SHARP

SHARP

POCKET COMPUTER

ELSI MATE

PC-1201

INSTRUCTION MANUAL

FOR YOUR RECORDS . . . .

For your assistance in reporting this electronic calculator in case of loss or theft, please record below the model number and serial number which are located on the bottom of the unit.
Please retain this information.

Model Number _____ Serial Number _____

Date of Purchase _____ Place of Purchase _____

LIMITED WARRANTY

SHARP ELECTRONICS CORPORATION warrants its Calculator products to the original purchaser to be free from defective materials and workmanship, and agrees to repair any such defect or to furnish a new or equal part in exchange, except batteries, through an authorized Sharp Factory Service Center.

This warranty does not apply to any appearance items nor to any product whose exterior has been damaged or defaced, nor to any product subjected to misuse, abnormal service or handling, nor to any product altered or repaired by other than an authorized Sharp Factory Service Center. This warranty does not apply to any product purchased outside the United States, its territories or possessions.

The period of this warranty covers one (1) year on parts and one (1) year on labor from date of purchase, except the solar cell contained on the solar calculator, which cell is warranted for three (3) years from date of original purchase.

This warranty entitles the original purchaser to have the warranteed parts and labor rendered at no cost for the period of the warranty described above when the calculator is carried or shipped into an authorized Sharp Factory Service Center together with proof of purchase.

This shall be the exclusive written warranty of the original purchaser and neither this warranty nor any other warranty expressed or implied shall extend beyond the period of time listed above. In no event shall Sharp be liable for consequential economic damage or consequensal damage to property. Some states do not allow a limitation on how long an implied warranty lasts or an exclusion of consequential damage, so the above limitation and exclusion may not apply to you. In addition, this warranty gives specific legal rights, and you may have other rights which vary from state to state.

INTRODUCTION

Thank you for your purchase of the SHARP pocket computer model PC-1201. Though small in size, this unit is capable of performing complex calculations with amazing speed and simplicity. Careful reading of this manual will enable you to use your new SHARP computer to its full capability.

OPERATIONAL NOTES

To insure trouble free operation of your SHARP computer, we recommend the following:

1. The computer should be kept in areas free from extreme temperature fluctuations, moisture and dust.
2. A soft, dry cloth should be used to clean the computer. Do not use solvents or a wet cloth.
3. If the computer will not be operated for an extended period of time, remove the batteries for main power (not memory power*) to avoid possible damage caused by battery leakage. (* See page 6)
4. When you are using an AC adaptor/charger, turn off the power switch prior to connecting or disconnecting the AC cord.
5. Do not incinerate used batteries when disposing of them.
6. If service of your computer is required, use only an authorized SHARP service center.

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THE POWER

The PC-1201 operates on two kinds of power sources. One is a main power for the calculation and the other is a memory power for the protection of program and date after the main power is turned off.

Main power: Rechargeable battery, AC current with recharger/adaptor (EA-17E) or two "AA" dry batteries.

Memory power: Two silver oxide batteries "S15"

RECHARGING AND AC LINE OPERATION

Recharging

1. The procedure for operation by AC adaptor-charger is as follows:
   1) Turn the PC-1201 power switch to OFF.
   2) Insert the adaptor-charger plug into the AC adaptor connecting terminal of the PC-1201 and insert the power plug into AC outlet.
   3) A discharged battery will be fully charged after being connected to the adaptor-charger for 15 hours.
   4) To finish charging, remove the adaptor-charger from both the AC outlet and the PC-1201 with the power switch being set at OFF.
   5) A fully charged battery provides approximately 6.5 hours of the continuous operation.

Note: i) When rechargeable battery operation of the computer is done after purchasing or stored unused for three months and more, please note the following:
The display may not happen to appear at the computer switch ON.
This is because the capacity of the rechargeable battery is lowered due to the self-discharge.
In this case connect the AC adaptor-charger with AC outlet and then use the computer at the AC line operation with the computer switch set at ON. After the calculation, recharge

the battery by setting the computer switch at OFF.

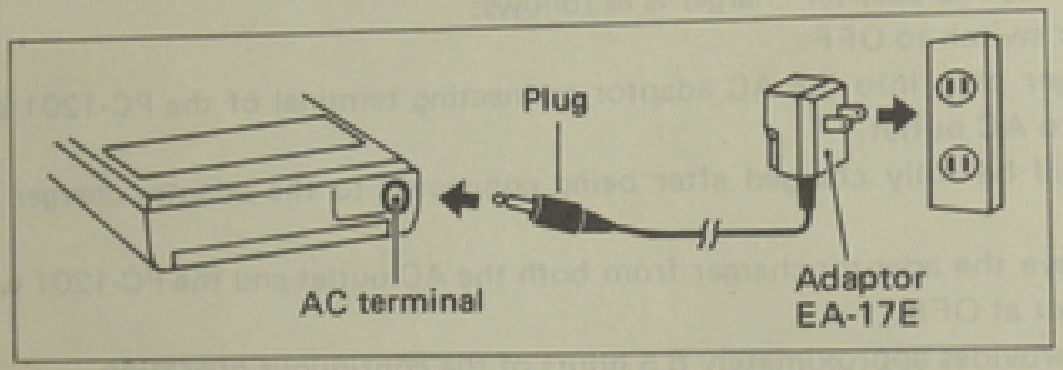
ii) Never use any AC adaptor or charger except EA-17E & never use any rechargeable batteries except EA-18B.

iii) To avoid any transient voltage from the AC adaptor/charger, the PC-1201 should be turned OFF before plugging it in.

2. AC Line operation

The procedure for operation by AC line is as follows:

1) Turn the PC-1201 power switch to OFF.
2) Insert the adapor-charger plug into the AC adaptor connecting terminal of the PC-1201 and then insert the power plug into AC outlet.
3) Turn the PC-1201 power switch to ON.



CAUTION

Use of other than AC adaptor/charger EA-17E & the Ni-Cd battery pack EA-18B may apply improper voltage to your SHARP computer & will cause damage.

BATTERY REPLACEMENT

Main power: The condition of all of the decimal points being lit indicates that the batteries should be replaced or recharged.*

Batteries: Two "AA" dry batteries or the Ni-Cd battery pack EA-18B

Recharger: EA-17E

1. Turn off the power switch.
2. Remove the battery cover by sliding it in the direction of the arrow on the cover. (Fig. 1)
3. Replace the battery. Be sure that the "+" and "—" mark on the battery correspond to the "+" and "—" mark in the case. (Fig.1)
4. Replace the battery cover.

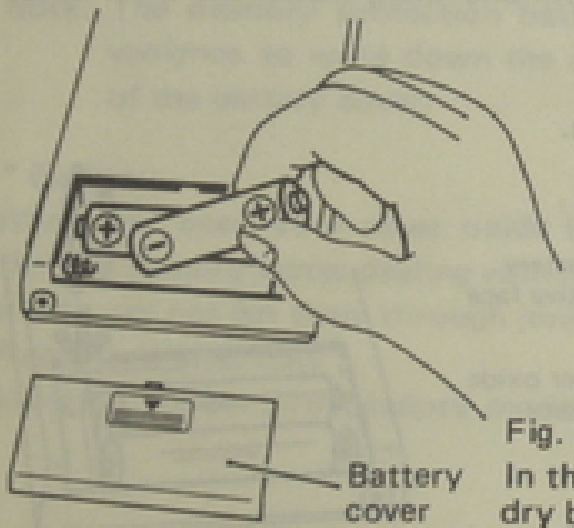


Fig. 1
In the case of dry battery.

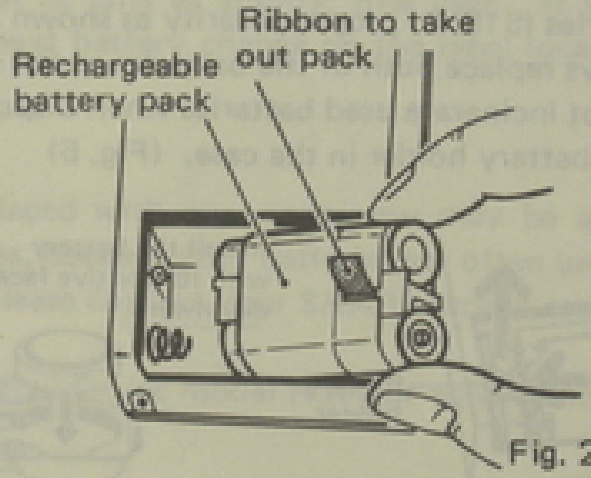


Fig. 2
In the case of rechargeable battery.

Note

- If the used battery is kept in the battery compartment of the computer, damage to the computer by battery leakage may result.
- Always replace both batteries at the same time.
- When installing the Ni-Cd battery pack EA-18B, refer to Fig. 2.

Memory power:

1. Remove the battery cover by sliding it in the direction of the arrow on the cover.
2. Remove the battery holder of the silver oxide batteries while pushing the holder in the direction of the arrow shown in Fig. 3.
3. Replace the used batteries with new ones.*

Note: • Wipe off the surface of the new batteries with dry cloth and then, install the silver-oxide batteries (S15) in proper polarity as shown in Fig. 4.
• Always replace both of the batteries at the same time.
• Do not incinerate used batteries when disposing of them.

4. Replace the battery holder in the case. (Fig. 5)

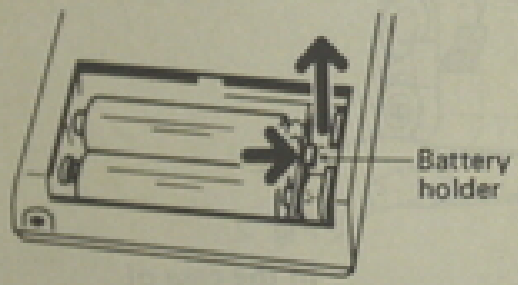


Fig. 3

Fig. 4

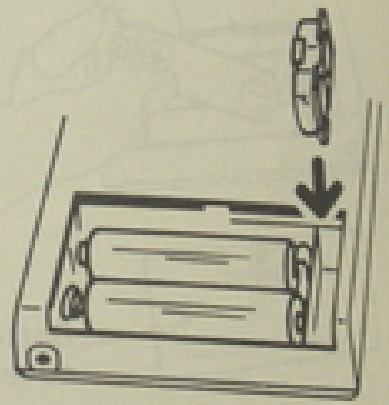


Fig. 5

computer

rection of

lver-oxide

Caution

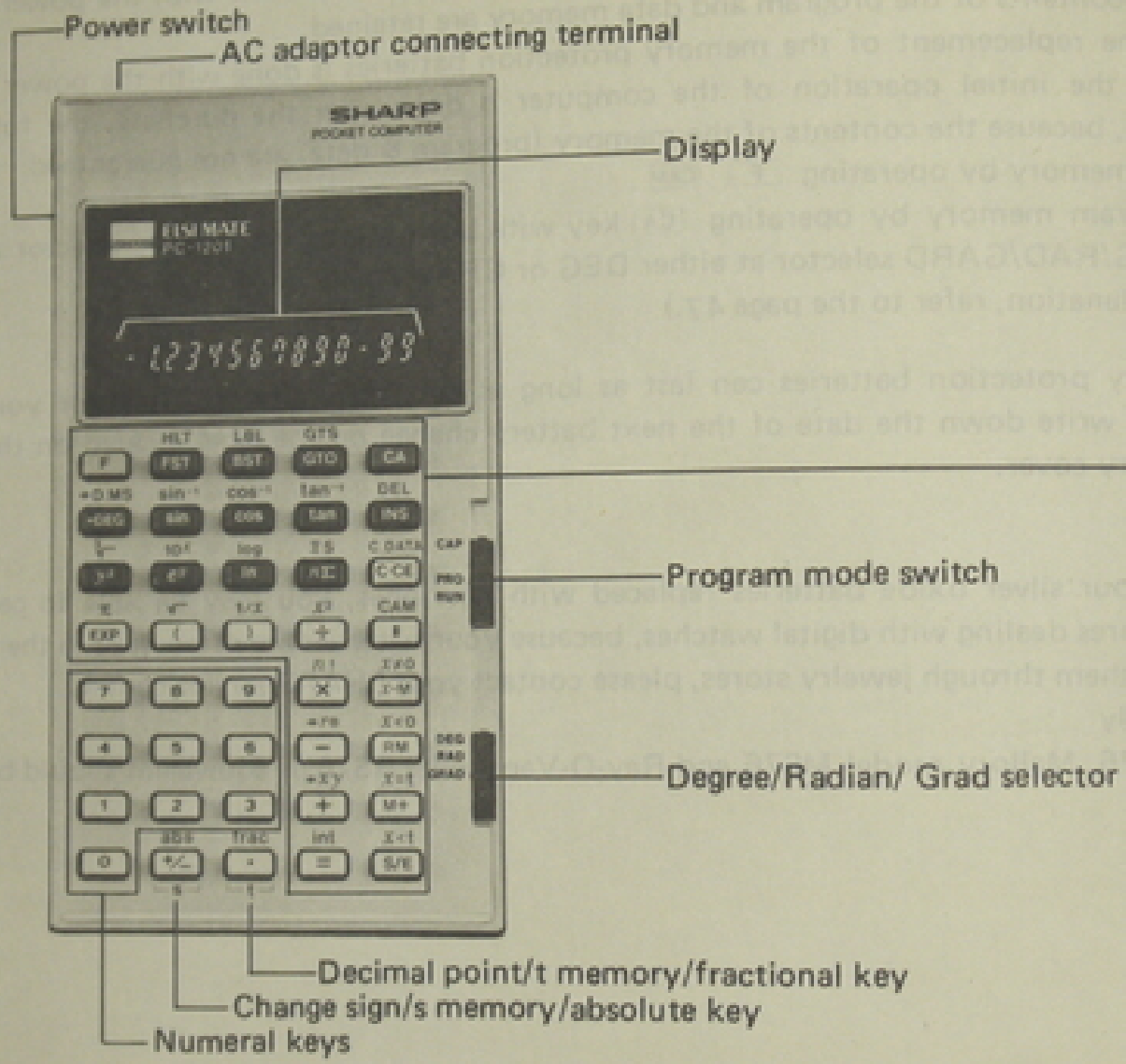
- When the replacement of the batteries for the memory protection is done with the power switch turned-on, the contents of the program and data memory are retained.
- When either the replacement of the memory protection batteries is done with the power switch turned-off, or the initial operation of the computer is done after the purchase, the following should be done, because the contents of the memory (program & data) are not guaranteed.
- Clear the data memory by operating [F] [CAM].
- Clear the program memory by operating [CA] key with both the program mode selector at CAP position & DEG/RAD/GARD selector at either DEG or GRAD position.
  (For detail explanation, refer to the page 47.)

Note: The memory protection batteries can last as long as approx. one year. It is for your convenience to write down the date of the next battery change on the label located on the back of the battery cover.

* Battery:

When you need your silver oxide batteries replaced with new ones, you may be able to get them through jewelry stores dealing with digital watches, because your batteries are often used in them.
If you can not get them through jewelry stores, please contact your SHARP service center.
Please note that only
Eveready model S76, Mallory model MS76 and Ray-O-Vac model RS76 or equivalent should be used.

THE KEYBOARD



F — Function key

HLT / FST — Forward step/Halt key

LBL / BST — Back step/Label key

GTS / GTO — Unconditional jump/subroutine jump key

CA — Clear all key

°'" / →DEG — Degree/minute/second ↔ Decimal degrees conversion key

$\sin^{-1}$ / sin, $\cos^{-1}$ / cos, $\tan^{-1}$ / tan — Trigonometric and inverse trigonometric function keys

DEL / INS — Insert/delete key

$\sqrt[3]{\ }$ / y^x — y^x and cube root key

10^x / e^x — Natural/common antilogarithm key

log / ln — Natural/common logarithm key

$\bar{x}$ S / $n\Sigma$ — Statistic calculation key

CDATA / C·CE — Clear • clear entry/correct data key (delete)

π / EXP — Exponent and Pi key

$\sqrt{\ }$ / (— Open parenthesis/square root key

$1/x$ /) — Closed parenthesis/reciprocal key

x^2 / ÷ — Division/square key

CAM / ↕ — Exchange/clear all memory key

$n!$ / × — Multiplication/factorial key

$x \neq 0$ / $x \rightarrow M$ — Memory-in/non-zero jump key

→r θ / − — Subtraction/rectangular coordinates → polar coordinates conversion key

$x < 0$ / RM — Recall memory/negative value jump key

→x y / + — Addition/polar coordinates → rectangular coordinates conversion key

$x = t$ / M+ — Memory plus/equal jump key

int / = — Equals/integer key

$x < t$ / S/E — Start-end/comparison jump key

MANUAL CALCULATIONS

- Set the program mode switch at "RUN" position.

1. Operating controls

The following keys are used in both manual and program calculations. As for the keys for the program calculations only, refer to "Program calculation" on page 47.

ON OFF **Power switch**

When the power switch is turned on, the machine is ready for operation.

CA **Clear all key**

Clears the contents of the calculation registers except for program and data memories and reseat the program step to 0 (zero).

F **Function key**

This key is to be operated when designating the second function (labeled in orange) of the special function keys. (i.e. log, $\cos^{-1}$, $\sqrt[3]{x}$, etc).

23 [F] [log / ln] → log 23

0.5 [F] [cos⁻¹ / cos] → $\cos^{-1}$ 0.5

- In the calculation examples shown below, the operation of function keys are represented as follows;

[log / ln] ① [ln] (First function)

② [F] [log] (Second function)

0 ~ 9 **Numeral keys**

- Used to enter numbers.

  Ex. 123 → 1 2 3

- If depressed following the memory keys (x→M , RM , M+), designates the memory location of the memories #0 to 9.

frac
·
t

Decimal point/t. memory/fractional key

- Positions the decimal point in an entered number.

  Ex. 12.3 → 1 2 · 3
  0.4 → · 4

- If depressed following the memory keys (x→M , RM , M+), designates the t memory (test memory).

- If depressed following the F key, displays the decimal portion only of the number.

  Ex. Calculate $\frac{826}{13}$

Key operation		Display
826 ÷ 13 =	→	63.53846154 (quotient)
F frac	→	0.53846154
× 13 =	→	7.00000002 (remainder)

abs
[+/−]
[S]

Change sign/s. memory/absolute key

- Changes the sign of the displayed number from a positive to a negative or from a negative to a positive.
- If depressed following the memory keys ([x→M], [RM], [M+]), designates the s memory.
- If depressed following the [F] key, displays the absolute value of the number.

int
[=]

Equals/integer key

- Completes the arithmetic function of +, −, x, ÷, and y^x.
- If depressed following the [F] key, displays the integer portion only of the number.

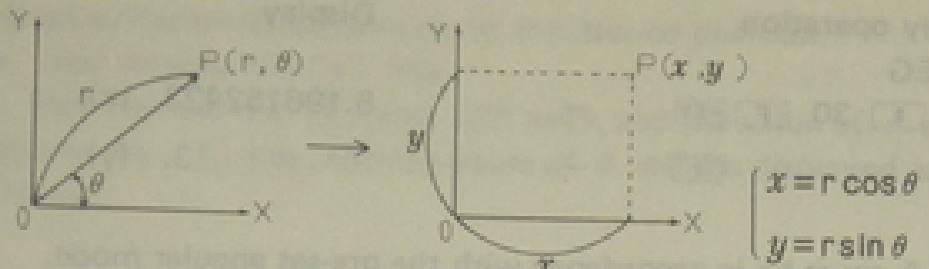
Ex. Calculate $\frac{826}{13}$ and displays the integer portion of the answer.

Key operation		Display
826 [÷] 13 [=]	→	63.53846154
[F] [int]	→	63. (quotient)

$\rightarrow xy$
[+]

Addition/polar coordinates → rectangular coordinates conversion key

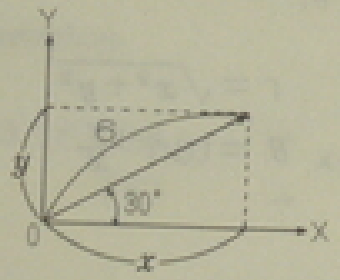
- Orders addition.
- If depressed following the [F] key, converts polar coordinates into rectangular coordinates.



$$\begin{cases} x = r\cos\theta \\ y = r\sin\theta \end{cases}$$

1) Set the Degree/Radian/Grad selector to the desired angular mode.
2) Enter r and depress the [↕] key.
3) Enter θ and depress the [F] and [→xy] keys, the value of x will be displayed.
4) Then depress the [↕] key, the value of y will be displayed.

Ex.



Calculates x and y

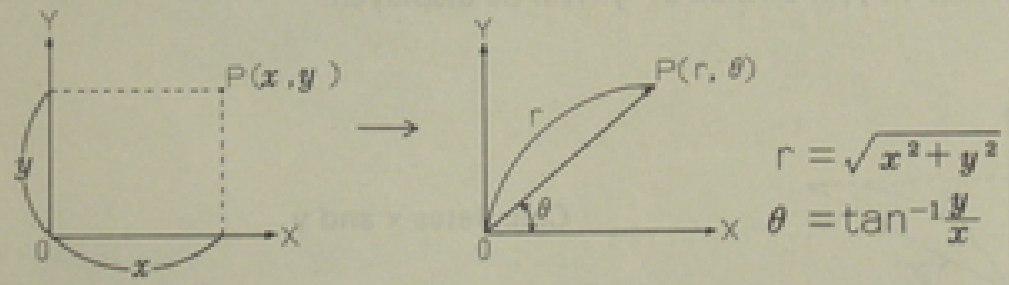
Key operation		Display	
DEG			
6 [↕] 30 [F] [→xy]	→	5.196152423	(x)
[↕]	→	3.	(y)

Note: The unit of θ must be in accordance with the pre-set angular mode.

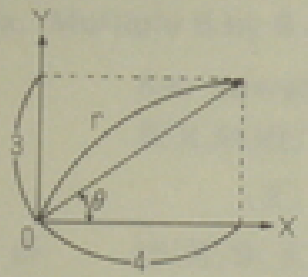
[−] $\rightarrow r\theta$

Subtraction/rectangular coordinates → polar coordinates conversion key

- Orders subtraction.
- If depressed following the [F] key, converts rectangular coordinates into polar coordinates.



1) Set the Degree/Radian/Grad selector to the desired position.
2) Enter x, then depress the [↕] key.
3) Enter y then depress the [F] and [→r/θ] keys, and the value of r will be displayed.
4) Then depress the [↕] key, and the value of θ will be displayed according to the pre-set angular mode.



Ex. Converts rectangular coordinates (4, 3) to polar coordinates with the angle pre-set at degrees.

Key operation		Display	
DEG			
4 [↕] 3 [F] [→r/θ]	→	5.	(r)
[↕]	→	36.86989765	(θ)

$n!$
[×]

Multiplication/factorial key

- Orders multiplication.
- If depressed following the [F] key, calculates the factorial of the displayed number.
  Factorial of n (n!) = n·(n-1)·(n-2) ····· 3·2·1 (note: 69 is the maximum).

x^2
[÷]

Division/square key

- Orders division
- If depressed following the [F] key, gives the square.

Ex. 29^2 =

Key operation		Display
29 [F] [x^2]	→	841.

x=t
M+

Memory plus/equal jump key

- Used to add the displayed number or a calculated result to the contents of the designated memory.

PC-1201 has 12 memories (0~9, t and s).

To designate each memory, depress the numeral key (0 ~ 9), t or s key following the M+ key.

Ex. Multiply 5 by 9 and add the answer to the contents of the No.3 memory.

Key operation		Display
5 × 9 M+	→	9.
3	→	45.

or (5 × 9 = M+ 3)

- If depressed following the F key, see x=t M+ on page 50.

x<0
RM

Recall memory/negative value jump key

- Displays the contents of the designated memory.

To designate each memory, depress the numeral key (0 ~ 9), t or s following the RM key.

- If depressed following the F key, see x<0 RM on page 50.

x≠0
x→M

Memory-in/non-zero jump key

- Clears the contents of the designated memory and replaces it with the number in the display.

To designate each memory, depress the numeral key (0 ~ 9), t or s key following the x→M key.

- If depressed following the [F] key, see [x≠0 / x→M] on page 49.

CAM

Exchange/clear all memory key

- Used to exchange the displayed number (x register) and the number stored in the machine (y register) together with their respective symbols.
- If depressed following the [F] key, clears the contents of all of the 12 memories.

→D.MS
→DEG

Degree/minute/second ↔ Decimal degrees conversion key

- Converts degrees/minutes/seconds to their decimal equivalents.

  Ex. Converts 12°30'45" to its decimal equivalents.

Key operation		Display
12.3045 [→DEG]	→	12.5125

- If depressed following the [F] key, converts decimal degrees to degree/minute/second.

  Ex. Converts 12.5125 degrees to degree/minute/second.

Key operation		Display
12.5125 [F] [→D.MS]	→	12.3045 (12°30'45")

$\sin^{-1}$ **Trigonometric/inverse trigonometric function key**

[sin] $\cos^{-1}$ [cos] $\tan^{-1}$ [tan]

- Used obtain the sine, cosine or tangent of a displayed number.

Ex. Find the sine of 40 in degrees
Find the cosine of 40 in radians
Find the tangent of 40 in grads

Key operation			Display
DEG	40 [sin]	→	6.427876097−01
RAD	40 [cos]	→	−6.669380638−01
GRAD	40 [tan]	→	0.726542528

- If depressed following the [F] key, the inverse trigonometric functions are calculated.

Ex. Find the arc sine of 0.5 in degrees
Find arc cosine of 0.5 in radians
Find the arc tangent of 0.5 in grads

Key operation			Display
DEG	0.5 [F] [sin⁻¹]	→	30.
RAD	0.5 [F] [cos⁻¹]	→	1.047197551
GRAD	0.5 [F] [tan⁻¹]	→	29.51672353

Y^x/cube root key

- Raises a number to a power.

Ex. Calculate $4^{2.7}$ and $(5 \times 7)^4$

Key operation		Display
4 [y^x] 2.7 [=]	→	42.22425314
5 [×] 7 [y^x] 4 [=]	→	1500625.

- If depressed following the [F] key, calculates the cube root of the displayed number.

Ex. Calculate $\sqrt[3]{343}$

Key operation		Display
343 [F] [$\sqrt[3]{}$]	→	7.

Natural/Common antilogarithm key

- Calculates the antilogarithm base e ($e \fallingdotseq 2.718281828$) & base 10 of the displayed number.

Ex. Calculate e^4

Key operation		Display
4 [e^x]	→	54.59815

Ex. Calculate $10^{12.3}$

Key opration		Display
12.3 [F] [10^x]	→	1.995262315 12

log
ln **Natural/Common logarithm key**

- Used to obtain the logarithm base e & base 10.

Ex. Calculate ln 54

Key operation		Display
54 [ln]	→	3.988984047

Ex. Calculate log 30

Key operation		Display
30 [F] [log]	→	1.477121255

x̄ S
nΣ **Statistic calculation key**

- Used to obtain sum of the samples (n), sum of x (Σx), mean ($\bar{x}$) and standard deviation (s) of the samples.

The mean and standard deviation are calculated by the following formulas.

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$s = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$$

Ex. Calculates mean and standard deviation.

No.	x values	Frequency
1	40	1
2	50	3
3	60	3
4	70	8
5	80	9
6	90	4
7	100	2

Key operation	Display	Remarks
CE 40 nΣ	1.	Number of samples
50 × 3 nΣ	4.	"
60 × 3 nΣ	7.	"
70 × 8 nΣ	15.	"
80 × 9 nΣ	24.	"
90 × 4 nΣ	28.	Number of samples
100 × 2 nΣ	30.	"
↓	2210.	Sum of x
F xs	73.66666667	Mean of x
↓	14.73521082	Standard deviation

Note:
- Be sure to depress the [C·CE] or [CA] key before a statistical calculation to clear calculation registers.
- Calculations having parenthesis are prohibited in the statistical calculation.

Note: The above formula of standard deviation is used to estimate the standard deviation(s) of samples. Moreover, the standard deviation (σ) of population can be determined as follows:

1. Determine standard deviation(s) by use of this machine.
2. Make a note of calculated standard deviation(s) and clear it by depressing the [CA] key.
3. Input the noted value and multiply it by $\sqrt{\frac{n-1}{n}}$.

C.DATA **Clear · Clear entry/correct data key**

C·CE

- Used to clear an incorrectly entered number.

  Ex. Correct 524 to 542

Key operation	Display
524	524.
C·CE	0.
542	542.

- Reset the error condition or clears the contents of the calculation registers. The contents of the data and program memory are not changed.
- Used to correct an incorrectly entered number in statistical calculation

  Ex. Correct a false data when a false number 55 is input instead of 50 as No.2 data in previous example (see page 23) of the statistical calculation.

Key operation	Display
C·CE 40 Σ+	1.
55 × 3 Σ+	4.
55 F C.DATA	3.
55 F C.DATA	2.
55 F C.DATA	1.
50 × 3 Σ+	4.
60 × 3 Σ+	7.
⋮	

π
EXP

Exponent/Pi key

- Used to enter the exponent of a number.

Ex.	Key operation	Display
2.3×10^{24}	2.3 EXP 24	2.3 24
2.3×10^{-9}	2.3 EXP 9 +/−	2.3 −09
100,000	EXP 5	1. 05

- If depressed following the F key, the constant π($\pi \doteqdot 3.141592653$) is entered.

√
(

Open parenthesis/square root key

- Used to open parenthesis. This key is effective up to the calculation having triple parenthesis. (3 levels)
- If depressed following the F key, calculates the square root of the number displayed.

Ex. Calculate $\sqrt{123}$

Key operation	Display
123 F √	11.09053651

1/x
)

Close parenthesis/reciprocal key

- Used to close parenthesis.

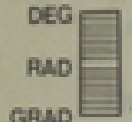
Ex. Calculate $123 \div [468 \div \{(4 + 5) \times (6 + 7)\}]$

Key operation	Display
123 ÷ (468 ÷	
(4 + 5 × (	
6 + 7))) =	30.75

- If depressed following the F key, calculate the reciprocal of the displayed number.

  Ex. Calculate $\frac{1}{8}$

Key operation	Display
8 F 1/x	0.125



Degree/Radian/Grad selector

- Used for calculation of trigonometric, inverse trigonometric and coordinates conversion.

  "DEG" position — Entries and answers are is decimal degree

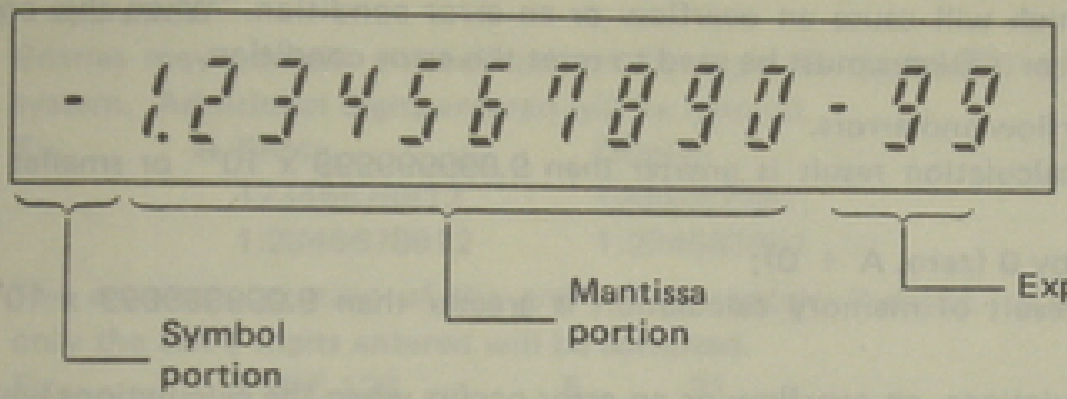
  "RAD" position — Entries and answers are in radians

  "GRAD" position* — Entries and answers are in grad.

  *GRAD: A new degree system which is being used in Europe

  $(100^g = 90^\circ = \frac{\pi}{2}$ [rad]).

DISPLAY FORMAT



All entries or answer will be displayed in either floating decimales or scientific notation. When operating in scientific notation, the minus symbol will be displayed to the left of the number (i.e.: mantissa or exponent).

The following symbols are displayed in the symbol portion.

—: Minus symbol
Indicates that the number in the display following the "—" is negative.

E: Error symbol
Appears when an overflow or error is detected.

⊔: Halt symbol
Appears when the HALT instruction is read-out and program calculation stops temporarily.

OVERFLOW ERRORS

There are several situations which will cause an overflow or an error condition. When this occurs, E 0. will be displayed. The [C€] or [CA] keys must be used to reset the error condition.

The following will cause an overflow and errors.

1. The absolute value of a calculation result is greater than $9.999999999 \times 10^{99}$ or smaller than 1×10^{-99}.
2. When a number is divided by 0 (zero, A ÷ 0);
3. The absolute value of a result of memory calculation is greater than $9.999999999 \times 10^{99}$ or smaller than 1×10^{-99}.
4. When using scientific calculations, an overflow or an error occurs when the calculations which is out of the calculation range on page 100 are performed.
   But, as for tan x and a statistical calculation, an overflow or an error is also caused by the following condition.

tan x:	DEG:	$\|x\| = 90 \times (2N-1)$
	GRAD:	$\|x\| = 100 \times (2N-1)$
	RAD:	$\|x\| = \frac{\pi}{2} \times (2N-1)$
		N : integer

Statistical:

- When a number of samples is 1 and the standard deviation (s) is calculated.
  (The square of any number must be positive.)

OPERATIONS

Before operation

- Entries may contain a maximum of 10 digits (9 decimales) when working in floating decimal system. Additional digits entered will be ignored.

Ex.	Enter	Display
	12345678912	1234567891.
	1.2345678912	1.234567891

- The exponent portion of the entry may contain 2 digits. If more than 2 digits are entered, only the last 2 digits entered will be accepted.

Ex. 5 [EXP] 123 → 5. 23

Display system

- All answers exceeding 10 integers or with an absolute value smaller than 1 and exceeding 9 decimals (Ex. 0.1234567891) will automatically be converted into scientific notation.
- During the calculation of the machine, "—" on the left most digit of the display (symbol portion) will be lit.
- To obtain an accurate result, be sure to perform the following operation before starting calculations.

Set RUN mode		(Display)	
Power switch "ON"	→	0.	
1111111111 [×] [=]	→	1.234567901	18

NORMAL CALCULATIONS

Four arithmetic calculations

Ex. 1 $123 - 45.6 + 789 =$ ①

Ex. 2 $230{,}000 \times (-240) \div 0.12 =$ ②

Ex. 3 $(54 \times 10^{5} + 6.76 \times 10^{6}) \div (1.25 \times 10^{-13}) =$ ③

Key operation	Display	Note
123 [−] 45.6 [+] 789 [=]	866.4	Ans. ①
230000 [×] 240 [+/−] [÷]	−55200000.	
.12 [=]	−460000000.	Ans. ②
54 [EXP] 5 [+] 6.76 [EXP] 6 [÷]	12160000.	
1.25 [EXP] 12 [+/−] [=]	9.728 18	Ans. ③

- When entering a negative number, operate as follows; Numeral keys [+/−].

Constant calculation

Ex. 1 $321 + \underline{357} =$ ..... ①
$654 + \underline{357} =$ ..... ②
$987 + \underline{357} =$ ..... ③

Constant: addend

Key operation	Display	Note
321 [+] 357 [=]	678.	①
654 [=]	1011.	②
987 [=]	1344.	③

Ex. 2 579 − 159 = ····· ①
456 − 159 = ····· ②
123 − 159 = ····· ③

Constant: subtrahend

Key operation	Display	Note
579 [−] 159 [=]	420.	①
456 [=]	297.	②
123 [=]	−36.	③

Ex. 3 742 x 450 = ····· ①
742 x 235 = ····· ②
742 x 89 x 10^6 = ····· ③

Constant: multiplicand

Key operation	Display	Note
742 [×] 450 [=]	333900.	①
235 [=]	174370.	②
89 [EXP] 6 [=]	6.6038 10	③

Ex. 4 $862 \div \underline{8} = \cdots\cdots ①$
$751 \div \underline{8} = \cdots\cdots ②$
$-624 \div \underline{8} = \cdots\cdots ③$

Constant: divisor

Key operation	Display	Note
862 [÷] 8 [=]	107.75	①
751 [=]	93.875	②
624 [+/−] [=]	−78	③

Memory calculation

- The PC-1201 has twelve (12) memory registers. To designate each memory, depress the memory key ([x→M] , [RM] or [M+]) followed by the numeral keys ([0] ~ [9]), [S] or [t] .
- Clear the memory before starting a memory calculations.
  To clear the designated memory, depress the [C·CE] and [x→M] keys followed by the numeral keys ([0] ~ [9]), [S] or [t] .
- To clear all memories, depress the [F] and [CAM] keys in this order.

Sub-/total calculation

Ex. 1 123 + 456 + 789 = ····· ① Sub-total
345 + 678 − 234 = ····· ② ″
+) 567 − 891 + 147 = ····· ③ ″
Total ····· ④

Key operation	Display	Note
C·CE x→M 0 *	0.	Clears 0 memory
123 + 456 + 789 M+ 0	1368.	Sub-total ①
345 + 678 − 234 M+ 0	789.	″ ②
567 − 891 + 147 M+ 0	−177.	″ ③
RM 0	1980	Total ④

*0 (zero) is memory designation.

• 0 memory is used in above example.

Ex. 2 Sum (difference) of products and individual product

45 x 67 x 89 = ... ①
+) 12 x 34 x 56 = ... ②
–) 78 x 91 x 23 = ... ③
Total ④

Key operation	Display	Note
CE x→M S *	0.	Clears S memory
45 X 67 X 89 M+ S	268335.	① Each product
12 X 34 X 56 M+ S	22848.	② Each product
78 X 91 X 23 +/– M+ S	–163254.	③ Each product
RM S	127929.	④ Sum or difference of products

* S memory designation

• When subtracting a number from the memory, depress the +/– and M+ keys in this order.

Ex. 3 Sum (difference) of quotients and individual quotient

567 ÷ 6 ÷ 8 = ... ①

+) 891 ÷ 5 ÷ 4 = ... ②

−) 2345 ÷ 25 ÷ 7 = ... ③

Sum or difference of quotients ④

Key operation	Display	Note
C CE x→M 2	0.	Clears No.2 memory
567 ÷ 6 ÷ 8 M+ 2	11.8125	Each quotient
891 ÷ 5 ÷ 4 M+ 2	44.55	Each quotient
2345 ÷ 25 ÷ 7 +/− M+ 2	−13.4	Each quotient
RM 2	42.9625	Sum or difference of quotients

Ex. 4 Products (quotients) of sums (differences) and individual sum (difference)

(234 + 56) x (789 − 102) ÷ (23 + 45) =

Key operation	Display	Note
23 [x→M] [0] 45 [M+] [0]	45.	
789 [x→M] [1] 102 [+/−] [M+] [1]	−102.	
234 [+] 56 [×] [RM] [1]	687.	
[÷] [RM] [0] [=]	2929.852941	Ans.

- If the [Ctl] and [x→M] keys are not depressed prior to calculation, a previously stored number can be cleared from the memory when a new number is stored in the memory by depression of the [x→M] key.
- Above example can also be calculated by using the parenthesis instead of the memory key.

SCIENTIFIC CALCULATIONS

- The accuracy of functions are described in "SPECIFICATIONS".
- The following functions can be used in chain calculations:
  sin, cos, tan, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, → DEG, → D.MS, e^x, 10^x, ln, log, $\sqrt{\ }$, $\sqrt[3]{\ }$, x^2, $1/x$, π, n!, abs, frac, int, ( )
- Calculations having parenthesis are prohibited in the statistical calculation.

1. Trigonometric function

Ex. 1 $\cos \frac{\pi}{4} = ①$

Ex. 2 $\sin^2 67^\circ - \sin^2 32^\circ = ②$

Key operation	Display	Note
RAD [F] [π] [÷] 4 [=] [cos]	7.071067812 –01	Ans. ①
DEG 67 [sin] [F] [x^2] [−]	8.473291851 –01	$\sin^2 67^\circ$
32 [sin] [F] [x^2] [=]	5.665147585 –01	Ans. ②

2. Inverse trigonometric function

($\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$)

- A calculation result of inverse trigonometric function can be obtained in the following ranges:

$\theta = \sin^{-1} x$, $\tan^{-1}$

DEG: $-90 \leqq \theta \leqq 90$

RAD: $-\frac{\pi}{2} \leqq \theta \leqq \frac{\pi}{2}$

GRAD: $-100 \leqq \theta \leqq 100$

$\theta = \cos^{-1} x$

DEG: $0 \leqq \theta \leqq 180$

RAD: $0 \leqq \theta \leqq \pi$

GRAD: $0 \leqq \theta \leqq 200$

Ex. 1 $\sin^{-1} 0.5 = ①$

Ex. 2 $\tan^{-1} \frac{\sqrt{1-0.6^2}}{0.6} = ②$

Key operation	Display	Note
GRAD .5 [F] [sin⁻¹]	33.33333333	Ans. [g] ①
DEG 1 [−] .6 [F] [x²] [=]	0.64	
[F] [√] [÷] .6 [=] [F] [tan⁻¹]	53.13010235	Ans. [°] ②

3. Angle conversion

To convert degree/minute/second to decimal equivalents, degrees and minutes/seconds should be entered as integer and decimal respectively.

Ex. $12^{\circ}39'18''$ → Enter 12.3918

- When decimal degrees are converted into degree/minute/second, the display (answer) indicates that the integer portion is degrees, 1st and 2nd decimal digits are minutes and the 3rd and 4th digits are the seconds.
- The 5th through end decimal digits are decimal degrees.

Ex. 1 Convert degree/minute/second to its decimal equivalent.

$12^{\circ}39'18'' =$ ①

Ex. 2 Convert decimal degrees to degree/minute/second.

$12.655 =$ ②

Ex. 3 Hour/minute/second + hour/minute/second.

7 hours 45 minutes 13 seconds + 12 hours 29 minutes 54 seconds = ③

Key operation	Display	Note
12.3918 [→DEG]	12.655	Ans. 12.655° ①
12.655 [F] [→D.MS]	12.3918	Ans. 12°39'18" ②
7.4513 [→DEG] [+]	7.753611111	
12.2954 [→DEG] [=]	20.25194444	
[F] [→D.MS]	20.15069999	Ans. ③ 20 hours 15 minutes 7 seconds

4. Power function (y^x)

- y^x = can be calculated if the following conditions are satisfied:
  y = positive number
  x = whole entry number

Ex. 1 $23.5^{2.5}$ = ①

Ex. 2 $(7 + 5)^{-4} = \frac{1}{(7 + 5)^4}$ = ②

Ex. 3 $258^{1/4} = \sqrt[4]{258}$ = ③

Ex. 4 $(51.3^4)^{2.4}$ = ④

Key operation	Display	Note
23.5 [y^x] 2.5 [=]	2677.131201	Ans. ①
7 [+] 5 [y^x] 4 [+/−] [=]	4.822530865 −05	Ans. ②
258 [y^x] 4 [F] [1/x] [=]	4.007789715	Ans. ③
51.3 [y^x] 4 [y^x] 2.4 [=]	2.612923559 16	Ans. ④

Ex. 5 8^5 = ... ①
12^5 = ... ②
23^5 = ... ③

Constant: 5

Key operation	Display	Note
8 [y^x] 5 [=]	32768.	①
12 [=]	248832.	②
23 [=]	6436343.	③

5. Logarithmic function

Ex. 1 $\frac{1}{2} \cdot \ln 21 =$ ①

Ex. 2 $5^3 \cdot \ln 5 =$ ②

Ex. 3 $\frac{32^4}{\log 32} =$ ③

Ex. 4 $\log \frac{\sqrt{7^3 - 1}}{7} =$ ④

Key operation	Display	Note
2 [F] [1/x] [×] 21 [ln] [=]	1.522261219	Ans. ①
5 [y^x] 3 [×] 5 [ln] [=]	201.179739	Ans. ②
32 [y^x] 4 [÷] 32 [F] [log] [=]	696658.815	Ans. ③
7 [F] [x^2] [−] 1 [=] [F] [$\sqrt{\ }$]	6.92820323	$\sqrt{7^3 - 1}$
[÷] 7 [=] [F] [log]	−4.477421293 −03	Ans. ④

6. Exponential calculation

Ex. 1 $e^{7} + e^{3} =$ ①

Ex. 2 $e^{\frac{1}{5}\ln 37} =$ ②

Ex. 3 $10^{2.5 - 3.1} =$ ③

Ex. 4 $1.5 \times 10^{-3} \times 10^{\frac{65}{20}} =$ ④

Key operation	Display	Note
7 [e^x] [+] 3 [e^x] [=]	1116.718694	Ans. ①
5 [F] [1/x] [×] 37 [ln] [=] [e^x]	2.058924136	Ans. ②
2.5 [−] 3.1 [=] [F] [10^x]	2.511886432 −01	Ans. ③
1.5 [EXP] 3 [+/−] [×]	0.0015	
[(] 65 [÷] 20 [)] [F] [10^x] [=]	2.667419115	Ans. ④

APPLICATION

Ex. 1 Hyperbolic function

(Formula) $\sin hx = \dfrac{e^x - e^{-x}}{2}$, $\cos hx = \dfrac{e^x + e^{-x}}{2}$

$\tan hx = \dfrac{e^{2x} - 1}{e^{2x} + 1}$

sin h 0.6 = , cos h 0.6 = , tan h 0.6 =

Key operation

.6 [e^x] [−] [F] [1/x] [÷] 2 [=] → 6.366535819 −01 (sin h 0.6)

.6 [e^x] [+] [F] [1/x] [÷] 2 [=] → 1.185465218 (cos h 0.6)

.6 [X] 2 [=] [e^x] [x→M] [0] [−] 1 [÷]

[(] [RM] [0] [+] 1 [)] [=] → 5.370495669 −01 (tan h 0.6)

Ex. 2 Inverse hyperbolic function

(Formula) $\sin h^{-1} x = \ln (x + \sqrt{x^2 + 1})$ (Range $-\infty < x < \infty$)

$\cos h^{-1} x = \ln (x + \sqrt{x^2 - 1})$ (Range $1 \leqq x < \infty$)

$\tan h^{-1} x = \ln \sqrt{\dfrac{1+x}{1-x}}$ (Range $-1 < x < 1$)

① $\sin h^{-1}$ 7 =

② $\cos h^{-1}$ 2 =

③ $\tan h^{-1}$ 0.4 =

Key operation

① 7 [x→M] [0] [F] [x^2] [+] 1 [=]

[F] [$\sqrt{\ }$] [+] [RM] [0] [=] [ln] → 2.644120761

② 2 [x→M] [0] [F] [x^2] [−] 1 [=]

[F] [$\sqrt{\ }$] [+] [RM] [0] [=] [ln] → 1.316957897

③ 1 [x→M] [0] .4 [M+] [0] [+/−] [+] 1 [÷]

[RM] [0] [=] [F] [$\sqrt{\ }$] [ln] → 4.236489304 −01

Ex. 3

$$nCrP^rq^{n-r} = {}_{20}C_5 \times \left(\frac{1}{6}\right)^5 \times \left(\frac{5}{6}\right)^{20-5}$$

$$= \frac{20!}{5!\,(20-5)!} \times \left(\frac{1}{6}\right)^5 \times \left(\frac{5}{6}\right)^{20-5}$$

Key operation

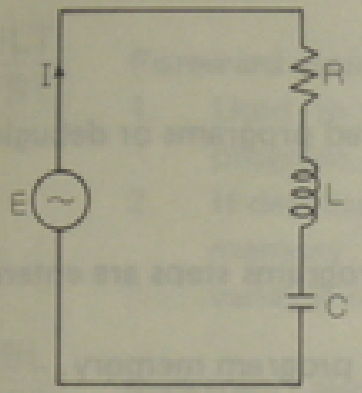
20 [F] [n!] [÷] [(] 5 [F] [n!] [×] [(] 20 [−] 5 [)] [x→M] [0]

[F] [n!] [)] [×] [(] 6 [F] [1/x] [y^x] 5 [)] [×] [(] [(] 5 [÷]

6 [)] [y^x] [RM] [0] [)] [=] → 1.294102921 −01

Ex. 4 If calculation of impedance of AC circuit

Calculate impedance Z and phase angle θ of the AC circuit shown above. Here, R = 150Ω, L = 4H, C = 3μF and f = 60 Hz.



Formula:

$$Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

$$\theta = \tan^{-1} \frac{\omega L - \frac{1}{\omega C}}{R}$$

Here, $\omega = 2\pi f$

Key operation

DEG 2 [X] [F] [π] [X] 60 [X] [x⇔M] [0] 4 [=]

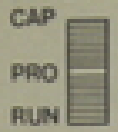
[(] [RM] [0] [X] 3 [EXP] 6 [+/−] [)] [F] [1/x]

[+] 150 [↕] [F] [→r/θ] → 641.5523703(z)

[↕] → 76.47863816(θ)

PROGRAM CALCULATIONS

1. OPERATING CONTROLS



Program mode switch

RUN: Run mode
performs manual calculation, program calculation by using the stored programs or debuging of the programs.

PRO: Program mode
performs the storage, check and correction of the program. The programs steps are entered and stored into the program memory.
The function of all keys except the following can be stored into the program memory.

- [CA] (Clear all)
- [FST] (Forward step)
- [BST] (Back step)
- [INS] (Insert)
- [F] [DEL] (Delete)

CAP: Clear all program
This mode clears all of the contents of the program memory.
The procedure is as follows:

i) Set the CAP mode
ii) Set the DEG/RAD/GRAD selector at the "DEG" or "GRAD".

iii) Depress the [CA] key, the display does not appears and the symbol "—" on the left most digit of the display will be indicated.

iv) Set the "RUN" or "PRO" positions, then all of the contents of the program memory will be cleared.

HLT
[FST]

Foreward step/Halt key

1. Used to step foreward in the program step by step to check,debug or correct the program.
2. If depressed following the [F] key, used to store the HALT instruction in the program memory. "HALT" is the instruction which stops the machine temporarily to enter a variable or to read an intermediate result of the calculation.

LBL
[BST]

Backstep/Label key

1. Used to back the program step by step to check or correct the program.
2. If depressed following the [F] key, used to store the designation number of the program, number of sub-routine or number of addressed step of the program.

Ex. PRO [F] [LBL] [1] (Entry of label No.1)

- The program jumps to the designated label number.
  To enter the label number, depress the [F] and [LBL] keys followed by the [0] ~ [9], [S] or [I] keys.

GTS
GTO

Unconditional jump/sub-routine jump key

1. Enter the jump instruction which jumps unconditionally in the program to the specified label No.

Ex. PRO GTO 2 (Enter the jump instruction to the label No.2)

The program jumps to the specified label number in the RUN mode.

Ex. RUN GTO 3 (Jumps to the label No.3)

2. If depressed following the F key, jumps to the specified sub-routine.

Ex. F GTS 5 (Enter the jump instruction to the sub-routine No. 5)

DEL
INS

Insert/delete key

1. Used to insert a new program step(s) into the stored program. (See page 61)
2. If depressed following the F key, used to delete the program step(s) from the stored program. (See page 62)

X≠0
X→M

Memory-in/non zero jump key

1. As for the X→M, see page 18.
2. If depressed following the F key, used to make the program jump to the specified label No. with jump condition satisfied when the content of x register is not zero.

x<0
RM

Recall memory/negative value jump key

1. As for the RM , See page 18.
2. If depressed following the F key, used to make the program jump to the specified label No. when the content of x register is a negative.

x=t
M+

Memory plus/equal jump key

1. As for the M+ , see page 18.
2. If depressed following the F key, used to make the program jump to the specified label No. when the content of the x register equals the content of the t memory.

x<t
S/E

Start-end/comparison jump key

1. Used to start the program, and enter the program end instruction.
2. If depressed following the F key, used to make the program jump to the specified label No. when the content of the x register is smaller than the content of the t memory.

2. ERRORS

When the errors are detected in the program calculation, the error symbol *"E"* is displayed and the step number and the instruction code which error conditions are detected will be displayed. Then the machine stops.

In addition to the error condition mentioned on page 29, the errors are detected in the following conditions.

1. When the program is jumped to the unspecified label No. in the program calculation or manual calculation.

2. When the program exceeds 128 steps.

3. PROGRAMMING

Before program calculation

1) The formula to obtain the area of a circle $S = \pi r^2$ will be used for easier understanding of the following explanations about "Programming", "Program check" and "Program debug"
To obtain the area of a circle having the radius 7 in the manual calculation, you should take the operation of

7 [F] [x^2] [×] [F] [π] [=].

And in the case of the radius 9; the operation should be

9 [F] [x^2] [×] [F] [π] [=].

Therefore, in the manual calculation, each time the radius changes naturally the variables should be input and the same key operations are required — the keys underlined should be operated repeatedly.
But in the program calculation, all you have to do is to input variable and/or variables (the radius in the case of a circle area's calculation) if you store the operation of the other keys in the machine before hand.
During programming, the following two should be taken care of although the procedures of the key operation are the same as in the manual calculation.

1-1) Programming of variables is different from that of constants (In a circle area's calculation, its radius is the variable whereas its π is the constant.) To store a variable, operate the [F] and [HLT] keys, and this results in the HALT instruction, by which a variable can be input

during the program calculation. To store a constant, just operate the corresponding numeral keys.

1-2) To end the program, operate the [S/E] key and this results in the END instruction being stored in the program, which stops the program.

2) Prior to programming in the machine, it is recommended to first write the desired program on paper to prevent mis-programming.

Ex. The program of $S = \pi r^2$

Step	Program	Note
		Input the radius (r) (Variable)
0	$F \cdot x^2$	r^2
1	X	
2	$F \cdot \pi$	Recall the π (Constant)
3	=	
4	S/E	End instruction

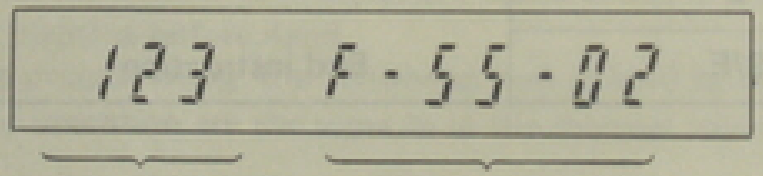
Programming

1) Set the program mode switch at "PRO" position.
2) Depress the [CA] key to clear and reset the step counter.
3) Operate the keys in accordance with the program.

Step	Key operation	Display		Note
	PRO			
1	CA	000		
2	F x^2	000	F-44	Enter the radius (r)
3	×	001	54	
4	F π	002	F-41	Recall the constant π
5	=	003	84	
6	S/E	004	85	END

Note:
- In the program mode, the step number is displayed at the left end of the display and the instruction code, at its right end.
- The PC-1201 will "peep" to tell you, it has accepted the entered program step.

Display



Step number Instruction code

Step number

There are 128 program steps available. (0 ~ 127).

There are two different type of program instructions, i.e. independent instruction and compound instructions. [×], [÷] and [S/Σ], are respectively the independent instruction and one instruction requires one step.

[F] [HLT], [F] [x^2] and [F] [x≠0] [7] are respectively the compound instructions and one instruction needs two or three steps.

Each digit and the decimal point counts as one program step.

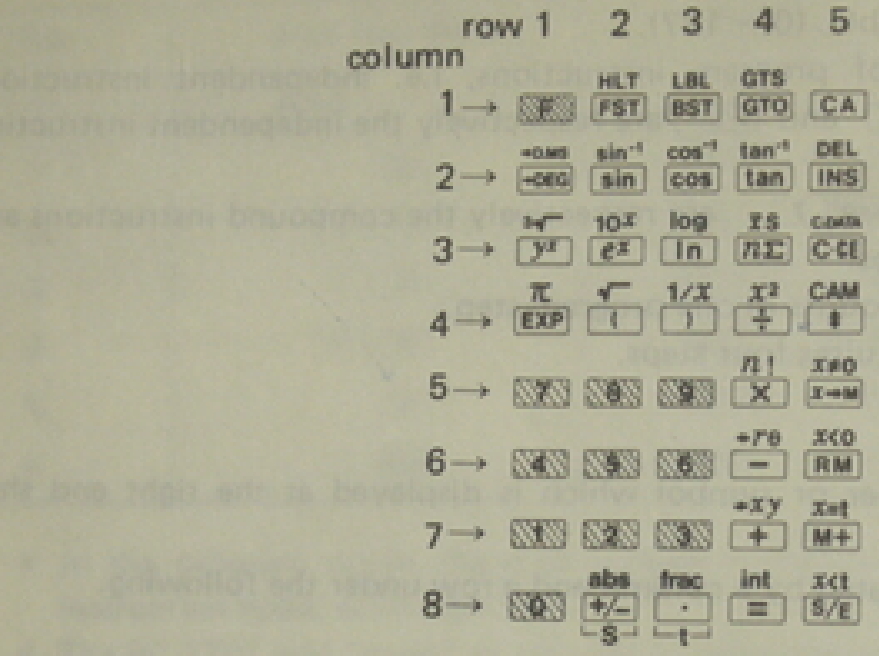
For example, the number 1.31 requires four steps.

Instruction code

In the program mode, the number or symbol which is displayed at the right end shows an instruction code.

The instruction code will be indicated by a column and a row under the following.

Ex.	Instruction code	Function	
	F-55-02	[F] [x≠0] [2]	(If $x \neq 0$, jumps to LBL 2)
	55-82	[x→M] [S]	(Transfer the contents of the x register to the S memory).
	F-23	[F] [$\cos^{-1}$]	($\cos^{-1} x$)



Note: • The keys which are indicated by the oblique line are not displayed by a row and a line.

• Each function of FST, BST, CA, INS or DEL have no instruction code because these function can not be programmed.

4. PROGRAM CHECKING

Program checking is for the purpose of checking the program step by step to make sure it has been entered in the machine as you wrote it on paper.

How to check

1) Set the program mode switch at "PRO" position.
2) Depress the [CA] key to reset the program step at 000.
3) Each time the [FST] key is operated, the program advances by one step. At the time, the step number is displayed on the left hand side of the display, the instruction code is displayed on the right hand side.

Ex. Check the program of the area of a circle

Step	Key operation	Display		Program written on the paper	Note
	PRO				
1	[CA]	000			
2	[FST]	000	F-44	$F \cdot x^2$	
3	[FST]	001	54	X	
4	[FST]	002	F-41	$F \cdot \pi$	
5	[FST]	003	84	=	
6	[FST]	004	85	S/E	

5. THE EXECUTION OF THE PROGRAM CALCULATION

1) Set the program mode switch at the "RUN" position.
2) Depress the [CA] key to reset the program step at 000.
3) Depress the [S/E] key, the program calculation is started and advanced until the HALT or END instructions are read.
4) When the HALT instruction is detected, the calculation stops and HALT symbol "␣" is displayed. When this happens, either enter a variable or confirm the calculation results by depressing the [S/E] key, the calculation will be performed continuously.

Ex. The execution for the program of the ares of a circle
In the case of r = 5, r = 6 and r = 7

Step	Key operation	Display	Note
	RUN		
1	[CA]	0.	
2	5	5.	r = 5
3	[S/E]	78.53981634	Ans.
4	6	6.	r = 6
5	[S/E]	113.0973355	Ans.
6	7	7.	r = 7
7	[S/E]	153.93804	Ans.

During the calculation, the symbol "—" will be displayed on the left most digit of the display.

6. PROGRAM DEBUGING

Program debuging for working through the program, step by step, by entering the variables, and reading the results.

1) Set the program mode switch at "RUN" position.
2) Depress the [CA] key to reset the program step at 000.
3) Each time the [FST] key is operated, the program advances by one step.
4) When the HALT symbol is displayed, enter the variable.

- During the DEBUGING, the calculation result in each step will be displayed.
- In the calculation which requires the setting of the DEG/RAD/GRAD selector, you must pre-set the selector at desired position.

Ex. Debug the program of the area of a circle.

In the case of $r = 2$

Key operation	Display	Program written on the paper		Note
		Step	Program	
RUN				
CA	0.			
2	2.			Entry of r
FST	4.	0	$F\cdot x^2$	r^3
FST	4.	1	X	
FST	3.141592653	2	$F\cdot\pi$	Recall the constant of π
FST	12.56637061	3	=	
FST	12.56637061	4	S/E	

7. PROGRAM CORRECTION, INSERTION & DELETION

When you want to correct or change a part of the stored program, performs the correct or change by one step in program mode.

Ex. When $F\sqrt{}$ instead of $F\pi$ is stored by mistake in No.2 step.

Correct program

Step	Program
0	F·x^2
1	X
2	F·π
3	=
4	S/E

Step	Key operation	Display		Note
	PRO			
1	CA	000		
2	F x^2	000	F-44	
3	X	001	54	
4	F √	002	F-42	Incorrect operation
5	BST	001	54	Back of one step correct
6	F π	002	F-41	Correct operation
7	=	003	84	
8	S/E	004	85	

When entering the program, the contents are stored in next step of the displayed step number. Therefore, when correcting the program, back the step number to one step before the correction-needed step and program the right instruction.

Ex. 2 When Fπ of the program in step 2 is lacked.

Step	Key operation	Display	Note
	PRO		
1	CA	000	
2	FST	000 F-44	
3	FST	001 54	←lack of instruction Fπ
4	FST	002 84	
5	BST	001 54	
6	INS	001 54	insert the instruction Fπ
7	F π	002 F-41	
8	FST	003 84	
9	FST	004 85	

- As you see from the above example, when inserting the program, simply forward the program step to one step before the insertion-needed step, then write one step of program following the INS key.
  When inserting the programs of several steps, depress the INS key in before each step to be inserted.
- When the program is inserted by operating the INS key, the instruction stored previously is transfered in next step.
  Please note that the program stored in No.127 step is removed in above example.

Ex. 3 When an unneeded instruction ("÷") in No.3 step is stored.

Step	Key operation	Display	Note
1	PRO		
1	CA	000	
2	FST	000 F-44	
3	FST	001 54	
4	FST	002 F-41	
5	FST	003 44	
6	F DEL	003 84	Delection of unneeded instruction
7	FST	004 85	

- When deleting a program step, the step to be dropped, is deleted by using the F and DEL keys.

8. INTERRUPTION CALCULATION

Whenever either the HALT symbol is on the display or the program step is at zero (000) step, you can operate the PC-1201 in the manual mode, than enter the variable and continue the program.

Ex. Interruption calculation during the program execution for an area of a circle.

In case of r = 4 x 2 and r = $\sqrt[3]{18}$

Step	Key operation	Display	Note
	RUN		
1	CA	0.	
2	4 X	4.	Interruption calculation of "4 x 2 = "
3	2 =	8.	
4	S/E	201.0619298	Ans.
5	18	18.	Interruption calculation of "$\sqrt[3]{18}$ = "
6	F $\sqrt{}$	2.620741394	
7	S/E	21.57735512	Ans.

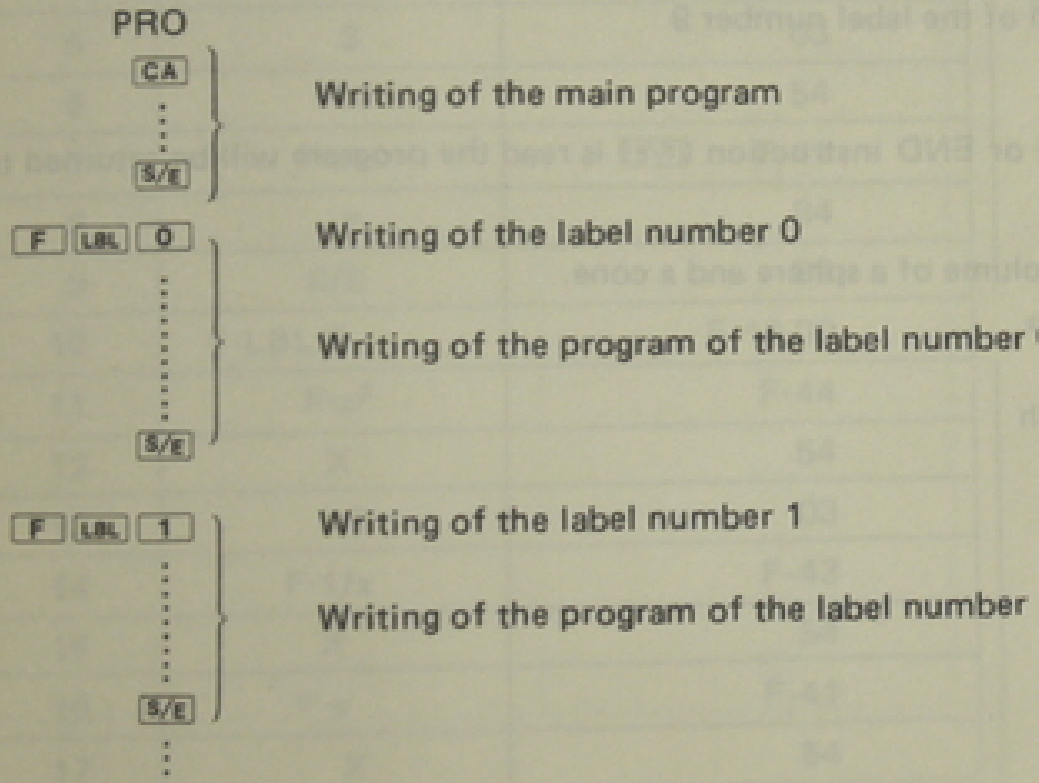
Note: This will however clear the contents of both X & Y registers & may cause your programmed calculation to be incorrect.

9. DIVISION OF PROGRAM STEPS

This machine can contain up to 13 programs by dividing the program memory. When plural programs are started, enter the label number in the beginning of the program except the first program (program which starts from (000) step). This label number will enable the corresponding program selected.

When entering the label number, the [0] ~ [9] . [$] or [↑] keys should be depressed following the [F] and [LBL] keys.

Ex. Entering of the plural programs



- When writing the program is finished, enter the label number following the END instruction ([S/E]).
  As a result, the other program can be written in remainding steps.
  When selecting the program, depress the [GTO] keys and the [0] ~ [9], [.] or [1] key in this order.

Ex. RUN

[GTO] [4] Program selection of the label number 4

[S/E] Program start

[GTO] [9] Program selection of the label number 9

[S/E] Program start

Note: When the [CA] key is depressed or END instruction ([S/E]) is read the program will be returned to 000 step.

Ex. Write the program for the volume of a sphere and a cone.

Volume of a sphere = $\frac{4}{3}\pi r^3$

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Program

Step	Program	Instruction code	Note
0	y^x	31	Entry (r)
1	3	03	
2	X	54	
3	4	04	
4	÷	44	Main program
5	3	03	
6	X	54	
7	F·π	F-41	
8	=	84	
9	S/E	85	
10	F·LBL·0	F-13-00	Label number Entry (r)
11	F·x^3	F-44	
12	X	54	
13	3	03	
14	F·1/x	F-43	
15	X	54	The program of label 0
16	F·π	F-41	
17	X	54	
18	F·HLT	F-12	Entry (h)

19	=	84	
20	S/E	85	
21	F·LBL·1	F-13-01	Label number prepared for the next program

Writing of program

Step	Key operation	Step	Key operation
	PRO	12	F LBL Q
1	CA	13	F x^2
2	y^x	14	×
3	3	15	3
4	×	16	F 1/x
5	4	17	×
6	÷	18	F π
7	3	19	×
8	×	20	F HLT
9	F π	21	=
10	=	22	S/E
11	S/E	23	F LBL 1

Execution of the program

① r = 4
② r = 5
} Volume of a sphere

Step	Key operation	Display	Note
	RUN		
1	[CA]	0.	
2	4	4.	
3	[S/E]	268.0825731	Ans.①
4	5	5.	
5	[S/E]	523.5987757	Ans.②

① r = 6, h = 13
② r = 7, h = 15

Volume of a cone

Step	Key operation	Display	Note
	RUN		
1	GTO 0		
2	6	6.	
3	S/E	37.69911184	HALT symbol turn-on
4	13	13.	
5	S/E	490.0884539	Ans.①
6	GTO 0	490.0884539	
7	7	7.	
8	S/E	51.31268	HALT symbol turn-on
9	15	15.	
10	S/E	769.6902	Ans.②

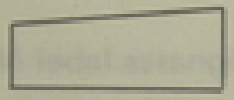
FLOW CHART

Each symbols in the flow chart of this manual represent the following functions

START or END

The processing of the calculation

The processing of the calculation as the sub-routine



Input (entry)

Output (input) (Display of the intermediate result)

Judgements

10. PROGRAM JUMP (BRANCHING)

Although the program instructions are performed in orders of one step, in the case that one of the jump instructions is in the program, the programs are to be performed from the designated step which are jumped in accordance with the instruction. There are two types of jump instructions; unconditional and conditional.

1. Unconditional jump instruction

   When an unconditional jump instruction is read in the program calculation, the program jumps to the step specified by the jump instruction and the program instructions are performed from that step.

   The entry of the unconditional jump instruction should be done by depressing the [GTO] key followed the [0]~[9], [S] or [t] key.

   Ex. [GTO] [2] Unconditional jump instruction which designates label No.2

   [GTO] [6] Unconditional jump instruction which designates label No.6

2. Conditional jump instructions

   There are basically four different types of instructions.

   Conditional jump instructions judge whether the jump condition is satisfied or not.

   When the jump condition is not satisfied (in case of No), the program goes forwards to the next step.

   Whereas, when the jump condition is satisfied, the program jumps to the designated step.

   There are the following four different instructions in conditional jump instruction.

1) $x \neq 0$: If x is not equal to zero ($x \neq 0$), the program jumps
2) $x < 0$: If x is negative, the program jumps
3) $x = t$: If x is equal to t, the program jumps.

4) $x<t$: If x is smaller than t, the program jumps.
(x : The contents (value) of x register
t : The contents (value) of t memory (test memory))

The entry of the conditional jump instructions should be done after designating the label number.

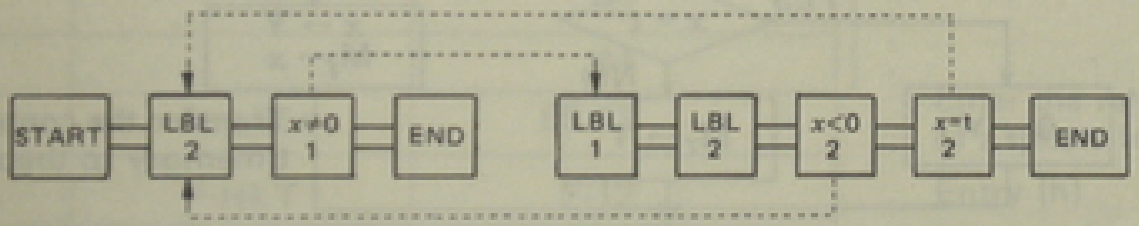
Ex. [F] [x≠0] [0] Conditional jump instruction ($x\neq0$) which designates label number zero.

[F] [x<0] [3] ($x<0$) label number 3

[F] [x=t] [5] ($x=t$) label number 5

[F] [x<t] [S] ($x<t$) label number S

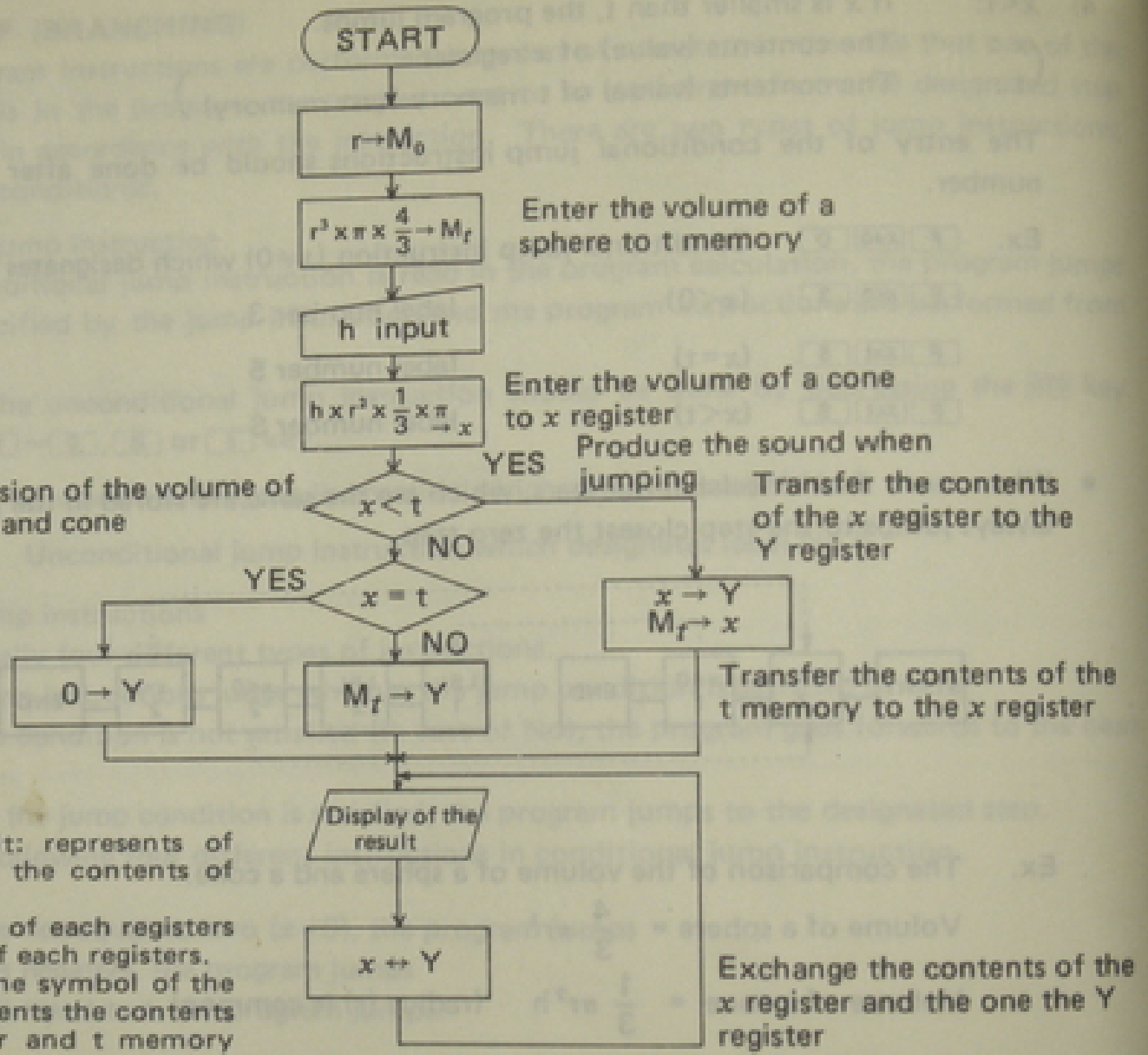
- When more than one label numbers, which are the same,are stored in the program, the program always jumps to the step closest the zero step.



Ex. The comparison of the volume of a sphere and a cone.

Volume of a sphere = $\frac{4}{3}\pi r^3$

Volume of a cone = $\frac{1}{3}\pi r^2 h$ (radius (r) is common)



Note:

- $M_0 \sim M_9$, Ms, Mt: represents of each memory or the contents of each memory.
  X, Y: represents of each registers or the contents of each registers.
- The x and t in the symbol of the judgement represents the contents of the x register and t memory respectively.

Program

Step	Program	Instruction code	Note
			Entry (r)
0	$x \rightarrow$M·0	55-00	Enter volue of r to memory
1	y^x	31	
2	3	03	
3	X	54	
4	F·π	F-41	
5	X	54	$r^3 \times \pi \times \frac{4}{3} =$
6	4	04	
7	÷	44	
8	3	03	
9	=	84	
10	$x \rightarrow$M·t	55-83	Enter the value of the volume of a sphere to "t" memory
11	F·HLT	F-12	Entry (h)
12	X	54	
13	RM·0	65-00	
14	F·x^2	F-44	
15	X	54	
16	3	03	$h \times r^2 \times \frac{1}{3} \times \pi =$
17	F·1/x	F-43	

Step	Program	Instruction code	Note
18	X	54	$h \times r^2 \times \frac{1}{3} \times \pi =$
19	F·π	F-41	
20	=	84	
21	F · x < t · t	F-85-83	If x<t, jump to label "t"
22	F · x = t · 1	F-75-01	If x=t, jump to label "1"
23	↕	45	If x>t, transfer the contents of t to the Y register
24	RM· t	65-83	
25	↕	45	
26	F·LBL·0	F-13-00	Label "0"
27	F·HLT	F-12	Display of the result
28	↕	45	
29	GTO·0	14-00	Jump to label "0"
30	F·LBL·t	F-13-83	Label (t)
31	↕	45	Transfer the contents of x to Y register and the contents of t to the x register
32	RM·t	65-83	
33	GTO·0	14-00	Jump to label "0"
34	F·LBL·1	F-13-01	Label "1"
35	↕	45	Enter zero to the Y register
36	0	00	
37	↕	45	
38	GTO·0	14-00	Jump label "0"

Note: The x, y and t in the above Note show the x register, Y register and t memory or the contents of the x register, Y register and t memory respectively.

- The machine produces the sound when the program jumps to the label number t by the jump instruction. In above example, when the condition of $x<t$ satisfy the jump condition ("YES") the machine will produce the sound. Therefore you can have an aural judgement check.

Program calculation

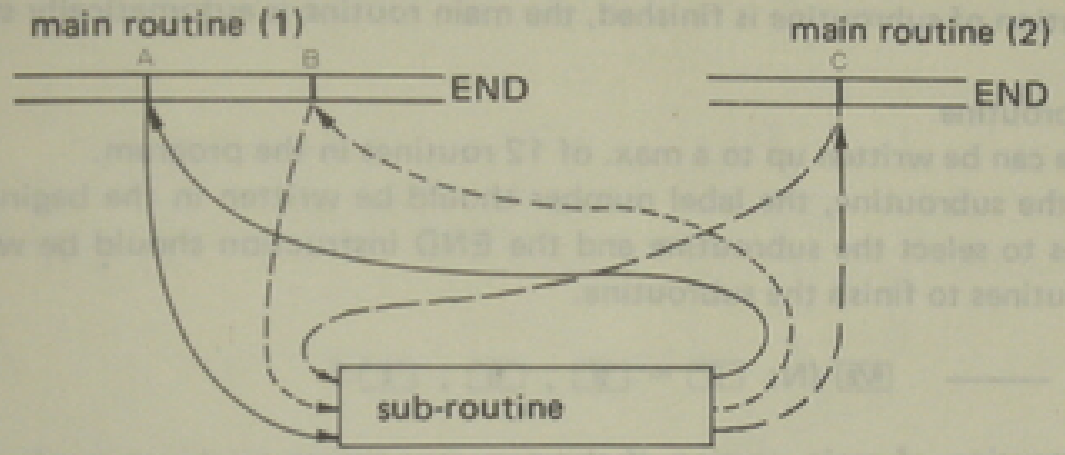
① r = 4, h = 9
② r = 5, h = 20
③ r = 6, h = 28

Step	Key operation	Display	Note
	RUN		
1	CA	0.	
2	4	4.	Entry r ①
3	S/E	␣ 268.0825731	Volume of a sphere
4	9	␣ 9.	Entry h ①
5	S/E	␣ 268.0825731	Volume of a sphere (Greater than a cone, produce the sound)
6	S/E	␣ 150.7964474	Volume of a cone

Step	Key operation	Display	Note
7	S/E	268.0825731	Recall the volume of a sphere
8	CA	0.	Return the program step to 0 step
9	5	5.	Entry r ②
10	S/E	523.5987757	
11	20	20.	Entry h ②
12	S/E	523.5987757	
13	S/E	0.	The volume of a sphere and a cone are equals
14	CA	0.	Return the program step to 0 step.
15	6	6.	Entry r ③
16	S/E	904.7786843	
17	28	28.	Entry h ③
18	S/E	1055.575132	Volume of a cone
19	S/E	904.7786843	Volume of a sphere

11. SUBROUTINE

When a certain program has several numbers of the same calculation, the operation of the sub-routine is used. Since it is needless to enter the same program several times in the main routine, we can reduce the number of steps.



The program is performed (advances) in the direction of the arrow.

1. Main routine including subroutine
   The instruction ([F] [GTS] [N] (N: [0] ~ [9] [S] or [t])) which causes the selection of subroutine should be entered in the section when the execution of subroutine is required.

(START) —— [F] [GTS] [0] —— [F] [GTS] [S] —— [F] [GTS] [0] ——(END)

The jump instruction to the subroutine 0 (label 0)

The jump instruction to the subroutine S (label S)

The jump instruction to the subroutine 0 (label 0)

When te execution of subroutine is finished, the main routine is automatically started.

2. Writing the subroutine
   The subroutine can be written up to a max. of 12 routines in the program.
   When writing the subroutine, the label number should be written in the beginning of the each of the subroutines to select the subroutine and the END instruction should be written at the end of the each subroutines to finish the subroutine.

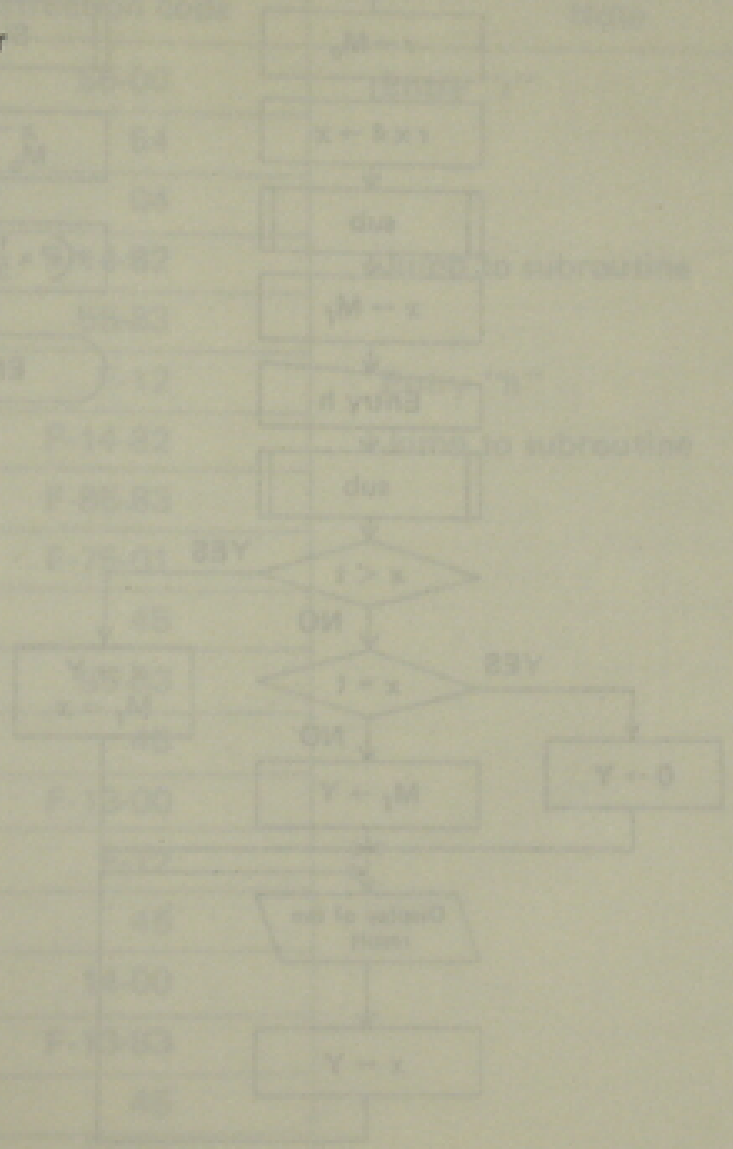
   [F] [LBL] N —— [S/E] (N: [0] ~ [9] , [S] , [t])

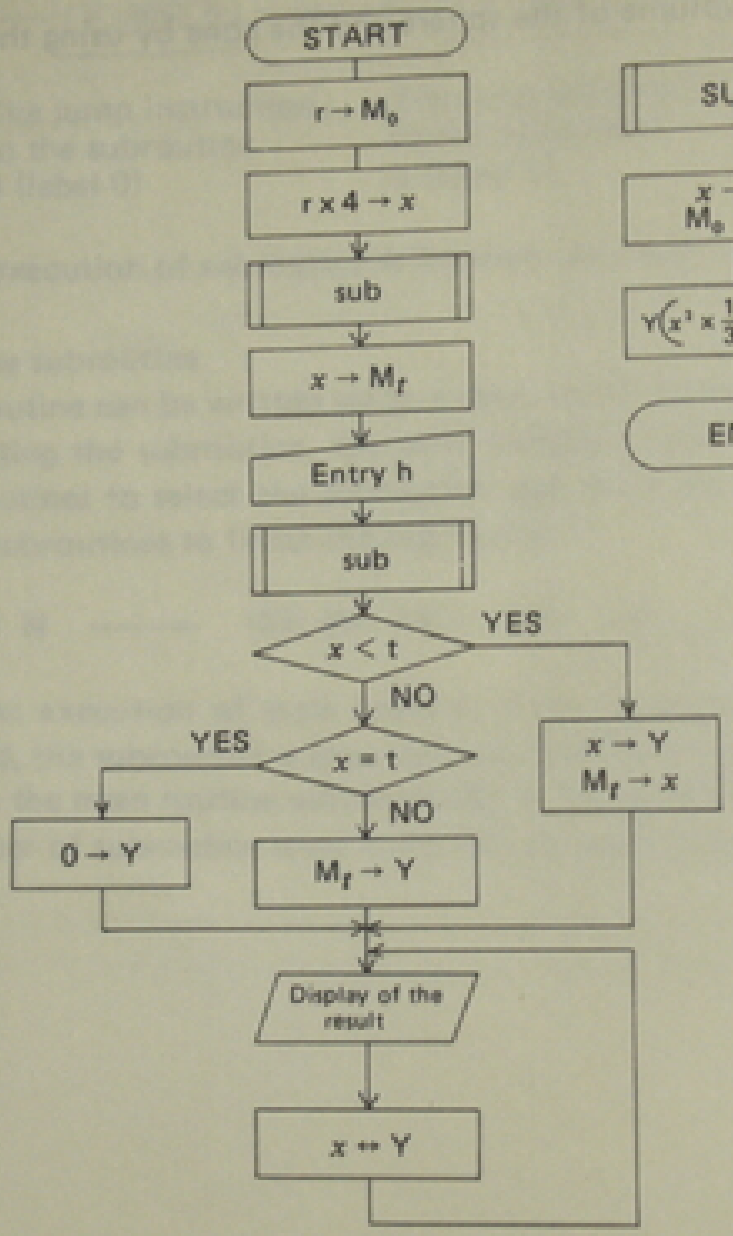
- During the execution of main routine, if the program comes to the step where the subroutine is designated, the subroutine is executed and END instruction of subroutine is read, then the program returns to the main routine automatically & proceeds the program.
  The number of subroutine level is one (1), so the subroutine of a subroutine is not available.

Ex. The program of the comparison of the volume of the sphere and the cone by using the subroutine

Volume of a sphere $= \frac{4}{3}\pi r^3 = (\frac{1}{3}\pi r^2)\,4r$

Volume of a cone $= \frac{1}{3}\pi r^2 h = (\frac{1}{3}\pi r^2)\,h$




START
r → M0
r x 4 → x
sub
x → Mt
Entry h
sub
x < t
YES
NO
x = t
YES
NO
0 → Y
Mt → Y
x → Y
Mt → x
Display of the result
x ↔ Y
SUB
Sub-routine
x → Y
M0 → x
Y(x³ x 1/3 x π) → x
END

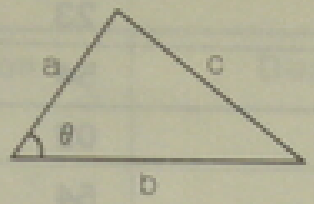
Program

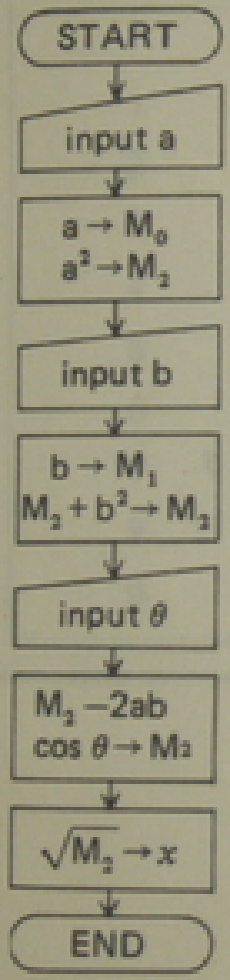
Step	Program	Instruction code	Note
0	$x \rightarrow$M·0	55-00	Entry "r"
1	X	54	
2	4	04	
3	F·GTS·S	F-14-82	Jump to subroutine
4	$x \rightarrow$M·t	55-83	
5	F·HLT	F-12	Entry "h"
6	F·GTS·S	F-14-82	Jump to subroutine
7	F·$x<$t·t	F-85-83	
8	F·$x=$t·1	F-75-01	
9	‡	45	
10	RM·t	65-83	
11	‡	45	
12	F·LBL·0	F-13-00	
13	F·HLT	F-12	
14	‡	45	
15	GTO·0	14-00	
16	F·LBL·t	F-13-83	
17	‡	45	
18	RM·t	65-83	

Step	Program	Instruction code	Note
19	GTO·0	14-00	
20	F·LBL·1	F-13-01	
21	‡	45	
22	0	00	
23	‡	45	
24	GTO·0	14-00	
25	F·LBL·S	F-13-82	Subroutine
26	X	54	
27	RM·0	65-00	
28	F·x^2	F-44	
29	X	54	
30	3	03	
31	F·1/x	F-43	
32	X	54	
32	F·π	F-41	
34	=	84	
35	S/E	85	

12. EXAMPLES OF THE PROGRAMS

1 Cosine theorem





$$C = \sqrt{a^2 + b^2 - 2ab\cos\theta}$$

Program

Step	Program	Instruction code	Note
			Input a
0	$x \rightarrow$ M·0	55-00	$a \rightarrow M_0$
1	F·x^2	F-44	
2	$x \rightarrow$ M·2	55-02	$a^2 \rightarrow M_1$
3	F·HLT	F-12	Input b
4	$x \rightarrow$ M·1	55-01	$b \rightarrow M_1$
5	F·x^2	F-44	
6	M+ · 2	75-02	$M_1 + b^2$
7	F·HLT	F-12	Input θ

Step	Program	Instruction code	Note
8	COS	23	
9	X	54	
10	2	02	
11	X	54	
12	RM·0	65-00	
13	X	54	
14	RM·1	65-01	
15	=	84	
16	+/−	82	
17	M+ · 2	75-02	$M_3 - 2ab \cos\theta$
18	RM·2	65-02	
19	F· $\sqrt{}$	F-42	
20	S/E	85	

① a = 3cm, b = 5 cm, $\theta = 46^\circ 36'$

② a = 7cm, b = 8 cm, $\theta = 31^\circ 19'$

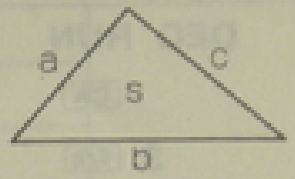
Calculates the length C

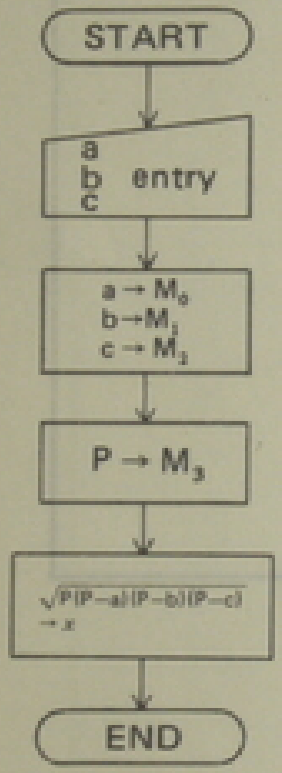
Step	Key operation	Display	Note
	DEG RUN		
1	CA		
2	3 S/E	9.	a^2
3	5 S/E	25.	b^2
4	46.36 →DEG	46.6	θ
5	S/E	3.658876148	Ans. ①
6	7 S/E	49.	a^2
7	8 S/E	64.	b^2
8	31.19 →DEG	31.31666666	θ
9	S/E	4.161434935	Ans. ②

2 Helon's formula

Area of a triangle(s) $S = \sqrt{P(P-a)(P-b)(P-c)}$

Here, $P = \dfrac{a+b+c}{2}$





PROGRAM

Step	Program	Instruction code	Note
			entry a
0	$x \rightarrow$ M·0	55-00	a → M_0
1	F·HLT	F-12	entry b
2	$x \rightarrow$ M·1	55-01	b → M_1
3	F·HLT	F-12	entry c
4	$x \rightarrow$ M·2	55-02	c → M_2
5	+	74	
6	RM·1	65-01	

Step	Program	Instruction code	Note
7	+	74	
8	RM·0	65-00	
9	÷	44	
10	2	02	
11	=	84	
12	$x \rightarrow$ M·3	55-03	$P \rightarrow M_1$
13	X	54	
14	(	~~52~~ 42	
15	RM·3	65-03	
16	–	64	
17	RM·0	65-00	
18	)	43	
19	X	54	
20	(	42	
21	RM·3	65-03	
22	–	64	
23	RM·1	65-01	
24	)	43	

Step	Program	Instruction code	Note
25	X	54	
26	(	42	
27	RM·3	65-03	
28	−	64	
29	RM·2	65-02	
30	)	43	
31	=	84	
32	F $\sqrt{}$	F-42	
33	S/E	85	

① a = 3, b = 4, c = 6

② a = 8, b = 5, c = 12

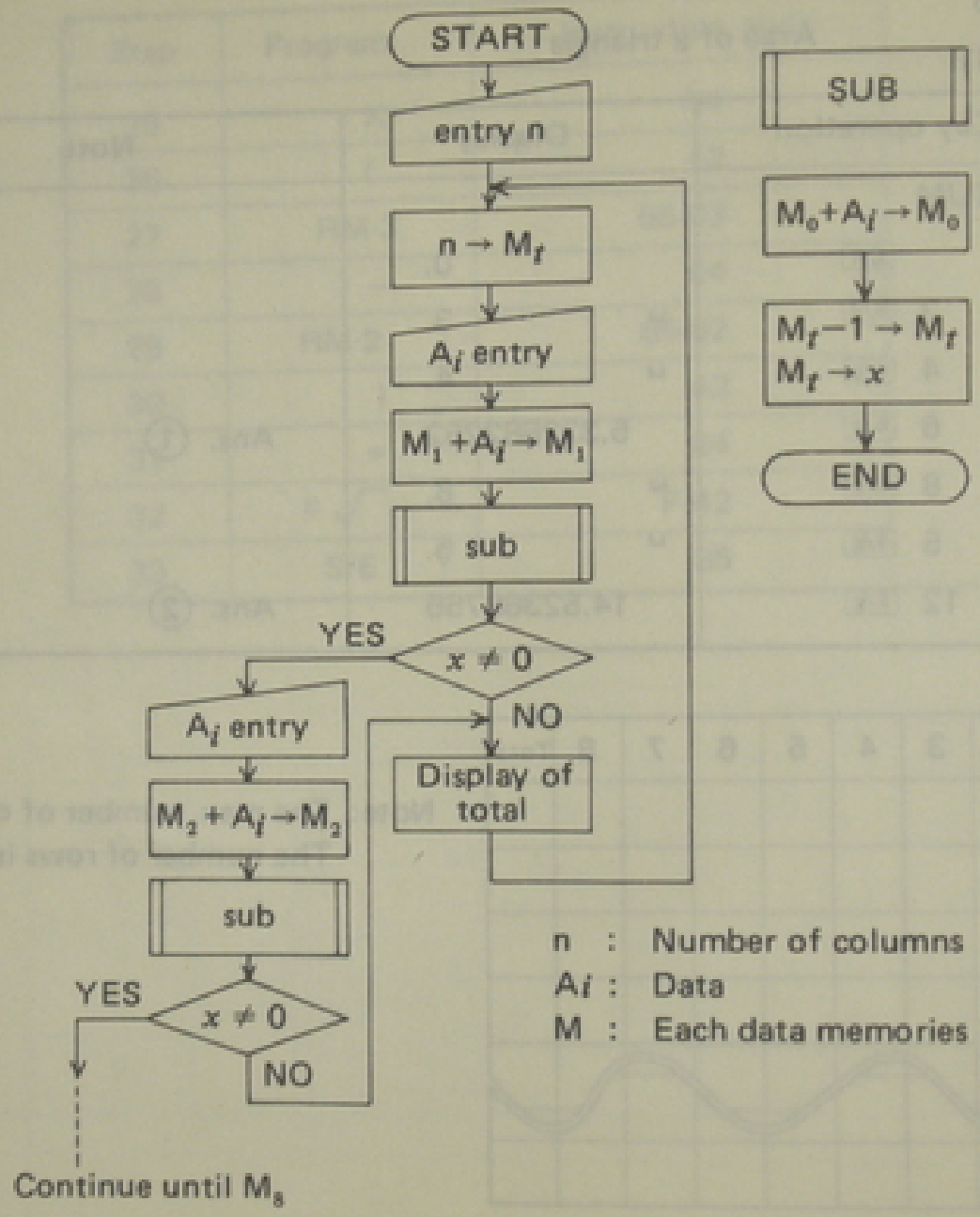
Area of a triangle

Step	Key operation	Display	Note
	RUM		
1	CA	0.	
2	3 S/E	u 3.	
3	4 S/E	u 4.	
4	6 S/E	5.332682252	Ans. ①
5	8 S/E	u 8.	
6	5 S/E	u 5.	
7	12 S/E	14.52368755	Ans. ②

3 Cross-footing

	1	2	3	4	5	6	7	8	Total
a									
b									
c									
d									
Total									

Note: The max. number of columns is 8.
The number of rows is limitless.


START
entry n
n → M_t
A_i entry
$M_1 + A_i \rightarrow M_1$
sub
YES
$x \neq 0$
NO
A_i entry
$M_2 + A_i \rightarrow M_2$
sub
YES
$x \neq 0$
NO
Display of total
Continue until M_8
SUB
$M_0 + A_i \rightarrow M_0$
$M_t - 1 \rightarrow M_t$
$M_t \rightarrow x$
END
n : Number of columns
Ai : Data
M : Each data memories

PROGRAM

Step	Program			Instruction code	Note
0		F	CAM	F-45	Enter the number of columns
1		$x \rightarrow$ M	S	55-82	
2	F	LBL	t	F-13-83	
3		RM	S	65-82	
4		$x \rightarrow$ M	t	55-83	
5		RM	0	65-00	
6		M+	9	75-09	
7			‡	45	
8			0	00	
9		$x \rightarrow$ M	0	55-00	
10			‡	45	
11		F	HLT	F-12	
12		M+	1	75-01	
13	F	GTS	S	F-14-82	
14	F	$x \neq 0$	0	F-55-00	
15		GTO	t	14-83	
16	F	LBL	0	F-13-00	

Step	Program			Instruction code	Note
17		F	HLT	F-12	
18		M+	2	75-02	
19	F	GTS	S	F-14-82	
20	F	$x \neq 0$	1	F-55-01	
21		GTO	t	14-83	
22	F	LBL	1	F-13-01	
23		F	HLT	F-12	
24		M+	3	75-03	
25	F	GTS	S	F-14-82	
26	F	$x \neq 0$	3	F-55-03	
27		GTO	t	14-83	
28	F	LBL	3	F-13-03	
29		F	HLT	F-12	
30		M+	4	75-04	
31	F	GTS	S	F-14-82	
32	F	$x \neq 0$	4	F-55-04	
33		GTO	t	14-83	
34	F	LBL	4	F-13-04	
35		F	HLT	F-12	

Step	Program			Instruction code	Note
36		M+	5	75-05	
37	F	GTS	S	F-14-82	
38	F	$x \neq 0$	5	F-55-05	
39		GTO	t	14-83	
40	F	LBL	5	F-13-05	
41		F	HLT	F-12	
42		M+	6	75-06	
43	F	GTS	S	F-14-82	
44	F	$x \neq 0$	6	F-55-06	
45		GTO	t	14-83	
46	F	LBL	6	F-13-06	
47		F	HLT	F-12	
48		M+	7	75-07	
49	F	GTS	S	F-14-82	
50	F	$x \neq 0$	7	F-55-07	
51		GTO	t	14-83	
52	F	LBL	7	F-13-07	
53		F	HLT	F-12	

Step	Program			Instruction code	Note
54		M+	8	75-08	
55	F	GTS	S	F-14-82	Here, if $x \neq 0$, error is detected
56	F	$x \neq 0$	8	F-55-08	
57		GTO	t	14-83	
58	F	LBL	S	F-13-82	Subroutine
59		M+	0	75-00	
60			1	01	
61			+/−	82	
62		M+	t	75-83	
63		RM	t	65-83	
64			S/E	85	
65	F	LBL	2	F-13-02	
66		RM	1	65-01	
67		F	HLT	F-12	Total of 1
68		RM	2	65-02	
69		F	HLT	F-12	Total of 2
70		RM	3	65-03	
71		F	HLT	F-12	Total of 3
72		RM	4	65-04	

Step	Program		Instruction code	Note
73	F	HLT	F-12	Total of 4
74	RM	5	65-05	
75	F	HLT	F-12	Total of 5
76	RM	6	65-06	
77	F	HLT	F-12	Total of 6
78	RM	7	65-07	
79	F	HLT	F-12	Total of 7
80	RM	8	65-08	
81	F	HLT	F-12	Total of 8
82	RM	9	65-09	
83	F	HLT	F-12	Grand total
84		S/E	85	

	1	2	3	4	5	6	7	8	Total
a	52	76	26	93	13	51	72	93	
b	18	8	16	36	13	49	59	22	
c	12	28	49	58	48	9	66	68	
Total									

Step	Key operation	Display	Note
	RUN		
1	CA	0.	
2	8 S/E	0.	Entry of number of columns
3	52 S/E	7.	
4	76 S/E	6.	
5	26 S/E	5.	
6	93 S/E	4.	
7	13 S/E	3.	
8	51 S/E	2.	
9	72 S/E	1.	
10	93 S/E	476.	Total of a (Produced the sound)
11	18 S/E	7.	

Step	Key operation	Display	Note
12	8 [S/E]	6.	
13	16 [S/E]	5.	
14	36 [S/E]	4.	
15	13 [S/E]	3.	
16	49 [S/E]	2.	
17	59 [S/E]	1.	
18	22 [S/E]	221.	Total of b (Produced the sound)
19	12 [S/E]	7.	
20	28 [S/E]	6.	
21	49 [S/E]	5.	
22	58 [S/E]	4.	
23	48 [S/E]	3.	
24	9 [S/E]	2.	
25	66 [S/E]	1.	
26	68 [S/E]	338.	Total of c (Produced the sound)
27	[GTO] [2]	338.	
28	[S/E]	82.	Total of 1
29	[S/E]	112.	Total of 2
30	[S/E]	91.	Total of 3

Step	Key operation	Display	Note
31	S/E	187.	Total of 4
32	S/E	74.	Total of 5
33	S/E	109.	Total of 6
34	S/E	197.	Total of 7
35	S/E	183.	Total of 8
36	S/E	1035.	Grand total

Note: This program will detect an error when the number of columns is more than 8.

SPECIFICATIONS

Model: PC-1201

Display capacity: Mantissa 10 digits, Exponent 2 digits

Calculation range:

- Entry and four arithmetic calculations 1st operand, 2nd operand
  $\pm 1 \times 10^{-99} \sim \pm 9.999999999 \times 10^{99}$ and 0
- Scientific calculation
  Maximum error of result is ± 1 at the 10th digits usually. But, the accuracy is lowered around the singular point and point of inflection.

Function	Calculation range	Note
$\sin x$ $\cos x$	DEG: $\lvert x\rvert < 1 \times 10^{10}$ RAD: $\lvert x\rvert < 1 \times 10^{10}$ GRAD: $\lvert x\rvert < 1 \times 10^{11}$	When the value of x is out of the range of the calculation described left, the accuracy becomes low.
$\tan x$	DEG: $\lvert x\rvert < 1 \times 10^{10}$ $\lvert x\rvert \neq 90 \times (2N-1)$ RAD: $\lvert x\rvert < 1 \times 10^{10}$ $\lvert x\rvert \neq \pi/2 \times (2N-1)$ GRAD: $\lvert x\rvert < 1 \times 10^{11}$ $\lvert x\rvert \neq 100 \times (2N-1)$ N (integer)	
$\sin^{-1} x$ $\cos^{-1} x$	$1 \times 10^{-50} < \lvert x\rvert \leqq 1$	

$\tan^{-1} x$	$x : \pm 1 \times 10^{-99} \sim \pm 9.999999999 \times 10^{99}$ & 0	
$\ln x$	$x > 0$	When the value of x in the vicinity of 1, the accuracy becomes low.
e^x	$x < 230.2585093$ $x > -227.9559243$	
$\log x$	$x > 0$	When the value of x is in the vicinity of 1, the accuracy is low.
10^x	$-99 \leqq x < 100$	
x^2	$\sqrt{10} \times 10^{-50} < \lvert x \rvert < 1 \times 10^{50}$	
$\sqrt{x}$	$x \geqq 0$	
$1/x$	$\lvert x \rvert \leqq 1 \times 10^{99}, x \neq 0$	
$\sqrt[3]{x}$	$x \neq 0$	
y^x	$y > 0, x \cdot \ln y < 230.2585093$ $x \cdot \ln y > -227.9559243$	
$n!$	$0 \sim 69.$ (natural integer)	

$x,y \rightarrow r,\theta$	$x^2+y^2 < 1 \times 10^{100}$ $\sqrt{10} \times 10^{-50} < \lvert x \rvert < 1 \times 10^{50}$ $\sqrt{10} \times 10^{-50} < \lvert y \rvert < 1 \times 10^{50}$ $1 \times 10^{-99} < \lvert y/x \rvert < 1 \times 10^{100}$	
$r,\theta \rightarrow x,y$	θ has the same condition as the x of the sin x and cos x mentioned above.	
$n\ \Sigma$	$\sqrt{10} \times 10^{-50} < \lvert x \rvert < 1 \times 10^{50}$ $n < 1 \times 10^{100}$	x : data n : number of data

Decimal point system: Automatic changeover from floating decimal point display system to exponential display system and vice versa.

Symbol: Minus symbol appears both in mantissa and exponents portion.

Calculations: Four arithmetic calculations, multiplication and division by constant, memory, Degree/minute/second ↔ decimal degrees conversion, trigonometric function, inverse trigonometric function, logarithmic function, square and power, cube root, square root reciprocal, factorial, coordinates conversion, statistical, calculation having parenthesis, integer, absolute, fractional calculations, etc.

Program

Program system: Stored program

Steps: 128 steps (1 step/1 function)

Jump function: Unconditional jump (GTO) Subroutine jump (GTS) Conditional jump ($x \neq 0$, $x<0$, $x=t$, $x<t$)

Division of program:	Max. 13
Subroutine:	Max. 12 kinds
Designation of program address:	Designation of label number
Program check:	Program check function (FST: forward step, BST: back step) Debug function (FST). Program deletion/insertion function (DEL: delete, INS: insert)
Sound:	Produces the sound when the program is input and jumps to the label t
Number of data memories:	12
Component:	LSI etc.
Display:	Fluorescent display tube
Power supply:	Main power: DC: 3V (AA x 2 pcs.) (Optional) DC: 2.4V (with rechargeable Ni-Cd battery pack [EA-18B] AC: 120V (with AC adaptor EA-17E) Memory power: DC: 3V silver oxide battery [S15] x 2 pcs.
Operating time:	Main power: Approx. 6.5 hours (AA, in the continuous operation) Approx. 6.5 hours (with EA-18B, in the continuous operation, charging time: 15 hours) Memory power: Approx. 1 year Display 55555. at the ambient temperature: 20°C (68°F).

	The operating time slightly changes depending on the type of battery or the way of use.
Ambient temperature:	0°C ~ 40°C (32°F ~ 104°F)
Power consumption:	DC: 3V 0.3W (with AA)
	DC: 2.4V 0.3W (with EA-18B)
	DC: 3V 0.4W (with EA-17E and EA-18B)
Dimensions:	Approx.
	81(W) x 151(D) x 22(H) mm
	3-3/16"(W) x 5-15/16"(D) x 7/8"(H)
Weight:	Approx. 195g (0.43 lbs.)
Accessories:	Silver oxide battery (S15) x 2, Rechargeable Ni-Cd battery pack, EA-18B, AC adaptor EA-17E, applications manual and soft case.

INTERNATIONAL WARRANTY SYSTEM

Within the period of one (1) year from the date of purchase, warranty repair service may be obtained for any Sharp battery-operated consumer calculator at any of the service centers listed below. An international Warranty Certificate must be presented with the calculator.

Australia, Hong Kong, Iran, Japan, Kuwait, Lebanon, Malaysia,
Panama, Philippines, Singapore, South Africa, Thailand,
United Kingdom, U.S.A., West Germany

The international Warranty Certificate is not required for warranty repair within the continental United States. However, if you plan to travel abroad, an International Warranty Certificate may be obtained free of charge by sending your dated proof of purchase listing the model and serial number of your calculator to Sharp Electronics Corporation, 10 Keystone Place, Paramus, New Jersey 07652. Attn: National Service Manager. Your proof of purchase will be returned to you along with your International Warranty Certificate. Please allow three (3) weeks for processing.

SERVICE CENTER ADDRESS

SHARP ELECTRONICS CORPORATION
10 Keystone Place Paramus, New Jersey 07652
(201) 265-5600

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214 Harvard Avenue, Boston, Massachusetts 02134
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SHARP ELECTRONICS CORPORATION
Century Annex
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