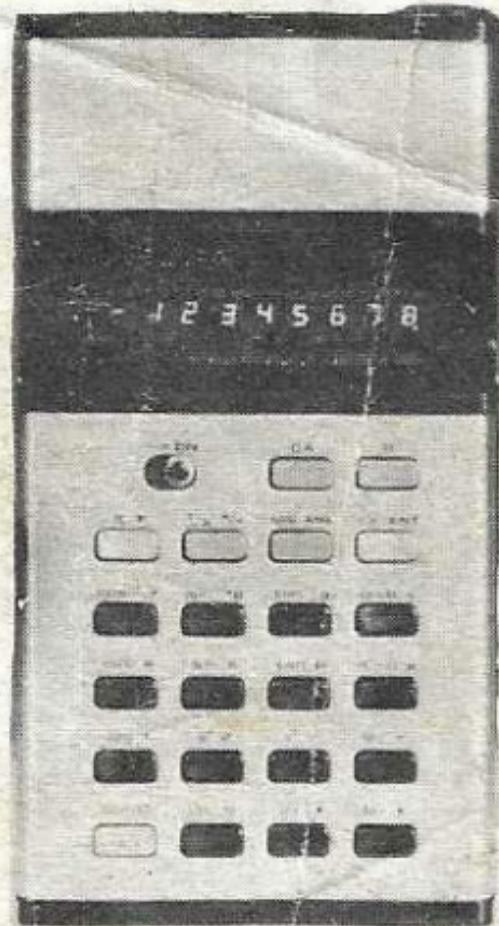


IMPORTANT:
WHEN THE 5th DECIMAL POINT
IS LIGHTED, THE BATTERY IS
BELOW OPERATING LEVEL.
CHANGE BATTERY IMMEDIATELY.

operating manual ART. NO. 02/4481

BINATONE PROFESSIONAL



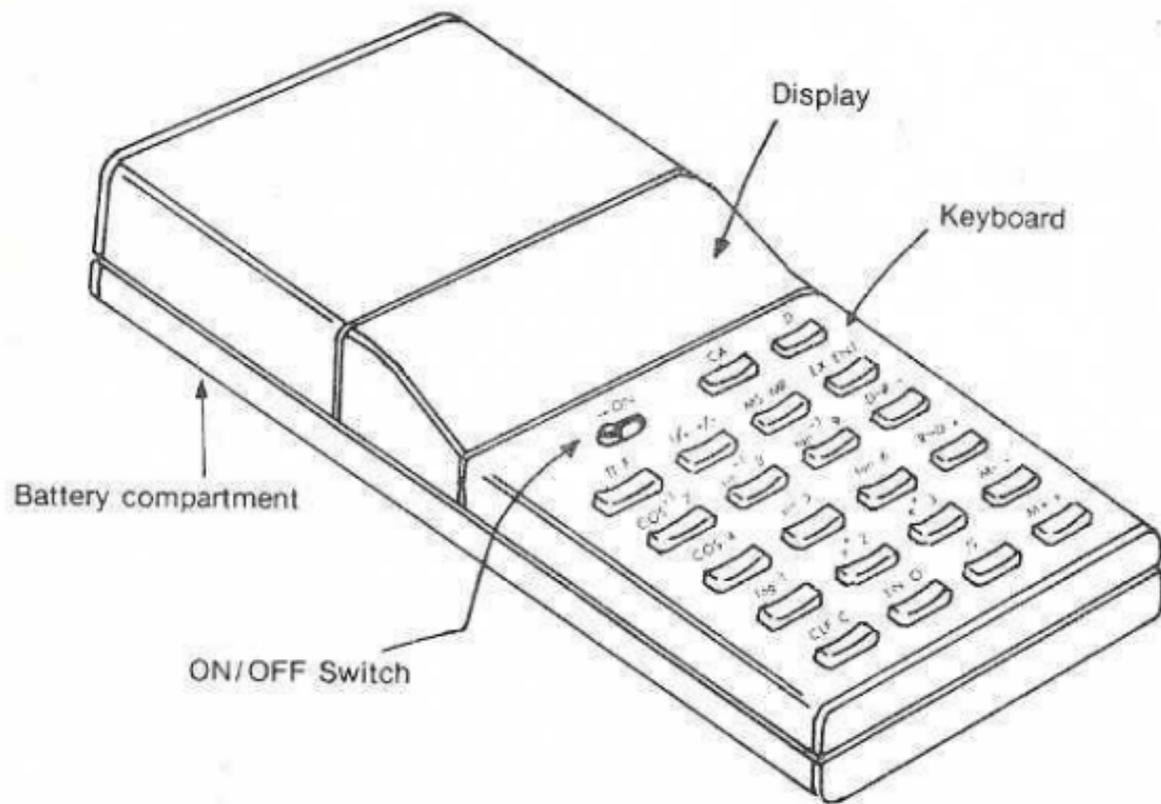
CONTENTS

1.	FEATURES	1
2.	NAMES OF VARIOUS PARTS	2
3.	POWER SUPPLY	3
4.	KEY IDENTIFICATION AND FUNCTION	4 - 6
5.	DISPLAY	7
6.	ERROR CONDITIONS AND ARGUMENT LIMITS	8 - 9
7.	THE OPERATIONAL STACK	10 - 12
8.	CALCULATION EXAMPLES	13 - 21
9.	OTHER CALCULATIONS	22 - 25

FEATURES

- RPN (Reverse Polish Notation) logic for easier and faster calculation
- 4-key memory (M—, M +, MS, MR)
- Nine-digit LED display with full-floating decimal system
- Scientific functions include:
tan, sin, cos, \tan^{-1} , \sin^{-1} , \cos^{-1} , e^x , y^x , \sqrt{x} , log, 1/x, ln, π .
- Direct degree/radian, radian/degree conversion
- Low battery indicator
- Battery saving system
- Error-correction key
- AC/DC operation

NAMES OF VARIOUS PARTS



POWER SUPPLY

The machine is operated by either:

- a) one 006p size, 9-V battery, or
- b) AC mains supply using AC adaptor with DC output of 9 volts at 100 mA suitable for earphone jack. Tip of DC output pin of adaptor should be positive.

KEY IDENTIFICATION AND FUNCTION

- F — function key
Depression of the function key F sets the calculator in the function mode to select the second function mode for a succeeding key as follows.
- F CLF C = CLF — cancels the function mode activated by F key
- F π F = π — causes entry and display of the constant π
- F log 1 = log — causes immediate execution of common log function and display of the result
- F LN O = LN — causes immediate execution of the natural log function and display of the result
- F e^x 3 = e^x — causes immediate execution of the exponential function and display of the result
- F y^x 2 = y^x — causes execution of a prior function and is stored as a current exponentiation command

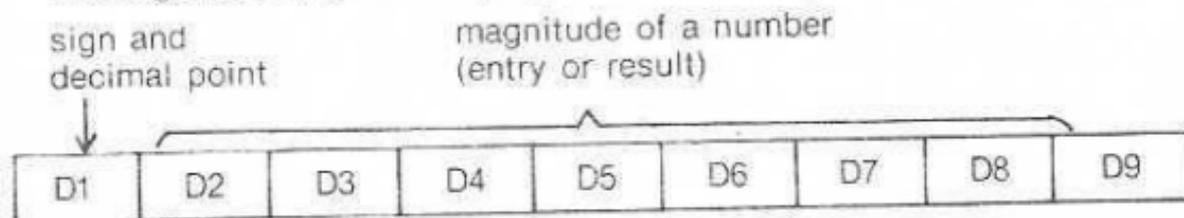
- F $\sqrt{x} \cdot = \sqrt{x}$ — causes immediate execution of the square root function and display of result
- F $1/x +/- = 1/x$ — causes immediate execution of the reciprocal function and display of the result
- F $M- - = M-$ — subtracts the contents of the display register from the memory register
- F $M+ + = M+$ — adds the contents of the display register to the memory register
- F $MS MR = MS$ — stores the contents of the display register in the memory register. The display is unchanged and any previously stored number is replaced by the new number
- F $EX ENT = EX$ — exchanges the contents of the display and constant register
- F $R \rightarrow D X = R \rightarrow D$ — converts radians to degrees
- F $D \rightarrow R \div = D \rightarrow R$ — converts degrees to radians

Other keys are explained as follows:

- + - x ÷ — each causes execution of a prior function and is stored as a current add, subtract, multiply or divide command respectively
- MR — copies the contents of the memory register into the display/entry register. The memory register contents are not changed.
- ENT — ENTER Key
- +/- — complements the sign of the number displayed
- C — a) clears the entry register when number entry is in process
b) clears all registers except memory register
- CA — clears all registers including memory register
- D — restores display after display cut-off has been activated.

DISPLAY

1. A 9-digit LED display is used with the 1st digit (the left most digit) for sign and decimal point.
2. The organization of the display format is as follows:



3. Status information

The information for calculation overflow, errors, low battery and display cut-off will be displayed as follows:

Display

Information

.

result overflow

.

error (due to illegal operation)

.

battery is below normal operating level

.

display cut-off is activated

ERROR CONDITIONS

1. Any overflow or illegal operation (e.g. division by zero) will cause the machine to indicate a error condition by displaying all zeros and decimal points.
2. The error condition can be cleared by using C key.
3. Memory is not affected by the error condition.

ARGUMENT LIMITS

Functions	Argument limits
$+, -, \times, \div$	$X > 99999999$
$\div, 1/x$	$ X \geq 0.0000001$
\sqrt{X}	$X > 0$
Y^X	$Y \geq 0; 18.42060 > X \ln Y > -28$
$\text{Log}^X, \ln x$	$X \geq 0$

$$e^x \quad 18.42068 > x > -28$$

$$\text{Sin, Cos} \quad x \leq 7 \text{ radians, } x \leq 401^\circ$$

$$\text{Tan} \quad |x| \leq 90^\circ, x \leq 7 \text{ radians}$$

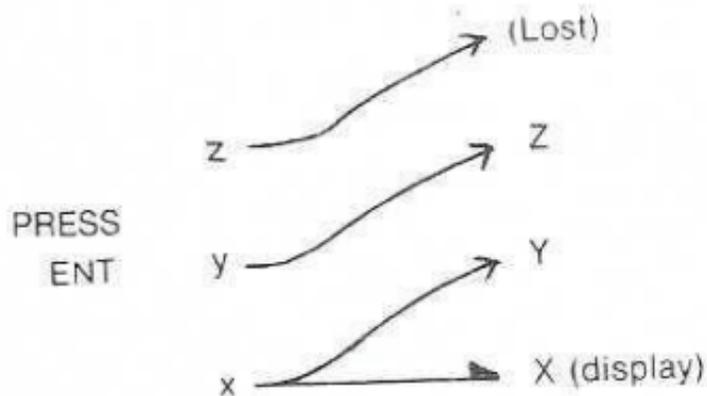
$$\text{Sin}^{-1}, \text{Cos}^{-1} \quad x < 1$$

$$\text{Tan}^{-1} \quad x < 99999999$$

THE OPERATIONAL STACK

This machine uses RPN with three registers X, Y and Z. A register is an electronic element used to store data while it is being displayed, processed or waiting to be processed. The three registers are arranged in a stack with register X on the bottom.

When a number is keyed in, it goes into the X register (display). When you press ENT, the number is duplicated into Y register. At the same time, the contents of Y register are transferred to register Z and the contents from the register Z are transferred out of the stack. The display always shows the number in the X register.



Let us examine how the stack principle works as we do $(2 + 3) \times (4 + 5)$ through steps (1) to (9) as follows:

Z						5.	5.		
Y		2.	2.		5.	4.	4.	5.	
X (Display)	2.	2.	3.	5.	4.	4.	5.	9.	45.
Key	2	ENT	3	+	4	ENT	5	+	X
Step	1	2	3	4	5	6	7	8	9

- Step 1 : 2 in display (X register)
- Step 2 : 2 duplicated into Y register
- Step 3 : 3 in display
- Step 4 : Sum (5) formed in Y, then drops into X
- Step 5 : Automatic ENT pushes 5 into Y, display shows 4
- Step 6 : ENT pushes 5 into Z and duplicates 4 into Y
- Step 7 : 5 in display
- Step 8 : Sum (9) formed in Y, then drops into X. At the same time, 5 drops into Y
- Step 9 : Product (45) formed in Y, then drops into X

CALCULATION EXAMPLES

Before each calculation, depress **CA** to clear the display and set the machine.

Two variable functions:

The functions of addition (+), subtraction (-), multiplication (x), division (÷) and exponentiation (y^x) all require two variables.

Basic arithmetic problems:

Example 1.1

$$\frac{(12 + 13) \times (-15) - 17}{16} = ?$$

Key	Display	Remarks
12 ENT 13 +	25.	12 + 13
15 +/- x	-375.	
16 -	-23.4375	
17 —	-40.4375	answer

Example 1.2

$$(5 \times 6) + (24 - 2) \times (2 + 4) = ?$$

Key	Display	Remarks
5 ENT 6 x	30.	5×6
24 ENT 2 -	12.	$24 - 2$
+	42.	$30 + 12$
2 ENT 4 +	6.	$2 + 4$
x	252.	42×6 (answer)

Example 1.3 Y^X , M +, MS, MR

$$2^{2.5} + (2^{2.5} - 2) = ?$$

answer: 8.4852735

Key	Display	Remarks
2 ENT 2.5 F y^x 2	5.656849	$2^{2.5}$
F MS MR	5.656849	store 5.656849 in memory
2 -	2.8284245	
F M + +	2.8284245	add 2.8284245 into the memory contents
MR	8.4852735	recall the memory contents to the display

SINGLE VARIABLE FUNCTIONS

The functions of \sin , \cos , \tan , \sin^{-1} , \cos^{-1} , \tan^{-1} , e^x , y^x , \sqrt{x} , \log , \ln , $1/x$ are all single variable functions which are executed immediately upon entry from the keyboard and which operate upon the operand as displayed by the calculator at the time the function is activated. Single variable functions may be activated in multiple sequence.

Example 2.1

$$\sqrt{\sqrt{2}} = ?$$

answer: 1.4142135

Key	Display	Remark
2 F \sqrt{x} •	1.4142135	$\sqrt{2}$

Example 2.2

In 45 = ?

answer: 3.806663

Key	Display	Remark
45 F LN O	3.806663	In 45

$\frac{1}{6} = ?$

answer: .16666666

Key	Display	Remark
6 F 1/x +/-	.16666666	$\frac{1}{6}$

Example 2.4

$$\log 30 = ?$$

answer: 1.477121

Key	Display	Remark
30 F log 1	1.477121	log 30

Example 2.5

$$e^{2.5} = ?$$

answer: 12.18249

Key	Display	Remark
2.5 F e ^x 3	12.18249	e ^{2.5}

Exampe 2.6

$$\tan 30^\circ = ?$$

answer: .5773502

Key	Display	Remark
30 F tan 6	.5773502	$\tan 30^\circ$

Example 2.7

$$\sin 30^\circ = ?$$

answer: .5

Key	Display	Remark
30 F sin 5	.5	$\sin 30^\circ$

Example 2.8

$$\cos(0.5 \text{ radian}) = ?$$

cos e, R D

answer: .8775826

Key

Display

Remark

.5 F R \rightarrow D x

28.64789

converts 0.5 radian to degrees

F cos 4

.8775826

Example 2.9

$\cos^{-1} x$

$$\cos^{-1} 0.5 = ?$$

answer: 60.

Key	Display	Remark
5 F \cos^{-1} 7	60.	

Example 2.10

$\tan^{-1} 1.0 = ?$ (radians)

answer .78539815

Key	Display	Remark
1 F \tan^{-1} 9	45.	answer in degrees
F $D \rightarrow R$ +	.78539815	answer in radians

OTHER CALCULATIONS

Probability Functions:

a) Gauss: $P(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$

$P(0.35) = ?$

Key	Display
F π F	3.1415926
ENT 2 x	6.2831852
F \sqrt{x} • F 1/x +/-	.39894229
.35 ENT x	.1225
+/- 2 +/-	-.06125
F e^x 3	.9405886
X	.37524057

Remark

the value of π

$$\frac{1}{\sqrt{2\pi}}$$

$$(.35)^2$$

$$\frac{-(.35)^2}{2}$$

$$e^{\frac{-(.35)^2}{2}}$$

answer

b) Poisson: $P(u, x) = \frac{u^x}{x!} e^{-u}$

$P(2.5, 4) = ?$

answer: .13360165

Key	Display	Remark
2.5 ENT 4 F y^x 2	39.06244	2.5^4
2.5 +/- F e^x 3	.082085	$e^{2.5}$
X	3.2064403	$u^x e^{-u}$
2 ENT 3 X 4 X	24.	
F $1/x$ +/-	.04166666	$\frac{1}{4!}$
X	.13360165	answer

Hyperbolic Functions

Example 1

$$\sinh X = \frac{1}{2} (e^X - e^{-X})$$

$$\sinh 1.5 = ?$$

Operation:

1.5 F e^x 3 F MS MR F 1/x +/- F M- - MR ENT 2 +

answer: 2.1292778

Example 2

$$\text{Cosh}^{-1} x = \ln [x + \sqrt{x^2 - 1}]$$

$$\text{Cosh}^{-1} \frac{\pi}{3} = ?$$

Operation:

F π F ENT 3 - F MS MR ENT X 1 - F \sqrt{x} • F M+ +

MR F LNO

answer: .3060418