

Chapter

5



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Binary, Octal, Decimal, and Hexadecimal Calculations

This calculator is capable of performing the following operations involving different number systems.

- Number system conversion
- Arithmetic operations
- Negative values
- Logical operations

5-1 Before Beginning a Binary, Octal, Decimal, or Hexadecimal Calculation

5-2 Selecting a Number System

5-3 Arithmetic Operations

5-4 Negative Values and Logical Operations

5-1 Before Beginning a Binary, Octal, Decimal, or Hexadecimal Calculation

You can use the **RUN Mode** and binary, octal, decimal, and hexadecimal settings to perform calculations that involve binary, octal, decimal and hexadecimal values. You can also convert between number systems and perform logical operations.

- You cannot use scientific functions in binary, octal, decimal, and hexadecimal calculations.
- You can use only integers in binary, octal, decimal, and hexadecimal calculations, which means that fractional values are not allowed. If you input a value that includes a decimal part, the unit automatically cuts off the decimal part.
- If you attempt to enter a value that is invalid for the number system (binary, octal, decimal, hexadecimal) you are using, the calculator displays an error message. The following shows the numerals that can be used in each number system.

Binary: 0, 1

Octal: 0, 1, 2, 3, 4, 5, 6, 7

Decimal: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Hexadecimal: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

- The alphabetic characters used in the hexadecimal number appear differently on the display to distinguish them from text characters.

Normal Text: A, B, C, D, E, F

Hexadecimal Values: **A**, **B**, **C**, **D**, **E**, **F**

- Negative binary, octal, and hexadecimal values are produced using the two's complement of the original value.
- The following are the display capacities for each of the number systems.

Number System	Display Capacity
Binary	16 digits
Octal	11 digits
Decimal	10 digits
Hexadecimal	8 digits

- The following are the calculation ranges for each of the number systems.

Binary Values

Positive: $0 \leq x \leq 1111111111111111$

Negative: $1000000000000000 \leq x \leq 1111111111111111$

Octal Values

Positive: $0 \leq x \leq 1777777777$

Negative: $2000000000 \leq x \leq 3777777777$

Decimal Values

Positive: $0 \leq x \leq 2147483647$

Negative: $-2147483648 \leq x \leq -1$

Hexadecimal Values

Positive: $0 \leq x \leq 7FFFFFFF$

Negative: $80000000 \leq x \leq FFFFFFFF$

•To perform a binary, octal, decimal, or hexadecimal calculation

1. In the main menu, select **RUN**.
2. Press **[SHIFT]** **[SETUP]** and then specify the default number system by pressing **[F2]** (Dec), **[F3]** (Hex), **[F4]** (Bin), or **[F5]** (Oct).
3. Press **[EXIT]** to change to the screen for calculation input. This causes a function menu with the following items to appear.
 - **{d-o}/{LOG}** ... {number system specification}/{logical operation} menu



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5-2 Selecting a Number System

You can specify decimal, hexadecimal, binary, or octal as the default number system using the set up screen. After you press the function key that corresponds to the system you want to use, press **EXE**.

•To convert a displayed value from one number system to another

Example To convert 22_{10} (default number system) to its binary or octal value

AC SHIFT SETUP F2 (Dec) EXIT F1 (d~o) F1 (d)	d22		22
2 2 EXE			
SHIFT SETUP F4 (Bin) EXIT EXE			0000000000010110
SHIFT SETUP F5 (Oct) EXIT EXE			00000000026

•To specify a number system for an input value

You can specify a number system for each individual value you input. While binary, octal, decimal, or hexadecimal is set as the default number system, press **F1** (d~o) to display a menu of number system symbols. Press the function key that corresponds to the symbol you want to select and then input the value you want.

- {d}/{h}/{b}/{o} ... {decimal}/{hexadecimal}/{binary}/{octal}

•To input values of mixed number systems

Example To input 123_{10} or 1010_2 , when the default number system is hexadecimal

SHIFT SETUP F3 (Hex) EXIT	d123		0000007B
AC F1 (d~o) F1 (d) 1 2 3 EXE			
F3 (b) 1 0 1 0 EXE	b1010		0000000A

5-3 Arithmetic Operations

Example 1 To calculate $10111_2 + 11010_2$

SHIFT SETUP F4 (Bin) EXIT
AC 1 0 1 1 1 +
1 1 0 1 0 EXE

10111+11010
0000000000110001

Example 2 To input and execute $123_8 \times ABC_{16}$, when the default number system is decimal or hexadecimal

SHIFT SETUP F2 (Dec) EXIT
AC F1 (d-o) F4 (o) 1 2 3 X
F2 (h) A B C EXE

o123xhABC
228084

SHIFT SETUP F3 (Hex) EXIT EXE

00037AF4

5-4 Negative Values and Logical Operations

While binary, octal, decimal, or hexadecimal is set as the default number system, press **F2** (LOG) to display a menu of negation and logical operators.

- **{Neg}** ... {negation}
- **{Not}/{and}/{or}/{xor}/{xnor}** ... {NOT}/{AND}/{OR}/{XOR}/{XNOR}

■ Negative Values

Example To determine the negative of 110010_2

SHIFT **SETUP** **F4** (Bin) **EXIT**
AC **F2** (LOG) **F1** (Neg)
1 1 0 0 1 0 **EXE**

```
Neg 110010
      1111111111001110
```

■ Logical Operations

Example 1 To input and execute " 120_{16} and AD_{16} "

SHIFT **SETUP** **F3** (Hex) **EXIT**
AC **1 2 0** **F2** (LOG)
F3 (and) **A D** **EXE**

```
120andAD      00000020
```

Example 2 To display the result of " 36_8 or 1110_2 " as an octal value

SHIFT **SETUP** **F5** (Oct) **EXIT** **EXIT**
AC **3 6** **F2** (LOG)
F4 (or) **EXIT** **F1** (d~o) **F3** (b)
1 1 1 0 **EXE**

```
36orb1110     0000000036
```

Example 3 To negate $2FFFD_{16}$

SHIFT **SETUP** **F3** (Hex) **EXIT** **EXIT**
AC **F2** (LOG) **F2** (Not)
2 F F F E D **EXE**

```
Not 2FFFD     FFD00012
```