been subject to misuse or abuse, improper voltage, or has been tampered or repaired by unauthorized person.

— IMPORTANT —

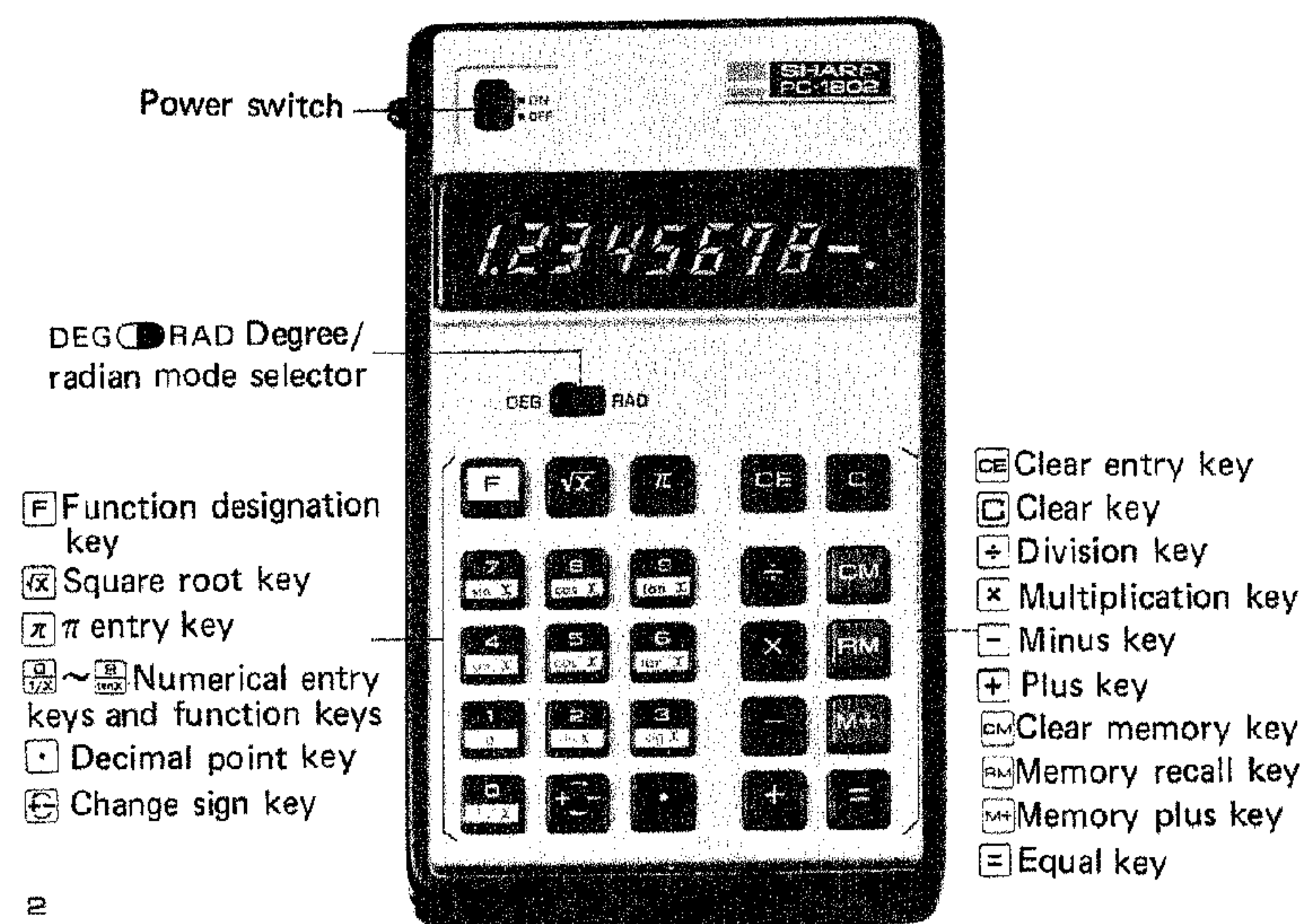
This warranty is valid only if accompanied by the proof of purchase showing date of purchase, model and serial numbers.

1. INTRODUCTION



The PC-1802 is a handy type function electronic calculator particularly designed for the scientific and technical calculations. It is the result of SHARP's high technical might to combine an ordinary desk-top calculator with a slide rule into one unit. You can compute 12 types of functions with amazing accuracy by one touch operation.

2. EXTERNAL FEATURES



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3. FEATURES

General features

PC-1802 provides four-arithmetical functions and certain scientific functions with full floating decimal point system.

In addition the following features are provided.

- 1) Memory calculation
- 2) Constant addition, subtraction, multiplication and division
- 3) Chain multiplication and division
- 4) Power calculations
- 5) Repeat addition and subtraction
- 6) Mixed calculations, etc.

Scientific functions

The following scientific functions are provided.

- 1) Trigonometric functions ($\sin x$, $\cos x$, $\tan x$):
After setting numbers, operate the **F** (**sin**, **cos**, **tan**) keys.
The argument "X" can be in degrees or radians according to the position of DEG-RAD (Degree/radian) mode selector.
- 2) Inverse trigonometric functions ($\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$).
After setting numbers, operate the **F** (**sin⁻¹**, **cos⁻¹**, **tan⁻¹**) keys.

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The answers will be in degrees or radians according to the position of DEG-RAD mode selector.

- 3) Logarithmic functions ($\ln x$, $\log x$)
After setting numbers, operate the \boxed{F} ($\boxed{\frac{a}{bx}}$, $\boxed{\frac{a}{cx}}$) keys.
- 4) Exponential function (e^x):
After setting numbers, operate \boxed{F} $\boxed{\frac{1}{x}}$ keys.
- 5) Reciprocal calculation ($1/x$):
After setting numbers, operate \boxed{F} $\boxed{\frac{1}{x}}$ keys.
- 6) Square root extraction:
After setting numbers, operate the $\boxed{\sqrt{x}}$ key.

4. EXPLANATION OF SELECTOR, KEYS, AND LAMPS

DEG-RAD mode selector

RAD: In case of trigonometric or inverse trigonometric calculation, the number which is operated (calculated) or the unit of answer can be obtained by setting in "RAD" position.

DEG: In case of trigonometric or inverse trigonometric calculation, the number which is operated or the unit of answer can be obtained by setting in "DEG" position.

When working with degrees or radians, the decimal portion of the number is read as a decimal, not as a form of minutes and seconds.

NOTE: The precision of individual incorporated functions is up to sixth digit (place).

Keys:

- \boxed{C} : Clears all the calculation registers, error etc.
It will not clear the memory register.
- \boxed{CE} : Clears display register
- $\boxed{0}$ ~ $\boxed{9}$: Numeral keys to enter a number
When these keys are pressed following \boxed{F} key, the function shown on the lower part of each key top will be computed.
- $\boxed{\cdot}$: Enters the decimal point in the display register.
- $\boxed{\pm}$: This key will change the sign of the number in the display.
- $\boxed{\pi}$: For entering π (3.1415926)
- $\boxed{+}$ $\boxed{-}$ $\boxed{\times}$ $\boxed{\div}$: Sets the order of each function.
- $\boxed{=}$: Completes the addition, subtraction, multiplication or division function.
- $\boxed{M\pm}$ $\boxed{M\div}$ $\boxed{M\times}$: These keys designate the memory functions.
- \boxed{MC} : Clears the content of memory register.
- \boxed{MR} : Displays the contents of the memory register. The memory remains unchanged.
However the content of the display prior to using the \boxed{MR} key is cleared.

- \square Adds an entry to the memory.
The displayed figure remains unchanged.
- \sqrt{x} The square root of the number x is calculated.
- \square This key designates the function shown on the lower part of each numeral key top.

Lamps

- Minus sign indicator
Turns on when the displayed number is negative or minus zero.
- Memory loading indicator
Turns on when the content of memory register is not zero.

5. DECIMAL POINT SYSTEM

If the integer part of the displayed number is N digits, the decimal point is displayed at Nth digit from most significant digit. However, when the integer part is a zero (0), N becomes 1. When N is more than 8, an overflow error is detected.

6. DISPLAY OF NUMBER

The number is displayed starting from the most significant digit to the least significant digit. All the useless zeros of decimal portion are not displayed.

Ex.	(KEY OPERATION)	(DISPLAY)
	\square	0.
	\square \square \square \square \square \square \square \square \square \square	1234567.0
	\times	1234567.
	\cdot	0.
	0	0.0
	0	0.00
	0	0.000
	0	0.0000
	2	0.00002
	=	24.69134

7. OPERATION

Calculations	Examples	Operation
Addition & Subtraction	$500 - 25 + 50 - 30 = 495$ $123 + 456 + 789 = 1,368$ $45.6 - 14.7 - 78.9 = -48.0$ $-1.23 - 5.67 + 6.78 = -0.12$	$500 \square - 25 \square + 50 \square - 30 \square \rightarrow 495.$ $123 \square + 456 \square + 789 \square \rightarrow 1368.$ $45.6 \square - 14.7 \square - 78.9 \square \rightarrow 48.-$ $1.23 \square - 5.67 \square + 6.78 \square \rightarrow 0.12-$
Repeat addition	$6 + 6 + 6 + 6 + 6 = 30$ $5 + 5 + 5 + 5 + 5 = 25$	$6 \square + \square = \square \rightarrow 30.$ $5 \square + \square = \square \rightarrow 25.$
Multiplication & Division	$2.2 \times 3.3 \times 4.4 \times 5.5 = 175.692$ $45.6 \div 12 = 3.8$ $123.45 \div (-15) = -8.23$	$2.2 \square \times 3.3 \square \times 4.4 \square \times 5.5 \square \rightarrow 175.692$ $45.6 \square \div 12 \square \rightarrow 3.8$ $123.45 \square \div 15 \square \rightarrow 8.23-$
Power calculation	$2^2 = 4$ $2^3 = 8$ $2^4 = 16$	$2 \square \times \square \rightarrow 4.$ $\square \rightarrow 8.$ $\square \rightarrow 16.$
Constant calculation	$2 + \frac{3}{3} = 5$ $4 + \frac{3}{3} = 7$ $5 + \frac{3}{3} = 8$	$2 \square + \frac{3}{3} \square \rightarrow 5.$ $4 \square + \frac{3}{3} \square \rightarrow 7.$ $5 \square + \frac{3}{3} \square \rightarrow 8.$

	$20 - \frac{5}{5} = 15$ $30 - \frac{5}{5} = 25$ $40 - \frac{5}{5} = 35$	$20 \square - \frac{5}{5} \square \rightarrow 15.$ $30 \square - \frac{5}{5} \square \rightarrow 25.$ $40 \square - \frac{5}{5} \square \rightarrow 35.$
	$99.99 \times 11.11 = 1110.8889$ $99.99 \times 33.33 = 3332.6667$ $99.99 \times 44.44 = 4443.5556$	$99.99 \square \times 11.11 \square \rightarrow 1110.8889$ $33.33 \square \rightarrow 3332.6667$ $44.44 \square \rightarrow 4443.5556$
	$100 \div 4 = 25$ $200 \div 4 = 50$ $400 \div 4 = 100$	$100 \square \div 4 \square \rightarrow 25.$ $200 \square \rightarrow 50.$ $400 \square \rightarrow 100.$
Memory calculation	$\left(\frac{5 \times 8}{1 + 2 + 3 + 4}\right) + (3 \times 4) = 16$	$\square \square 1 \square \square + \square \square 2 \square \square + \square \square 3 \square \square + \square \square 4 \square \square$ $5 \square \times 8 \square \div \square \square \square \square \square \square \square \square + \square \square \square \square 3 \square \square \times \square \square$ $4 \square \square \square \square \square \square \rightarrow 16.$
Trigonometric & Inverse trigonometric functions	<ol style="list-style-type: none"> $\sin 30^\circ = 0.5$ $\cos \pi/3 = 0.5$ $\tan 45^\circ = 1.0$ $\sin^{-1} 0.5 = 30$ (Degree \rightarrow Radian) Ex. $\sin 90^\circ \rightarrow \sin \pi/2$ <p>Degree can be converted into radian by determining the value of $\sin 90^\circ$</p>	$\text{DEG} \square \text{RAD} 30 \square \square \square \square \rightarrow 0.5$ $\text{DEG} \square \text{RAD} \pi \square \div 3 \square \square \square \square \rightarrow 0.5$ $\text{DEG} \square \text{RAD} 45 \square \square \square \square \rightarrow 1.$ $\text{DEG} \square \text{RAD} .5 \square \square \square \square \rightarrow 30.$ $\text{DEG} \square \text{RAD} 90 \square \square \square \square \rightarrow 1.$ $\text{DEG} \square \text{RAD} \square \square \square \square \rightarrow 1.570796$

Calculations	Examples	Operation
Exponential function	$e^1 = 2.71828$	1 $\boxed{F} \boxed{\frac{1}{e}} \rightarrow 2.71828$
Logarithmic function	$\ln 5 = 1.609437912$ $\log 100 = 2$	5 $\boxed{F} \boxed{\frac{2}{\ln x}} \rightarrow 1.609438$ 100 $\boxed{F} \boxed{\frac{2}{\log x}} \rightarrow 2.$
Reciprocal calculation	$\frac{1}{5^2} = 0.04$ $\frac{1}{5 \times 9 + 5} = 0.02$	5 $\boxed{\times} \boxed{=}$ $\boxed{F} \boxed{\frac{2}{\ln x}} \rightarrow 0.04$ 5 $\boxed{\times} \boxed{9} \boxed{+} \boxed{5} \boxed{=}$ $\boxed{F} \boxed{\frac{2}{\ln x}} \rightarrow 0.02$
Square root extraction	$\sqrt{169} = 13$ $\sqrt{(456 + 397) \times 20} = 130.61393$	169 $\boxed{\sqrt{x}} \rightarrow 13.$ 456 $\boxed{+}$ 397 $\boxed{\times}$ 20 $\boxed{=}$ $\boxed{\sqrt{x}}$ $\rightarrow 130.61393$

Applied calculation

Ex. 1 $5^{\frac{1}{3}} = ?$

Steps	Operation	Display	Note
1	5 $\boxed{F} \boxed{\frac{2}{\ln x}}$	1.609438	
2	$\boxed{+} \boxed{3} \boxed{=}$	0.5364793	
3	$\boxed{F} \boxed{\frac{1}{e}}$	1.709975	Ans.

Ex. 2 $(1.5)^{\frac{1}{2.5}} = ?$

Steps	Operation	Display	Note
1	1.5 $\boxed{F} \boxed{\frac{2}{\ln x}}$	0.405465	
2	$\boxed{+} \boxed{2.5} \boxed{=}$	0.162186	
3	$\boxed{F} \boxed{\frac{1}{e}}$	1.176078	Ans.

Ex. 3 $(1.5)^{2.5} = ?$

Steps	Operation	Display	Note
1	1.5 $\boxed{F} \boxed{\frac{2}{\ln x}}$	0.405465	
2	$\boxed{\times} \boxed{2.5} \boxed{=}$	1.0136625	
3	$\boxed{F} \boxed{\frac{1}{e}}$	2.755673	Ans.

Ex. 4 $\sin 30^\circ \times \cos 18^\circ = ?$

DEG RAD

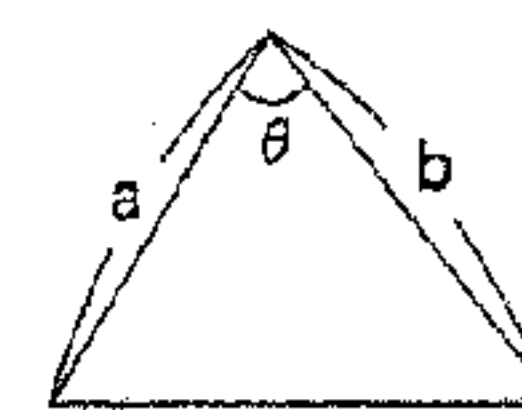
Steps	Operation	Display	Note
1	CM 30 F Z $\text{M}+$	0.5 .	Memory lamp on
2	18 F B $\text{M} \times$	0.951057 .	
3	RM E	0.4755285 .	Ans.

Ex. 5 $\tan^{-1} \left(\frac{1}{\sqrt{1+2^2}} \right)$

DEG RAD

Steps	Operation	Display	Note
1	2 \times E	4.	
2	+ 1 E	5.	
3	\sqrt{x}	2.2360679	
4	F B $\text{M} \div$	0.4472136	
5	F B $\text{M} \text{tan}^{-1}$	24.09485	Ans.

Ex. 6 Area of a triangle



(Formula)

$$S = \frac{1}{2} a \cdot b \cdot \sin \theta$$

DEG RAD $a = 6, b = 3, \theta = 60^\circ$

Steps	Operation	Display	Note
1	60 F Z $\text{M} \times$	0.866025	$\sin \theta$
2	6 \times 3 \div	15.58845	$a \cdot b \cdot \sin \theta$
3	2 E	7.794225	Ans. $\frac{1}{2} a \cdot b \cdot \sin \theta$

Ex. 7 Hyperbolic function, $\sinh x$

(Formula) $\sinh x = \frac{1}{2} (e^x - e^{-x})$ $x = 0.5$

Steps	Operation	Display	Note
1	CM .5 F Z $\text{M} +$	1.64872 .	e^x memory lamp on
2	F B $\text{M} -$	0.6065311- .	$-e^{-x}$ (memory)
3	RM \div 2 E	0.5210944 .	Ans. $\frac{1}{2} (e^x - e^{-x})$

Ex. 8 Conversion of power amplification into decibels

(Formula:) Power amplification = $10 \log \frac{P_2}{P_1}$ [dB]

$P_1 = 100W, P_2 = 200W$

Steps	Operation	Display	Note
1	200 \div 100 \square \square \square \square	0.30103	$\log P_2/P_1$
2	\times 10 \square \square	3.0103	Ans. $10 \log P_2/P_1$

Correcting mistakes When a wrong number is entered, press the \square key to clear the entry and enter the correct number.

Ex. 1 123 + 455 (mistake) 456 (correct)

123 \square 455 \square 456 \square 579.
 \uparrow misoperation

Ex. 2 456 \times 469 (mistake) 369 (correct)

456 \square 469 \square 369 \square 168264.
 \uparrow misoperation

Four arithmetic calculation

Algebraic key operation

Easy operation, the way you see the formula written.

Therefore constant and power calculation are possible without constant mode.

Constant calculation

In multiplication, the first entry (multiplicand) becomes constant. While in division, addition and subtraction, the second entry number becomes constant.

Accuracy

- In four arithmetic calculations, reciprocal calculation and square root extraction, the significant figure is 8 digits.
- In specific functions (except square root extraction), the significant figure is 6 digits provided that the entered number satisfies the conditions shown at the end of this manual.
 (That is, an error of ± 1 takes place at the 6th digit.)

Memory calculation

\square key: Adds the displayed number to the memory register.

The numbers in the display and calculation registers remain unchanged even after the \square key operation.

\square \square \square and \square keys are also effective even after \square key operation.

Note: In memory calculation, when the integer portion of sum or difference exceeds 8 digits the content of memory register is cleared.

8. OVERFLOW ERROR

An overflow error will occur in the following cases.

1. When the integer portion of listed number exceeds 8 digits.
2. When the integer portion of sum, difference, product or quotient exceeds 8 digits.
3. When a number is divided by zero.
4. When the number beyond the entry number range specified at the end of this manual is entered in the calculations of specific functions.

When an overflow error is detected, all the decimal points and a zero are displayed. An overflow error electronically interlocks all keys except the \square key. Overflow error is released by pressing the \square key.

9. HOW TO REPLACE THE BATTERY

Turn off the power source switch.

1. Hold the unit with its display part facing down.
2. Put a coin into a groove on the side of the unit to release the hook inside the unit. (Fig.1)

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3. Take out the battery case. (Fig.2)

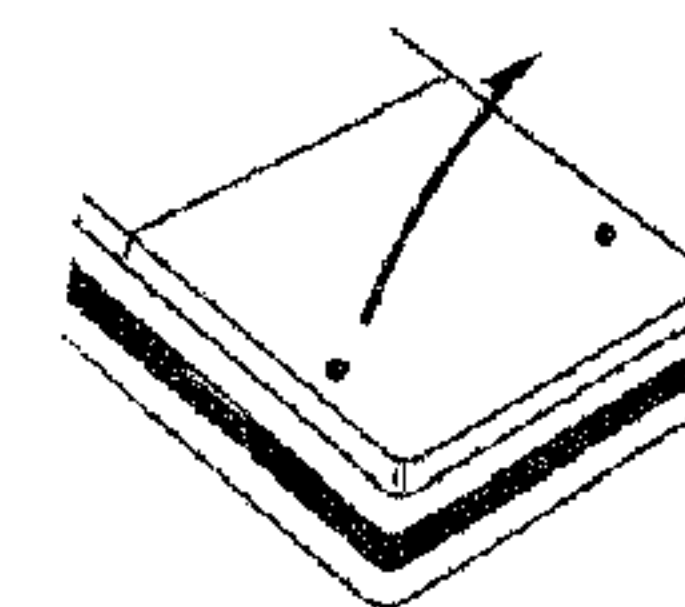


Fig. 1

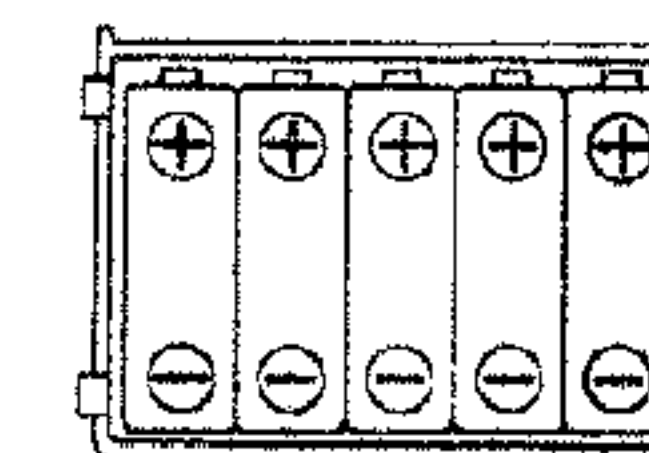


Fig. 2

CAUTION

In case you do not use this calculator for a long time, please take out the batteries and preserve them in a dry, cool and shady place.

HINTS

1. As highly sensitive LSIs and electronic components are used, avoid placing the unit in hot, dusty, humid locations or the place exposed to direct sunlight.
2. Do not jolt or drop the unit.

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3. When cleaning the cabinet, do not use a wet cloth or any organic solutions such as kerosene or benzene.

10. SPECIFICATIONS

Power source:	DC: AM-3 x 5 27 hours (average) } . . . at (20°C) SUM-3E x 5 16 hours (average) }
	(Slightly changes according to the kinds of batteries and the way of use.)
	→ AC: By using AC adaptor model EL-97 (optional)
Capacity:	8 digits
Memory:	1
Decimal point:	Complete floating system.
Sign indicators:	Minus sign indicator, Memory loading indicator.
Basic calculations:	Four arithmetic calculations, memory calculation constant addition (subtraction, multiplication and division), power calculations, chain multiplication and division, repeat addition and subtraction

Entering functions:	$\sin x, \cos x, \tan x$ $\sin^{-1} x, \cos^{-1} x, \tan^{-1} x, e^x, \ln x$ $\log x, 1/x, \sqrt{x}, \pi$
Display tube:	ITRON
Calculation components:	LSI, transistors, diodes, etc.
Dimensions:	89mm(W) x 148mm(D) x 36mm(H) (3-1/2"(W) x 5-7/8"(D) x 1-7/16"(H))
Weight:	450 g (with dry batteries)

Entry number range of specific functions

- 1) Range of trigonometric functions

$$\begin{cases} \theta = \sin^{-x} & -90^\circ \leq \theta \leq +90^\circ \left(-\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2} \right) \\ \theta = \cos^{-x} & 0^\circ \leq \theta \leq +180^\circ \left(0 \leq \theta \leq \pi \right) \\ \theta = \tan^{-x} & -90^\circ \leq \theta \leq +90^\circ \left(-\frac{\pi}{2} \leq \theta \leq +\frac{\pi}{2} \right) \end{cases}$$

- 2) Square root extraction (\sqrt{x})

Entry numbers; $0 \leq x \leq 99999999$

If the number less than a 0 (zero) is entered in the calculation of \sqrt{x} , an overflow error is detected.

- 3) After calculation of specific function, the calculation register is cleared and the “+” function is memorized anew.

Overflow error in function calculations

sin x DEG <input type="radio"/> RAD	When	$ x \geq 99999900$
cos x DEG <input type="radio"/> RAD	When	$ x \geq 99999900$
tan x DEG <input type="radio"/> RAD	When	$ x \geq 99999900$
	When	$ x = 90,270,450 \dots$ (When the value is ∞)
	DEG <input type="radio"/> RAD	When $ x = \pi/2, 3/2\pi, 5/2\pi \dots$ (When the value is ∞)
$\sin^{-1}x$	When	$ x > 1$
$\cos^{-1}x$	When	$ x > 1$
e^x	When	$x \geq 18.420682$
	When	$x \leq -18.420683$
$\ln x$	When	$x \leq 0$
$\log x$	When	$x \leq 0$
$\frac{1}{x}$	When	$x = 0$
\sqrt{x}	When	$x < 0$

Note: If an overflow occurs in the memory, an overflow error is also detected. At the time, the content of the memory is automatically cleared.

WARNING

THE VOLTAGE USED MUST BE THE SAME AS SPECIFIED ON THIS CALCULATOR. USING THIS CALCULATOR WITH A HIGHER VOLTAGE THAN THAT WHICH IS SPECIFIED IS DANGEROUS AND MAY RESULT IN A FIRE OR OTHER TYPE OF ACCIDENT CAUSING DAMAGE. WE ARE NOT RESPONSIBLE FOR ANY DAMAGE RESULTING FROM USE OF THIS CALCULATOR WITH A VOLTAGE OTHER THAN THAT WHICH IS SPECIFIED.

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