

Windows PLC

Programmer Manual

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Leading Numerical Controller



LNC Technology Co., Ltd.

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1 Introduction of Built-in PLC Software

Being the industry-leading developing platform, LNC controllers not only provide built-in PLC modules from small to medium sizes, but also provide the ladder figure editing software of PLC Programmer for Windows operating system.

The Input/Output points supported by PLC modules can be applied as the I/O signals. The software also provides mathematical abilities to measure time or numbers, logistics, to perform operations, and to compare, etc. for the need of every kinds of sequence control.

PLC programmer of this version can be applied to two types of ladder programs:

1. Dual-system controllers (Ex. LNC-T800 Lathe controller)
Ladder file name is CNC.MLC.
2. Single system controllers (Ex. LNC-600 Series, LNC-520 Series, LNC-510i Series, LNC-310i Series)
Ladder file name is CNC.LAD.

This chapter describes how to set hardware ports & their corresponding I/O points of PLC.

Chart 1 Dual-system PLC I/O Data Types

Data Type	Name	Q'ty	Definitions
Boolean	I	5120	Digital input -----I0 ~ I5119
	O	5120	Digital output -----O0 ~ O5119
	A	5120	Internal contact -----A0 ~ A5119
	S	5120	Internal contact (Status)-----S0 ~ S5119
	C	5120	Internal contact (Command)-----C0 ~C5119
Integer	Timer (TIM)	256	Timer -----TM0 ~ TM255 Timer unit type-----10 ms, 0.1 sec,1 sec
	Counter (CNT)	256	Counter-----CT0 ~ CT255 Counting method: Up, Down, Reset, Ring Up, & Ring Down Counter
	Data Register (DReg)	1024	Data Register-----D0 ~ D1023 Data is preserved after shut down.
	Register (Reg)	1024	Register----- R0 ~ R1023 Data is cleared after shut down.

Chart 2 Single-system PLC I/O Data Types

Data Type	Name	Q'ty	Definitions
Boolean	I	512	Digital input -----I0 ~ I511
	O	512	Digital output -----O0 ~ O511
	A	512	Internal contact -----A0 ~ A511
	S	512	Internal contact (Status)-----S0 ~ S511
	C	512	Internal contact (Command)-----C0 ~ C511
Integer	Timer (TIM)	256	Timer-----TM0 ~ TM255 Timer unit type-----10 ms, 0.1 sec, 1 sec
	Counter (CNT)	256	Counter-----CT0 ~ CT255 Counting method: Up, Down, Reset, Ring Up, & Ring Down Counter
	Data Register (DReg)	256	Data Register-----D0 ~ D255 Data is preserved after shut down.
	Register (Reg)	256	Register----- R0 ~ R255 Data is cleared after shut down.

2 PLC I/O Setting

Except for LNC-310i Series, which does not require the PLCIO.cfg file, for the rest of other models, the PLCIO.cfg file can be found in the MACHINE directory. This file allows users to set the actual I/O points which correspond to logical I/O points in CNC. Below is an example of I/O signal setting by editing a **PLCIO.cfg** file in the machine:

```

InputSignalInverse=0           // To inverse I point or not; 0= No,1= Yes
OutputSignalInverse=0        // To inverse O point or not; 0= No, 1= Yes
BaseAddress=0x200            // Base address
Set1Slave1=1                 // If to use Slave 1 of Set1, 0= No, 1= Yes
Set1Slave2=0                 // If to use Slave 2 of Set1, 0= No, 1= Yes
Set2Slave1=1                 // If to use Slave 1 of Set2, 0= No, 1= Yes
Set2Slave2=0                 // If to use Slave 2 of Set2, 0= No, 1= Yes
// Field [I or O]  [NUMBER]  [SET]  [ADDRESS]  [Add remarks here]
I      0      1      0x200
I      8      1      0x201  // No blank is allowed between lines.
I     16      1      0x202  // Either I or i
I     24      1      0x203  // Either O or o
I     32      1      0x204  // SET=1 refers to SET1, SET=2 refers to SET2
I     40      2      0x200
I     48      2      0x201
I     56      2      0x202
I     64      2      0x203
I     72      2      0x204
O      0      1      0x200  // O points must be even numbers.
O      8      1      0x201
O     16      1      0x202
O     24      1      0x203
O     32      1      0x204
O     40      1      0x205
O     48      2      0x200
O     56      2      0x201
O     64      2      0x202
O     72      2      0x203

```



I 80 11 0x200 // SET=11 presents the first 4 points of Local IO, 12 presents the later
4 points. Set only 4 points each time, and put them together for claiming.

I 84 12 0x200 // 0x200:0~7,0x201:8~15

O 80 11 0x201 // 0~7 和 12~15 : Local Input

I 88 12 0x201 // 8~11 : Local Output

2.1 PLC PROGRAM SOFTWARE INTERFACE

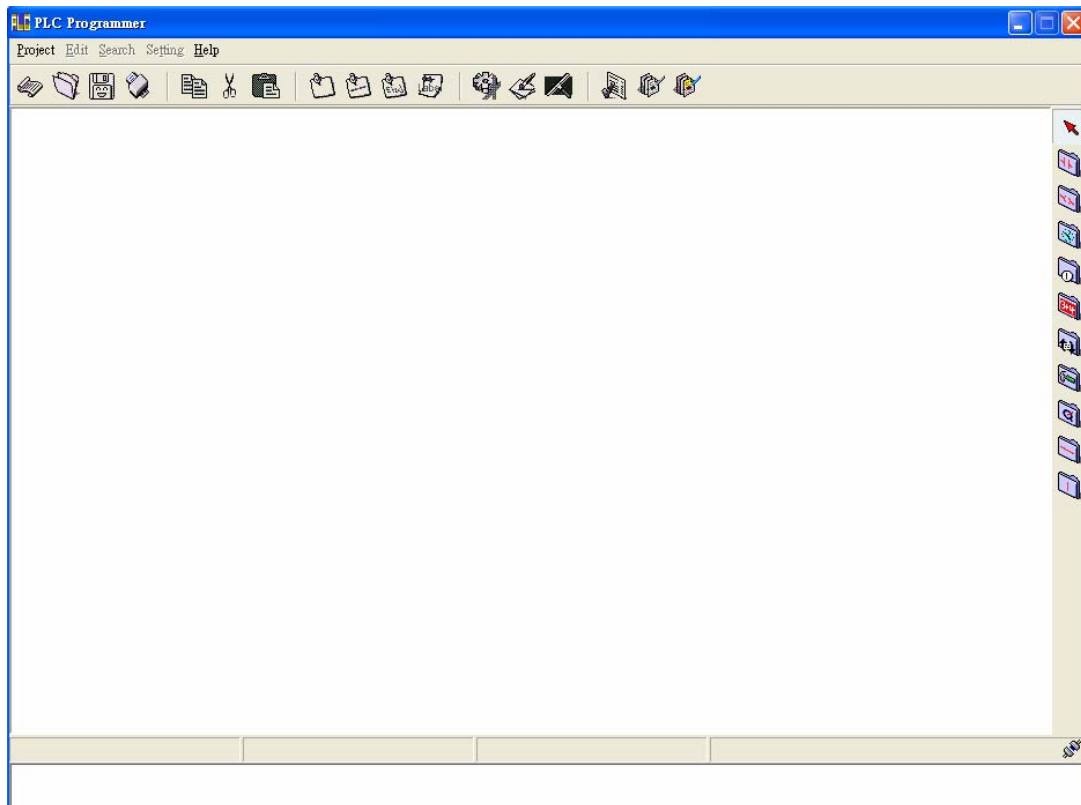
2.1.1 Software Operation Instruction:

Method 1

1. Go to the PLC installation file such as **C:\Program Files\PLC Programmer** (Default).
2. Execute the PLCProgrammer.exe file & PLC Program screen as shown in <Figure 1>.

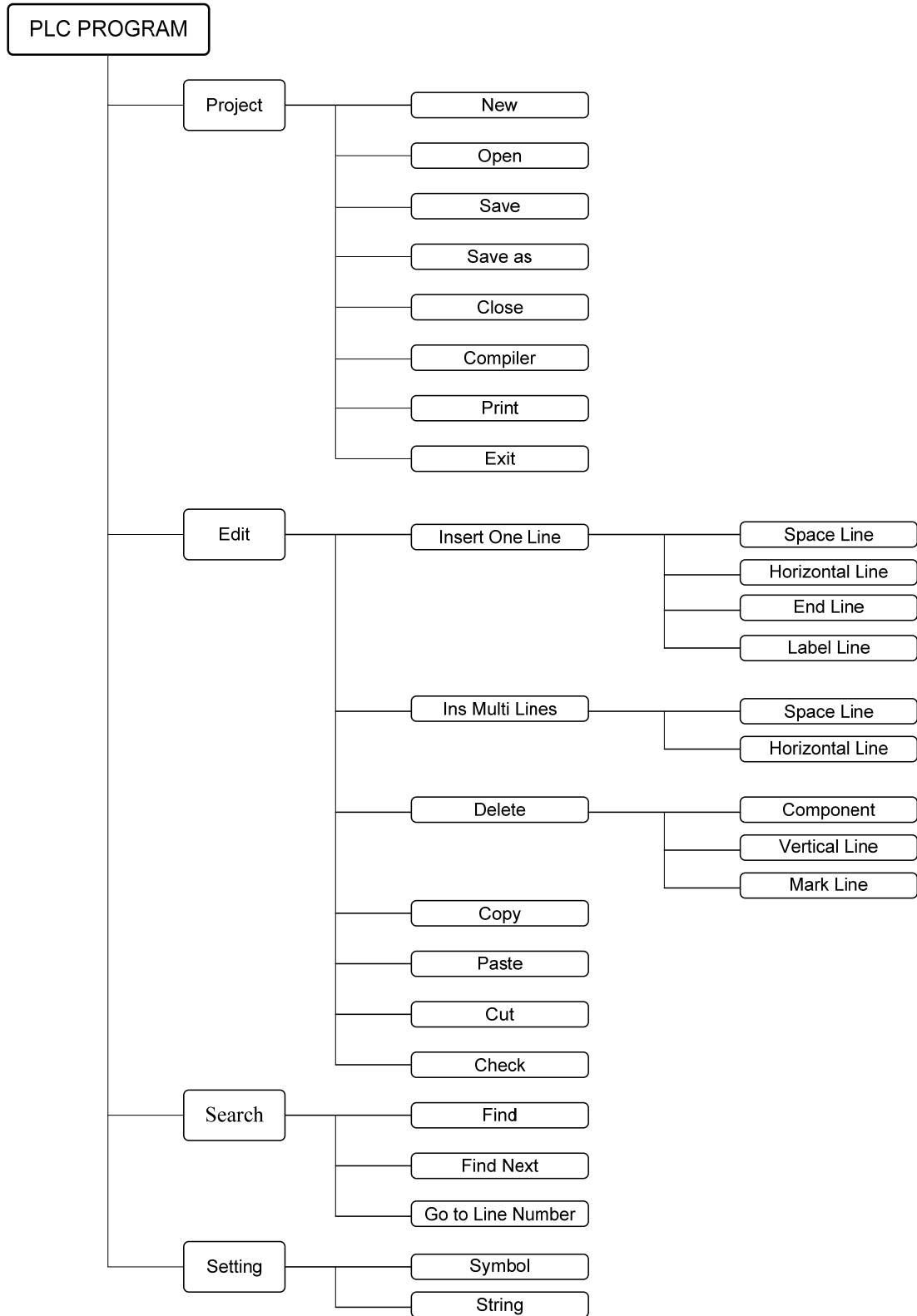
Method 2

1. Click **Start**→**Program Files**→ **PLC Programmer**
2. Click the shortcut PLC Programmer
3. The PLC Program screen is shown as <Figure 1>.



<Figure 1> PLC PROGRAM Software Interface

2.2 PLC PROGRAM FEATURES & STRUCTURE



Software interface screen is shown as <Figure 2> :

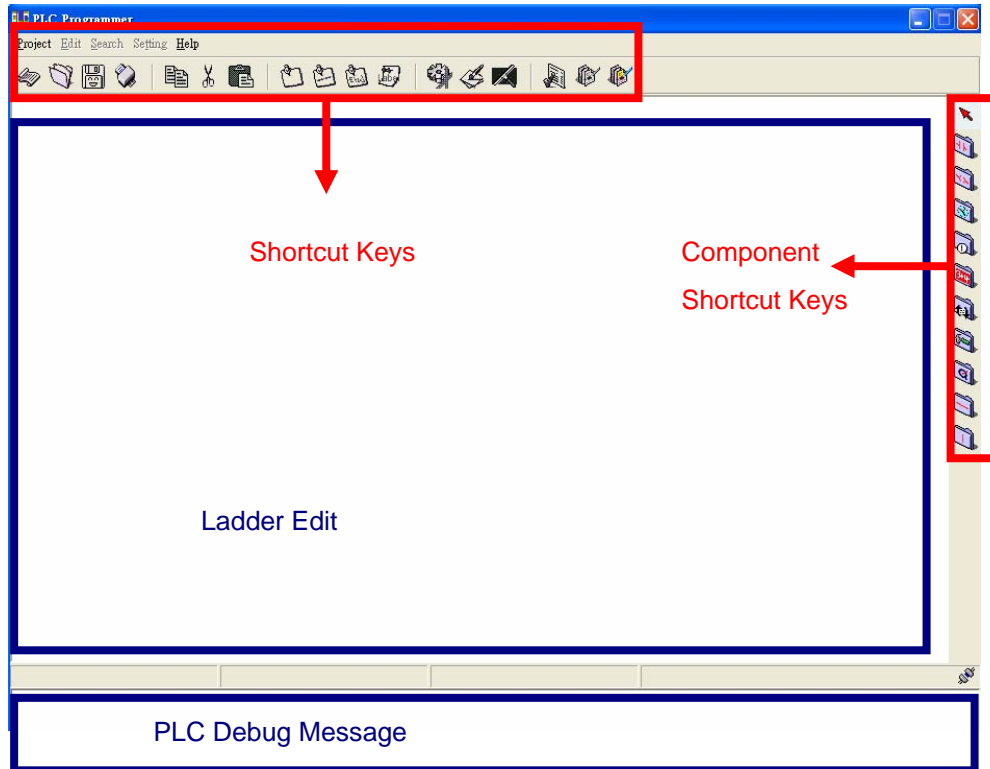
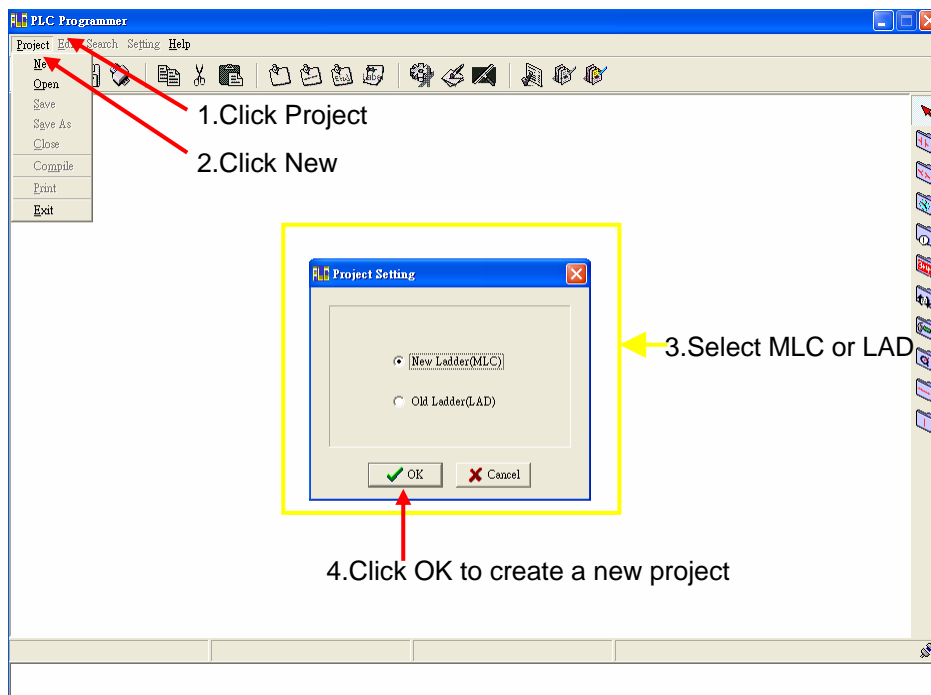


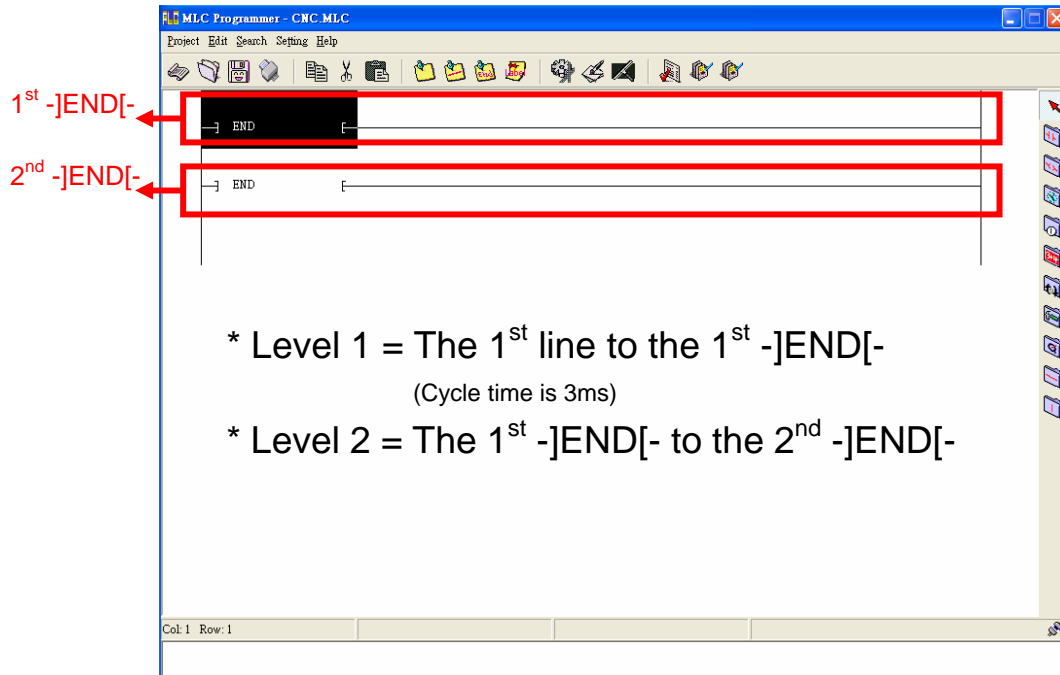
Figure 2 Software Interface

PLC PROGRAM: Steps to create a new project is shown as <Figure 3> :

- I. Click **Project**.
- II. Click **New**.
- III. Select single (LAD) or dual system (MLC) in the **Project Setting** dialog box.
- IV. After selection is finished, click **OK** to create a new project.
- V. The new project is created as shown in Figure 4.



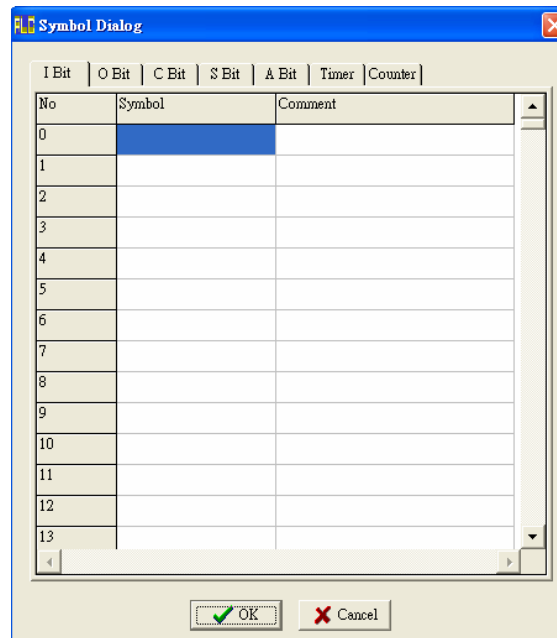
<Figure 3>PLC PROGRAM: Steps to Create a New Project



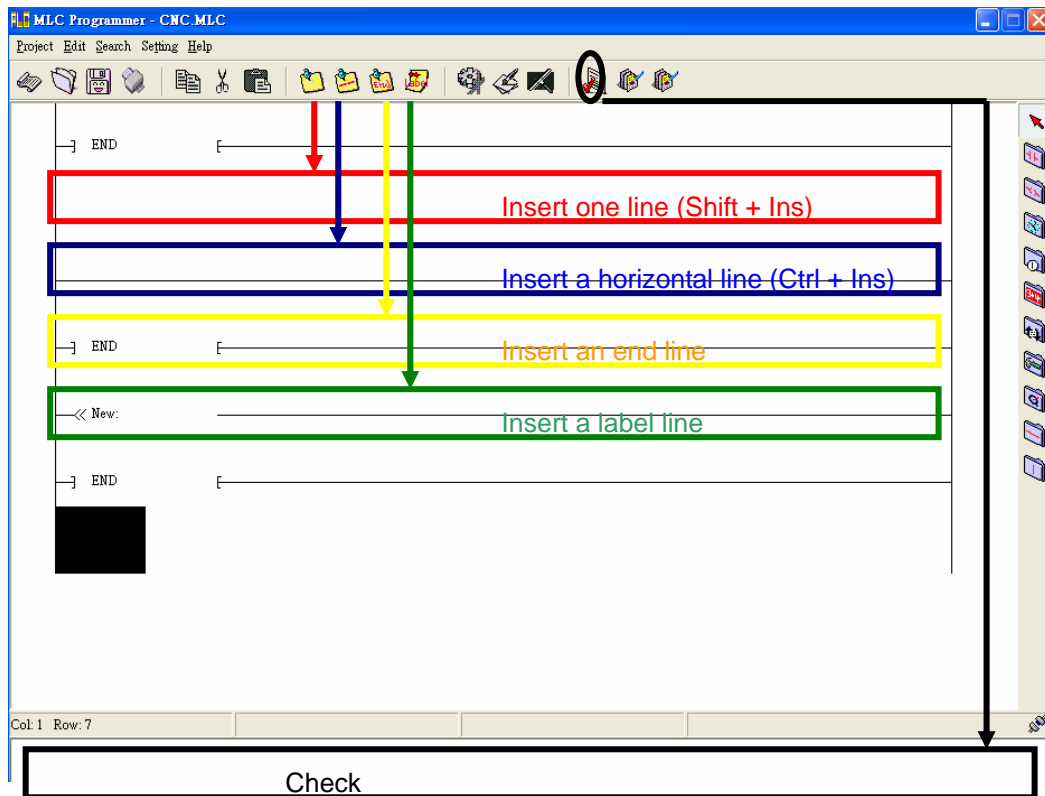
<Figure 4> Complete the Steps of Creating a New Project.

2.3 Functions of Shortcut Keys

- ⊙ New : Create a new project.
- ⊙ Open : Open an old project.
- ⊙ Save : Save the current project.
- ⊙ Print : Print the current project.
- ⊙ Copy : Copy one line **【Unable to copy single component】** .
- ⊙ Cut : Cut one line **【Unable to cut single component】** .
- ⊙ Paste : Paste one line **【Unable to paste single component】** .
- ⊙ Insert One Line : Add a new line (Shift + Ins).
- ⊙ Insert One Line – Horizontal Line : Insert a horizontal line (Ctrl + Ins).
- ⊙ Insert One Line – End Line : Insert an end line.
- ⊙ Insert One Line – Label Line : Insert a label line.
- ⊙ Delete – Component : Delete a component (Del).
- ⊙ Delete – Vertical Line : Delete a vertical line (Shift+Del).
- ⊙ Delete – Mark Line : Delete the entire line (Ctrl+Del).
- ⊙ Check : Check if the ladder is correct or not.
- ⊙ Setting – Symbol : Edit symbols, as shown in <Figure 5>.
- ⊙ Setting – String : Edit word strings.




<Figure 5> Define Symbols



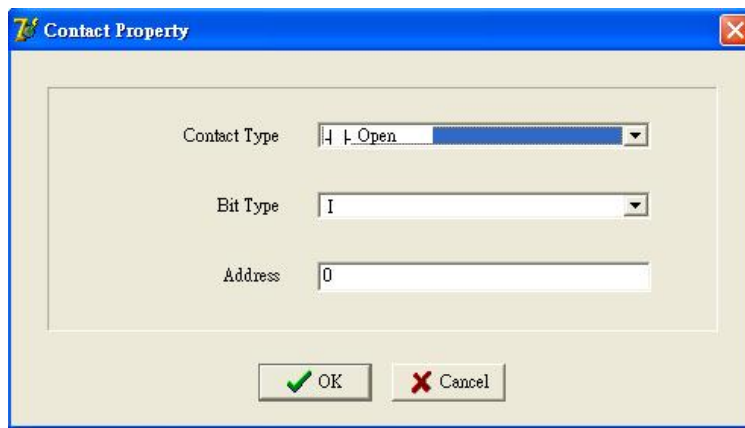
<Figure 6> Ladder Edit Shortcut Keys

2.4 Component Shortcut Keys

 Cursor shortcut key : Right-click the mouse and drag to select.

 Contact shortcut key : Left-click the Contact shortcut key, and the Contact Property dialog box will appear as

<Figure 7>.



<Figure 7> Select a Contact Type

※ Select a contact type as shown in <Figure 8> :

Open : Normal open contact.

Close : Normal close contact.

Timer Open : Timer is triggered.

Timer Close : Timer is NOT triggered.

Counter Open : Counter is triggered.

Counter Close : Counter is NOT triggered.

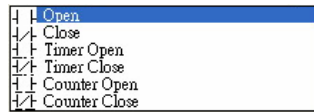
※ Component Types for selection (Only limited to Open or Close type) as <Figure 9> :

I : PLC obtains external inputs for the information of peripheral status.

O : PCL outputs signals to external peripherals.

C、S : Interface between NC and PLC.

A : PLC internal auxiliary contacts.



<Figure 8> Select a Contact Type



<Figure 9> Select a Component Type

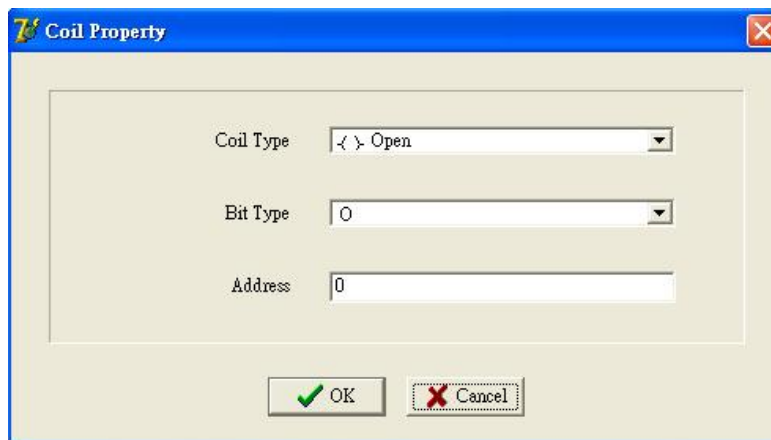
※ Input address range : Dual-system:0~4095. Single-System:0~511

Chart 7 PLC Coil Types

Name	Definition
Normal Open	A contact that is ON is True.
Normal Close	A contact that is ON is False.
Timer Open	Timer that is triggered is True
Timer Close	Timer that is triggered is False.
Counter Open	Counter that is triggered is True.
Counter Close	Counter that is triggered is False.
Horizontal Line	Horizontal lines connect different components.
Vertical Line	Vertical lines.



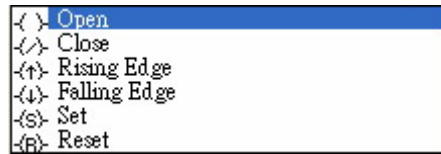
Coil shortcut key : Left-click the Coil shortcut key, and the Coil Property dialog box shows up as <Figure 10>.



<Figure 10> Set Coil Property

- ※ Select the type of coil :
 - Open : Normal open contact of Coil.
 - Close : Normal close contact of Coil.
 - Rising Edge : Coil is triggered when the contact turns from OFF to ON.
 - Falling Edge : Coil is triggered when the contact turns from ON to OFF.
 - Set : Coil is always ON.
 - Reset : Coil is always OFF.

 - ※ Select a component type :
 - O : PLC outputs signals to external peripherals.
 - C、S : NC and PLC interface.
 - A : PLC internal auxiliary contact.
- a. After the OK key is clicked, if there is any component at the right side of the cursor (not including HorConnect & VerConnect), a dialog box will show up and ask the user if to overwrite the original coil.
 - b. No matter the dialog box that asks the user if to overwrite the original coil appears or not, after OK is clicked, the new coil component will be put at the end of the line; also, HorConnect component will be automatically filled in between the original cursor's location and the end of the line.



<Figure 11> Select a Coil Type

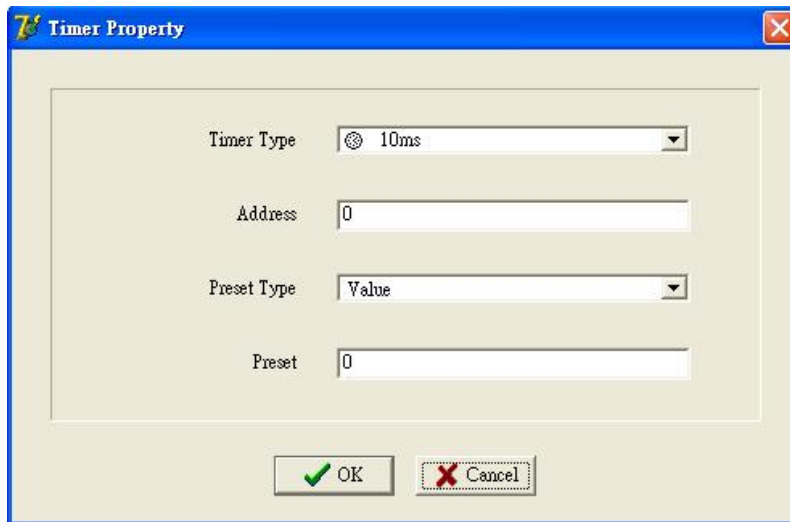


<Figure 12> Select a Component Type

Chart 8 PLC Coil Types

Name	Definition
Normal Open Coil	When True, Coil is ON.
Normal Close Coil	When False, Coil is ON.
Rising Triggered Coil	Coil that is turned from OFF to ON is True.
Falling Triggered Coil	Coil that is turned from ON to OFF is True.
Latch Coil	Coil is always ON.
Unlatch Coil	Coil is always OFF.

Timer shortcut key : Left-click the Timer shortcut key, and the Timer Property dialog box shows up as <Figure 13>.



<Figure 13> Set Timer Property

※ Select as Timer unit type as shown in <Figure 14> :

10ms : Time base is 10ms.

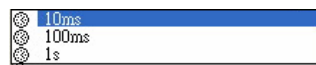
100ms : Time base is 100ms.

1s : Time base is 1sec.

※ Select the type of set value as shown in <Figure 15> :

Value : Integer type (0~32767).

Register : Register type (Dual-system:0~1023; Single-System:0~511). (Register value)



<Figure 14> Select a Timer Type



<Figure 15> Select a Value Type

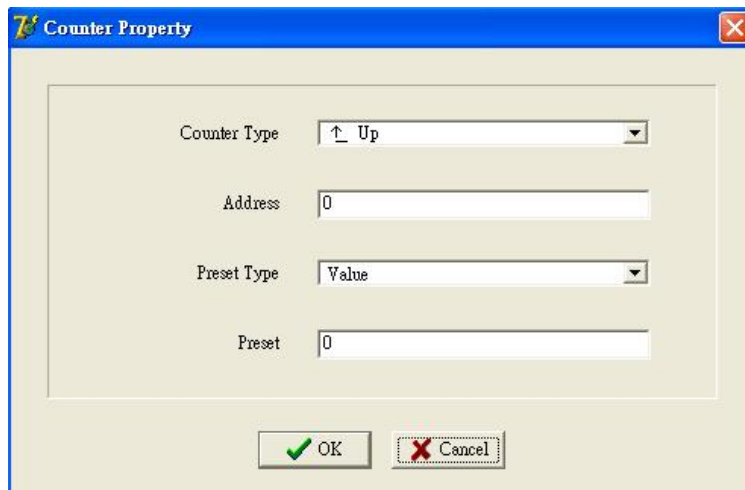
※ Input address range : 0~255.

Chart 9 PLC Timer Definitions

Name	Definition
10ms Timer	Time base is 10ms.
100ms Timer	Time base is 100ms.
1s Timer	Time base is 1sec.



Counter shortcut key : Left-click the Counter shortcut key, and the Counter Property dialog box will appear as <Figure 16>.



<Figure 16 > Set Counter Property

※ Select a counter type as shown in <Figure 17 > :

UP : Counter increases its value by 1 per cycle time from 0 to the preset value.

Down : Counter decreases its value by 1 per cycle time from the preset value to 0.

Ring UP : Counter increases its value by 1 per cycle time from 0 to the preset value, and then resets itself to 0 and counts up to the preset value.

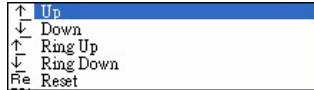
Ring Down : Counter decreases its value by 1 per cycle time from the preset value to 0, and then resets itself to the preset value and counts down to 0.

※ Select a preset type as shown in <Figure 18> :

Value : Integer type (0~32767).

Register : Register type (Dual-system:0~1023; single-System:0~511). (Register value)

※ When the counter type is Reset, the Preset type & setting value options are not available.



<Figure 17> Select a Counter Type




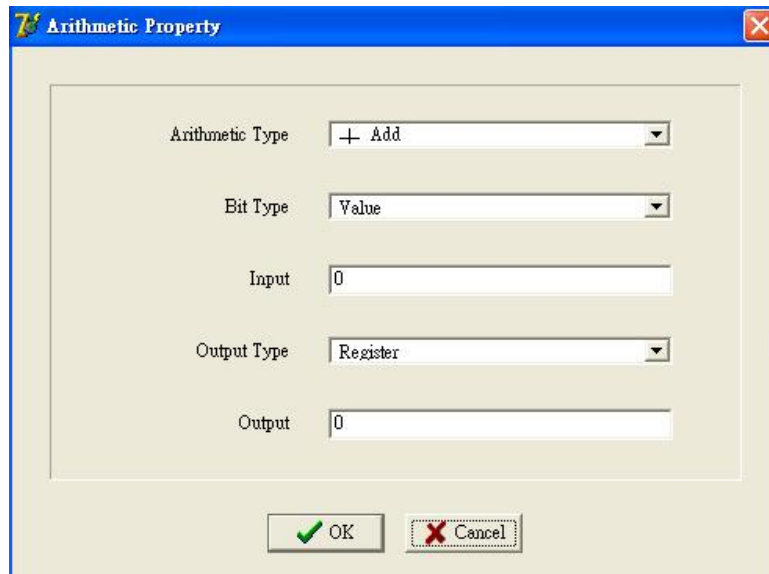
<Figure 18> Select a Preset Type

※ Input address range : 0~255.

Chart 10 PLC Counter Definitions

Name	Definition
Up Counter	Counter increases its value by 1 per cycle time from 0 to the preset value.
Down Counter	Counter decreases its value by 1 per cycle time from the preset value to 0.
Ring Up Counter	Counter increases its value by 1 per cycle time from 0 to the preset value, and then reset itself to 0 and repeat counting up to the preset value.
Ring Down Counter	Counter decreases its value by 1 per cycle time from the preset value to 0, and then reset itself to the preset value and repeat counting down to 0.
Reset Counter	Counter is reset to the predetermined reset value.

 Arithmetic shortcut key : Left-click the Arithmetic shortcut key, and the Arithmetic Property dialog box shows up as <Figure 19>.



<Figure 19 > Arithmetic Property Setting

※ Arithmetic Instructions :

+Add	-Sub	xMul	÷Div	∩Move
>More than	<Less than	=Equal to	&And	Or
∧Xor				

※ Input Types :

Value : Integer type (± 32767).

Register : Register type (Dual-system:0~1023; Single-System:0~511).

Register Pointer : Only applicable for + Add.

※ Output Types :

Register : Register type (Dual-system:0~1023; Single-System:0~511).

Register Pointer : Only applicable for + Add.

※ Add instruction: When True, the value continues to increase until False.

- + Add
- Sub
- × Mul
- ÷ Div
- ↶ Move
- > More than
- < Less than
- = Equal to
- ∩ And
- | Or
- ^ Xor

<Figure 20> Arithmetic Instructions

- Value
- Register
- Register Pointer


<Figure 21> Input Types

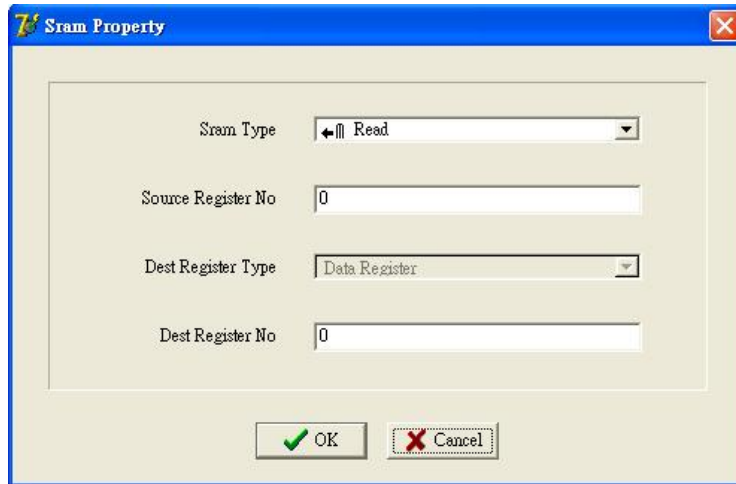
- Register
- Register Pointer

<Figure 22> Output Types

Chart 11 PLC Arithmetic Instructions

Name	Definition
Add	Output Register = Output Register value + (Value or Input Register value)
Subtract	Output Register = Output Register value - (Value or Input Register value)
Multiply	Output Register = Output Register value ÷ (Value or Input Register value)
Divide	Output Register = Output Register value x (Value or Input Register value)
Move	Output Register = Value or Input Register value
Compare Large	Compare if Output Register > Value or Input Register value)
Compare Less	Compare if Output Register < Value or Input Register
Compare Equal	Compare if Output Register = Value or Input Register
AND	AND operation
OR	OR operation
Exclusive OR	Exclusive OR operation

 SRAM shortcut key : Left-click the SRAM shortcut key, and the SRAM Property dialog box will show up as <Figure 23>.



<Figure 23> Set SRAM Property

- ※ Select a SRAM type :
 - Read : Source Register retrieves the value of destination Register.
 - Write : Store the value of source Register in destination Register.

- ※ Select a destination Register type :
 - Data Register
 - Data Register Pointer (Only applicable in **Write** type).

- ※ When the SRAM type is Read, destination Register type selection is unavailable.




<Figure 24> Select a SRAM Type

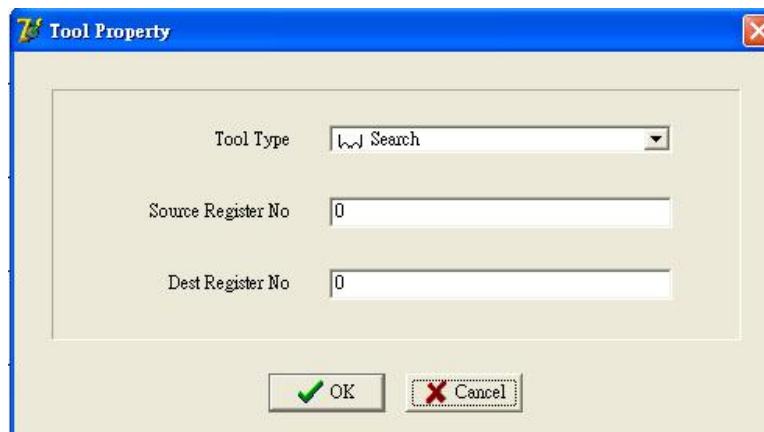


<Figure 25> Select a Destination Register Type

Chart 12 PLC SRAM Register Types

Name	Definition
SRAM Read	Retrieve Data Register value
SRAM Write	Store Register value in Data Register

 Tool shortcut key : Left-click the Tool shortcut key, and the Tool Property dialog box will show up as <Figure 26>.



<Figure 26> Set Tool Property


- ※ Select a SRAM tool type :
 - Search : Component for data search.
 - Rotation : Component for turret rotation.

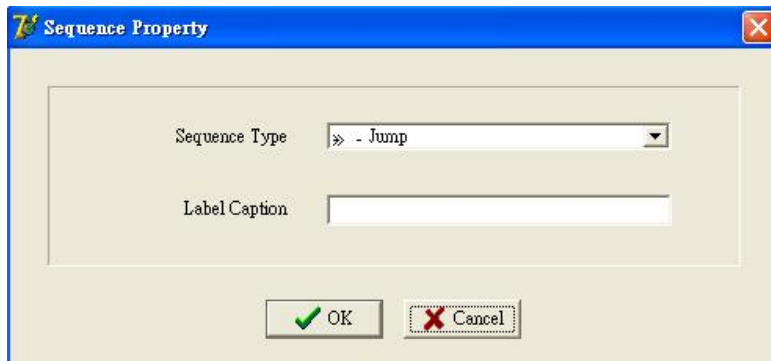


<Figure 27> Select a Tool Type

Chart 13 Definitions of PLC Tools

Name	Definition
Search	Search data in Register array
Rotation	Rotate turret Register array

 Sequence shortcut key : Left-click the Sequence shortcut key, and the Sequence Property dialog box shows up as shown in <Figure 28>.



<Figure 28> Set Sequence Property

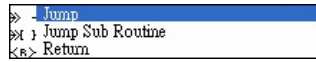
※ Select a Sequence Type

Jump : When Jump instruction is executed, the program will go to the designated label and execute the program from the location of the label.

Jump Sub Routine : Call Subroutine instruction. The program will go to the designated label and execute the line where the label is. After finishing execution of the line, the program will return to its previous location to resume the previous execution.

Return : Finish execution of a subroutine. Please note that a Return instruction must be made with one subroutine; in other words, they must be applied as a pair. If not applied as a pair, there will be an error in the program.

- a. Label : The input characters can be more than 6, but only 6 characters will be shown or saved.
- b. When the sequence type is Return, no label is required.
- c. When the sequence type is Jump or Return, after OK is clicked, if there is any component at the right side of the cursor (not including HorConnect & VerConnect), a dialog box will show up and ask the user if to overwrite the original coil.
- d. No matter whether the dialog box that asks the user if to overwrite the original coil appears or not, after OK is clicked, the new Sequence component will be put at the end of the line; also, HorConnect component will be automatically filled in between the original cursor's location and the end of the line.



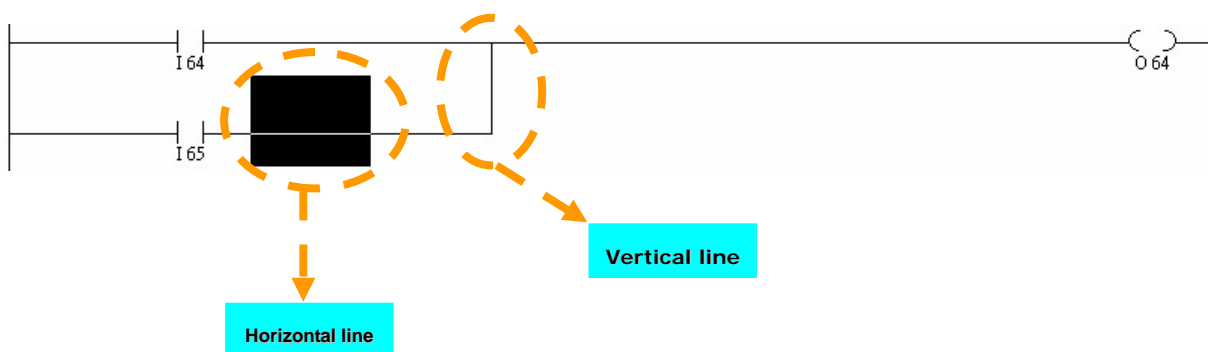
<Figure 29> Select a Sequence Type

Chart 14 Definitions of PLC Sequences

Name	Definition
JUMP	Go to the level where the label is.
Call Subroutine	Execute the assigned subroutine first.
Label	Program level label or subroutine name.
Return	Return to the previous program after executing the subroutine.
End	The end of a level.

Horizontal Line shortcut key : To create a new horizontal line, left-click the Horizontal Connect shortcut key (or Shift + H).

Vertical Line shortcut key : To create a new vertical line, left-click the Vertical Connect shortcut key (or Shift + V).



<Figure 30> Lines

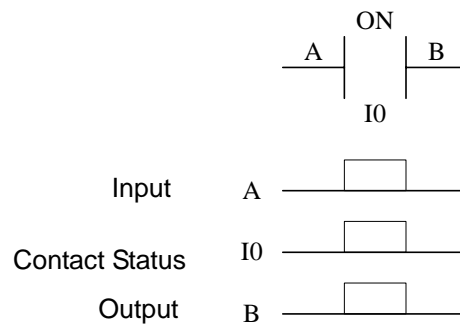
Chart 15 PLC Lines

Name	Definition
Horizontal Line	Horizontal lines connect different components.
Vertical Line	Vertical lines.

2.5 PLC Contact Definition

2.5.1 Normal Open Contact -| |-

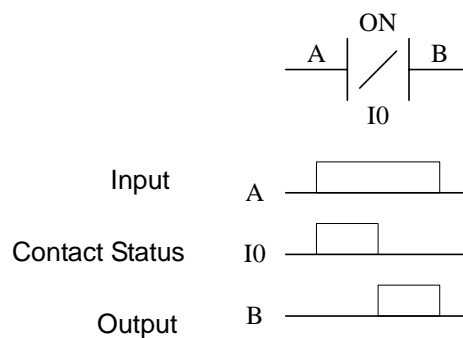
The status of output signal B is the result of both the statuses of input signal A **and** contact I0. The contact type can be either a Timer or Counter. A Timer or Counter that reaches the preset value will be True as shown in <Figure 31>.



<Figure 31> Normal Open Contact

2.5.2 Normal Close Contact -|/|-

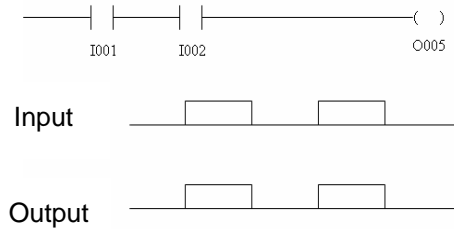
The status of output signal B is the result of both the statuses of input signal A **or** contact I0. The contact type can be either a Timer or Counter. A Timer or Counter that reaches the preset value will be True as shown in <Figure 32>.



<Figure 32> Normal Close Contact

2.5.3 Normal Open Coil

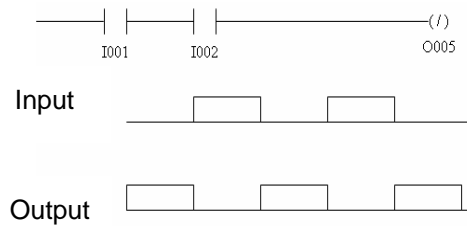
As soon as I001 and I002 turn ON, RELAY O005 will turn to ON as shown in <Figure 33>.



<Figure 33> Normal Open Coil

2.5.4 Normal Closed Coil

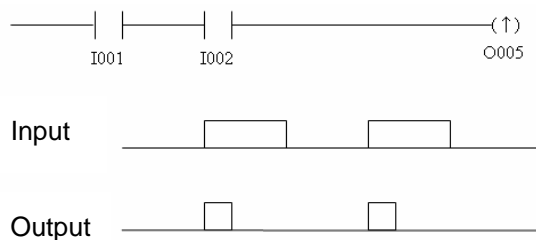
As soon as I001 and I002 turn to ON, RELAY O005 will turn to OFF as shown in <Figure 34>.



<Figure 34> Normal Closed Coil

2.5.5 Positive Edge Triggered Coil (↑)

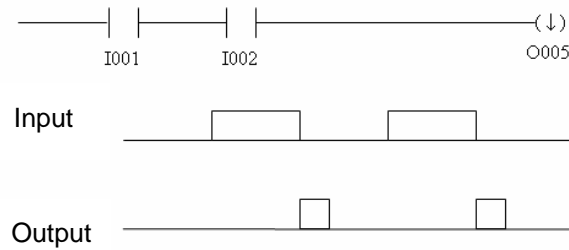
- a. As soon as I001 and I002 turn to ON, RELAY O005 will output one pulse signal.
- b. A pulse signal's cycle time is the scan time required for a PC program to execute a cycle.



<Figure 35> Positive Edge Triggered Coil

2.5.6 Negative Edge Triggered Coil (↓)

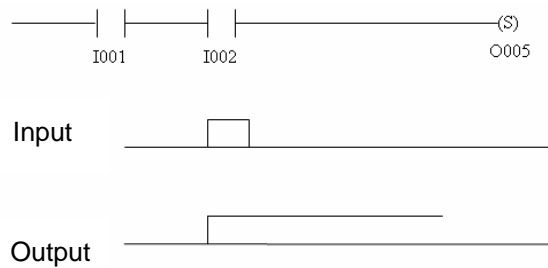
- c. As soon as I001 and I002 turn to OFF, RELAY O005 will output a pulse signal.
- d. A pulse signal's cycle time is the scan time required for a PC program to execute a cycle.
- ※ Remark : The number of RELAY for positive & negative edge triggered coils is 256. When the RELAY number that is over 256 is invalid.



<Figure 36> Negative Edge Triggered Coil

2.5.7 Latch Coil (S)

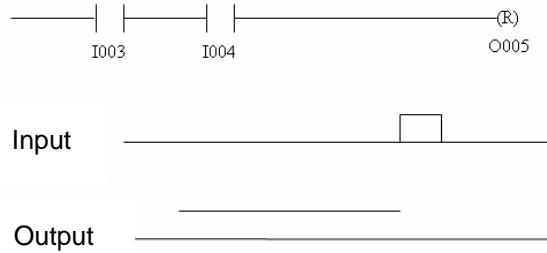
- a. As soon as I001 and I002 turn ON, RELAY O005 will turn to ON & remains as ON.
- b. Input signals can either be PULSE (1 SCAN) or not.



<Figure 37> Latch Coil

2.5.8 Unlatch Coil (R)

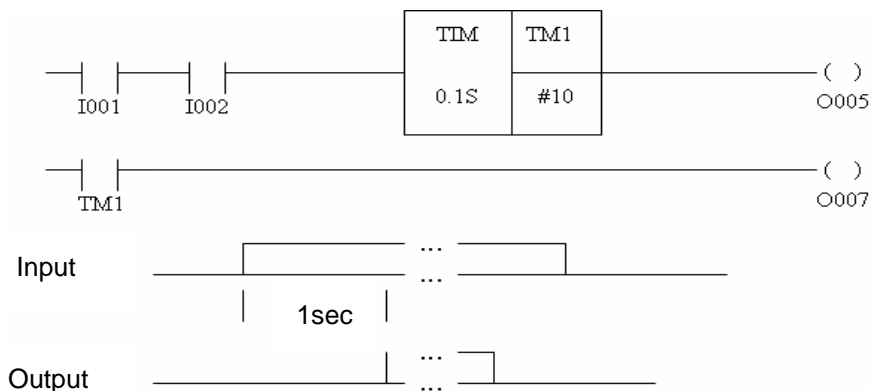
- a. As soon as I003 and I004 turn ON, RELAY O005 signal will turn from ON to OFF.
- b. Input signals can be either PULSE (1 SCAN) or not.



<Figure 38> Coil is Always ON.

2.5.9 Timer Relay

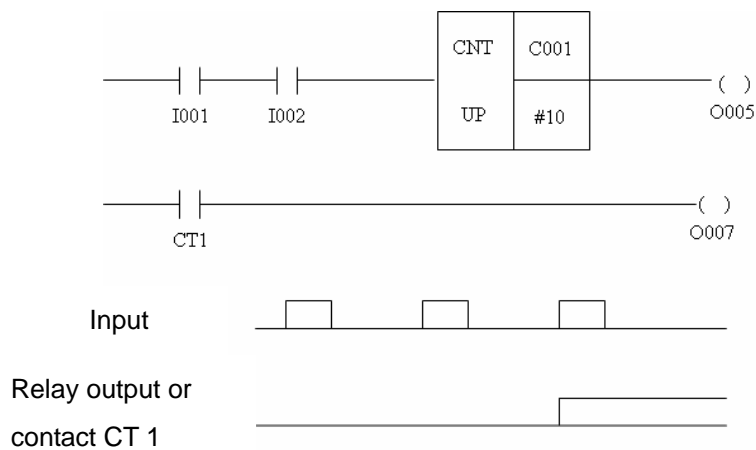
- a. When I001 & I002 turn from OFF to ON, & remain as ON, Timer #1(TM1) starts to count with the time base of 0.1sec.TM*
- b. When Timer reaches the default value (1 sec), the output RELAY (O005) signal is ON.
- c. The total number of Timer is 4096. Each Timer has a corresponding contact signal. When Timer reaches the default value, each Timer's corresponding contact is ON. Each Timer's corresponding contact can be used as A \ B contact for unlimited times.
- d. When the input signal is OFF (meaning, when I001 & I002 turn ON to OFF), Timer stops counting.
- e. Timer's unit base can be 0.01 sec, 0.1 sec, or 1 sec.
- f. Register value can be Timer's preset value.



Input Output <Figure 39 > Timer

2.5.10 Up Counter

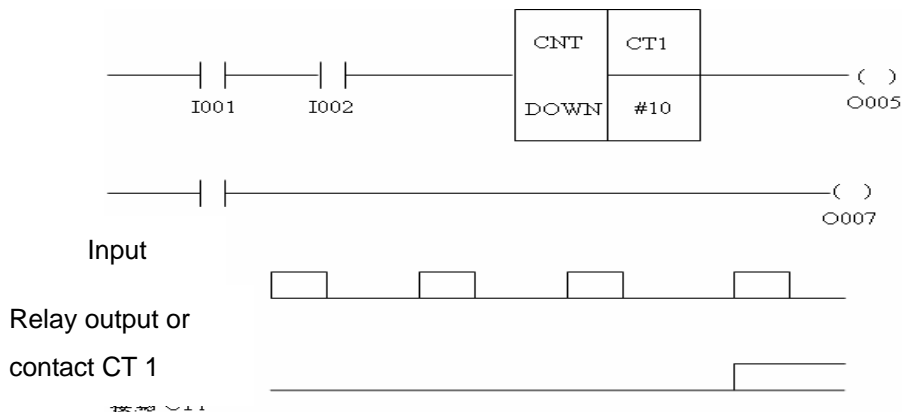
- Every time when I001 and I002 turn from OFF to ON, Counter #1 increases its value by 1 and stops counting when the value reaches 10.
- When a Counter reaches the preset value, the output RELAY (O005) signal is ON.
- The total number of counter is 4096. Each counter has a corresponding contact signal.
- When a Counter reaches the preset value, each corresponding contact is ON CTXXX. Each counter's corresponding contact can be used as A · B contact for unlimited times.
- The input signal can be either PULSE (1 SCAN) or not.
- Register value can be Timer's preset value.



<Figure 40> Up Counter

2.5.11 Down Counter

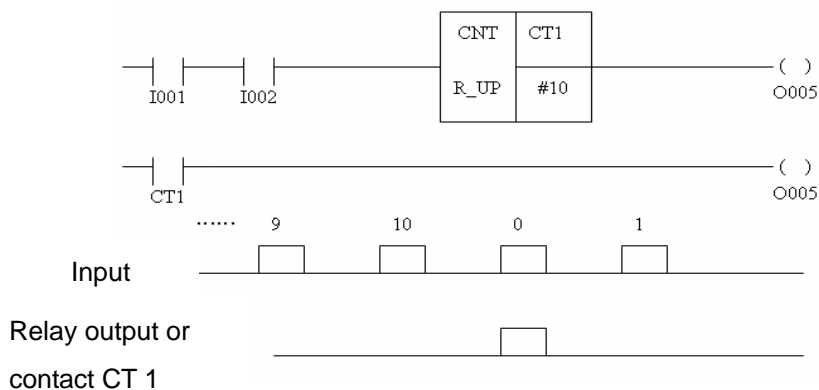
- Every time when I001 and I002 turn from OFF to ON, Counter #1 decreases its value by 1 and stops counting until the value reaches zero.
- When a Counter reaches the preset value, each corresponding contact is ON CTXXX. Each counter's corresponding contact can be used as A · B contact for unlimited times.
- The input signals can be either PULSE (1 SCAN) or not.
- Register value can be Timer's preset value.



<Figure 41> Down Counter

2.5.12 Ring Up Counter

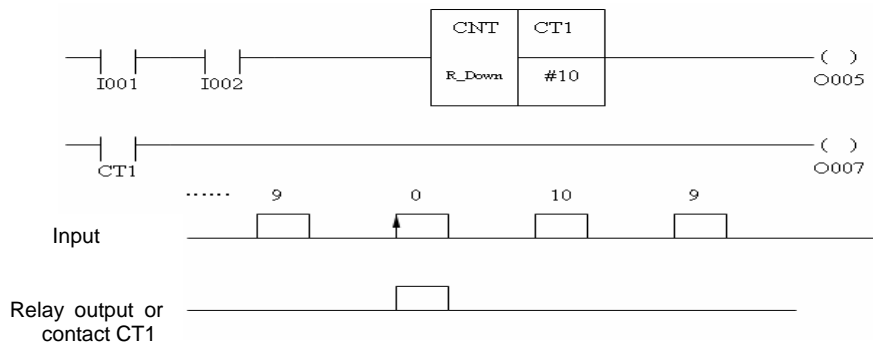
- Every time when I001 and I002 turn from OFF to ON, Counter #1 increases its value by 1. When the value reaches 10, the Counter is reset to 0 and counts from 0 again.
- When a Counter reaches the preset value, output RELAY (O005) signal is ON CTXXX.
- The total number of counters is 4096. Each counter has a corresponding contact signal.
- When a Counter reaches the preset value, each counter's corresponding contact is ON. Each counter's corresponding contact can be used as A · B contact for unlimited times.
- The input signals can be either PULSE (1 SCAN) or not.
- Register value can be Timer's preset value.



<Figure 42> Ring Up Counter

2.5.13 Ring Down Counter

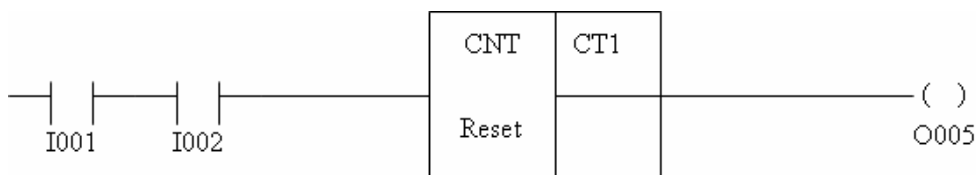
- a. Every time when I001 and I002 turn from OFF to ON, Counter #1 decreases its value by 1. When the value reaches 0, the Counter is reset to 10 and counts from 10 again.
- b. When a Counter reaches the preset value, output RELAY (O005) signal is ON.
- c. The total number of a Counter is 4096. Each counter has a corresponding contact signal. When a Counter reaches the preset value, each counter's corresponding contact is ON. Each counter's corresponding contact can be used as A · B contact for unlimited times.
- d. The input signals can be either PULSE (1 SCAN) or not.
- e. Register value can be Timer's preset value.



<Figure 43> Ring Down Counter

2.5.14 Reset Counter

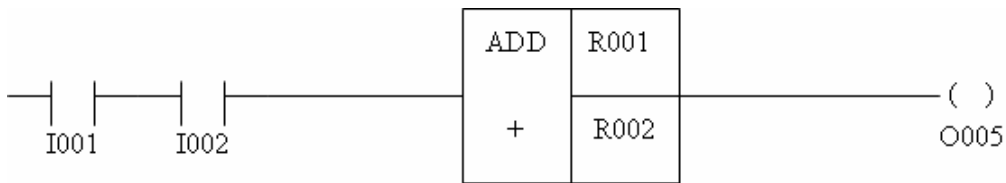
- a. As soon as I001 and I002 turn from OFF to ON, Counter No.1 is reset.
- b. To reset an Up Counter, the preset Counter value is 0.
- c. To reset a Down Counter, the preset Counter value is the default value.
- d. When a Counter is reset, the output relay (O005) is ON, and the corresponding contact signal turns to OFF.



<Figure 44> Reset Counter

2.5.15 Add Instruction (Add)

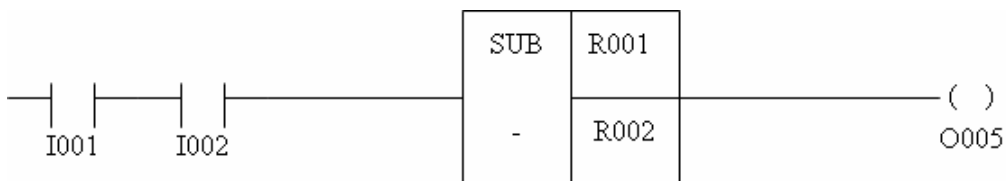
- a. When I001 and I002 turn from OFF to ON, Add instruction is executed. The augend is the value of Data Register No. R002, and the addend is the value of Data Register No. R001. The operation result is the value of Data Register No. R001. Each Data Register's value can be a long integer. Each integer is 4 Bytes. $(-2147483648 \leq X \leq +2147483647)$
- b. $R002 = R002 + R001$.
- c. The value of the addend can be a long integer.
- d. When input is OFF, the output relay (O005) is OFF. When input is ON, output is also ON.
- e. When input is ON, Add instruction will be executed one time per scan time.



<Figure 45> Add Instruction

2.5.16 Subtract Instruction (Subtract)

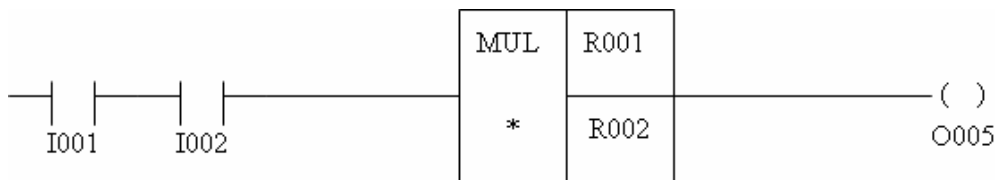
- a. When I001 and I002 turn from OFF to ON, Subtract instruction is executed. The minuend is the value of Data Register No. R002, and the subtrahend is the value of Data Register No. R001. The operation result is the value of Data Register No. R002. Each Data Register's value can be a long integer. Each integer is 4 Bytes.
- b. $R002 \leftarrow R002 - R001$
- c. The value of the subtrahend can be a long integer.
- d. When input is OFF, the output relay (O005) is OFF. When input is ON, output is also ON.
- e. When input is ON, SUB instruction will be executed one time per scan time.



< Figure 46> Subtract Instruction

2.5.17 Multiply Instruction

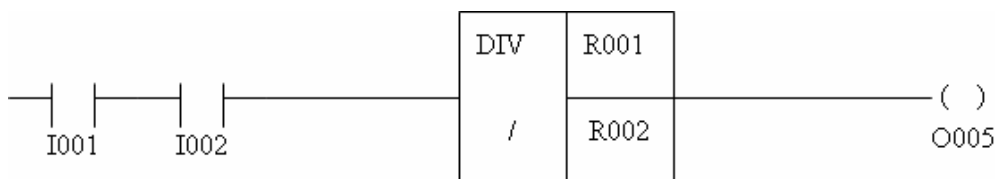
- a. When I001 and I002 turn from OFF to ON, Multiple instruction is executed. The multiplicand is the value of Data Register No. R0002, and the multiplier is the value of Data Register No. R001. The operation result is the value of Data Register No. R002. Each Data Register's value can be an integer. Each integer is 4 Bytes.
- b. $R002 \leftarrow R002 \times R001$
- c. The value of the multiplier can be a long integer.
- d. When input is OFF, the output relay (O005) is OFF. When input is ON, output is also ON.
- e. When input is ON, MUL instruction will be executed one time per scan time.



<Figure 47> Multiply Instruction

2.5.18 Divide Instruction (Divide)

- a. When I001 and I002 turn from OFF to ON, Divide instruction is executed. The dividend is the value of Data Register No. R0002, and the divisor is the value of Data Register No. R001. The operation result is the value of Data Register No. R002. Each Data Register's value can be an integer. Each integer is 4 Bytes.
- b. $R002 \leftarrow R001 / R002$
- c. The value of the divisor can be a long integer.
- d. When the divisor is 0 or when input is OFF, the output relay (O005) is OFF. When input is ON, output is also ON.
- e. When input is ON, DIV instruction will be executed one time per scan time.



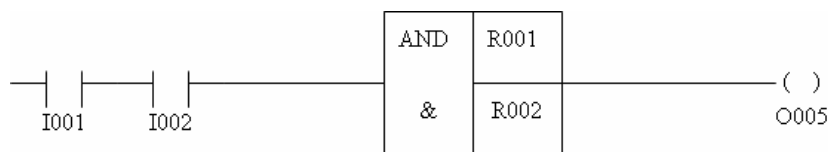
<Figure 48> Divide Instruction

2.5.19 AND Instruction

- a. When I001 and I002 turn from OFF to ON, AND instruction is executed. The two conditions that AND instruction is applied are the values of Data Register No. R0002 and Data Register No. R001. The operation result is the value of Data Register No. R002. Each Register is 32 Bytes.
- b. $R002 \leftarrow R002 \& R001$
- c. & : AND operation of Bit and Bit.
- d. The values that AND instruction is applied can be an integer.
 (-2147483648 ≤ X ≤ +2147483647.)
- e. If the operation result is 0 or if input is OFF, the output relay is OFF or output is ON.
- f. When input is ON, AND instruction will be executed one time per scan time.
- g. AND chart is shown as <Figure 49>

X	Y	Z
1	1	1
1	0	0
0	1	0
0	0	0

<Figure 49> AND Chart



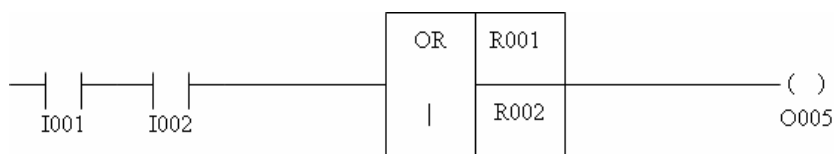
<Figure 50> AND Instruction

2.5.20 OR Instruction (Or)

- When I001 and I002 turn from OFF to ON, OR instruction is executed. The two conditions that OR instruction is applied are the values of Data Register No. R0002 and Data Register No. R001. The operation result is the value of Data Register No. R002. Each Register is 32 Bytes.
- $R002 \leftarrow R002 | R001$
- | : OR operation of Bit and Bit.
- The values that OR instruction is applied can be an integer.
($-2147483648 \leq X \leq +2147483647$.)
- If the operation result is 0 or if input is OFF, the output relay is OFF or output is OFF.
- When input is ON, OR instruction will be executed one time per scan time.
- OR chart is shown as <Figure 51>

X	Y	Z
1	1	1
1	0	1
0	1	1
0	0	0

<Figure 51> OR Chart



<Figure 52> OR Instruction

2.5.21 XOR Instruction (Exclusive Or)

- a. When I001 and I002 turn from OFF to ON, XOR instruction is executed. The two conditions that XOR instruction is applied are the values of Data Register No. R0002 and Data Register No. R001. The operation result is the value of Data Register No. R002. Each Register is 32 Bytes.
- b. $R002 \leftarrow R002 \wedge R001$
- c. \wedge : XOR operation of Bit and Bit.
- d. The values that XOR instruction is applied can be an integer.
 (-2147483648 \leq X \leq +2147483647.)
- e. When the operation result is 0 or when input is OFF, the output relay is OFF.
- f. When input is ON, XOR instruction will be executed one time per scan time.
- g. XOR chart is shown as <Figure 53>

X	Y	Z
1	1	0
1	0	1
0	1	1
0	0	0

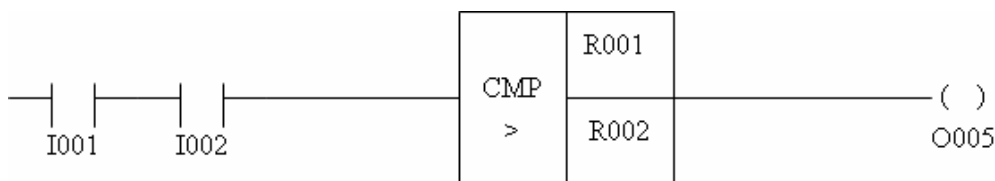
<Figure 53> XOR Chart



<Figure 54> XOR Instruction

2.5.22 CMP Instruction (Compare, Larger Than)

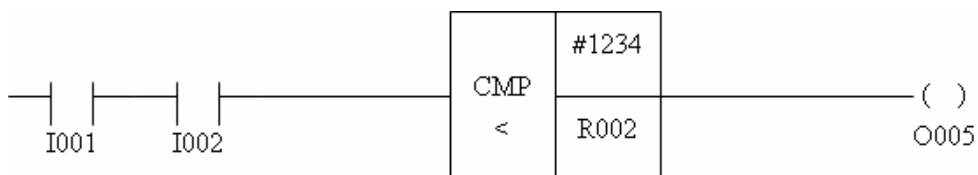
- a. When I001 and I002 turn from OFF to ON, CMP > instruction is executed. The value of Data Register No. R0002 is compared to the value of Data Register No. R001. When the comparison result is True, the output Relay is ON.
- b. TRUE ← R002 > R001
- c. The value to be compared can be a decimal value.
- d. When the comparison result is false or when input is OFF, the output relay (O005) is OFF.
- e. When input is ON, CMP > instruction will be executed one time per scan time.



<Figure 55> CMP > Instruction

2.5.23 CMP Instruction (Compare, Smaller Than)

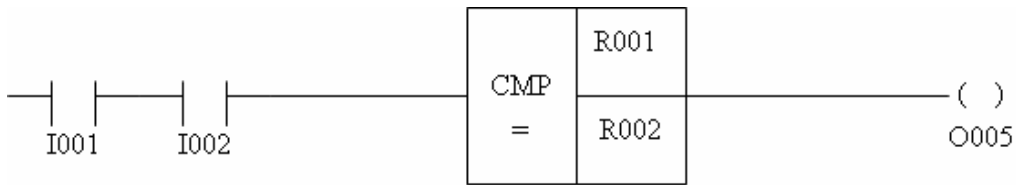
- a. When I001 and I002 turn from OFF to ON, CMP < instruction is executed. The value of Data Register No. R0002 is compared to the value of Data Register No. R001. When the comparison result is True, the output Relay is ON.
- b. TRUE ← R002 < R001
- c. The value to be compared can be a decimal value.
- d. When the comparison result is false or when input is OFF, the output relay (O005) is OFF.
- e. When input is ON, CMP < instruction will be executed one time per scan time.



<Figure 56> CMP < Instruction

2.5.24 Compare Instruction, Equal To

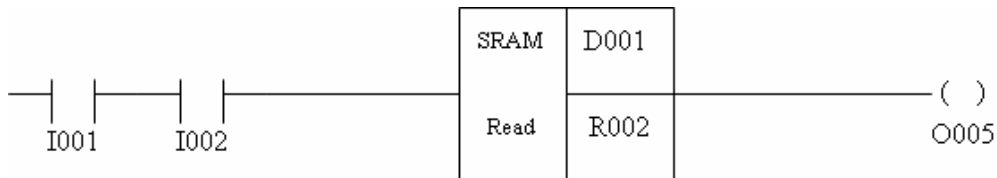
- a. When I001 and I002 turn from OFF to ON, CMP = instruction is executed. The value of Data Register No. R002 is compared to the value of Data Register No. R001. When the comparison result is True, the output Relay is ON.
- b. TRUE ← R002=R001
- c. The value to be compared can be a decimal value.
- d. When the comparison result is false or when input is OFF, the output relay (O005) is OFF.
- e. When input is ON, CMP = instruction will be executed one time per scan time.



<Figure 57> CMP = Instruction

2.5.25 SRAM Read Instruction (SRAM Read)

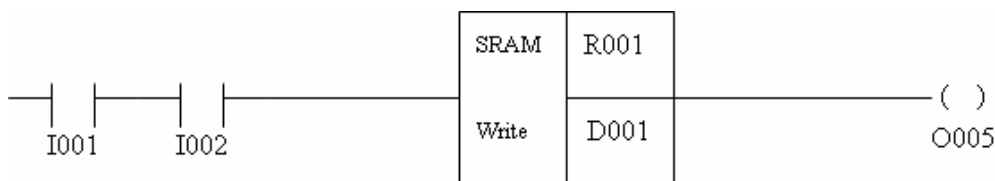
- a. When I001 and I002 turn from OFF to ON, SRAM Read instruction is executed. Data Register No. R001 retrieves the value of Data Register No. D001. When the instruction is finished, the output relay (O005) is ON.
- b. R001=D001
- c. When input is ON, SRAM Read instruction will be executed one time per scan time.



<Figure 58> SRAM Read instruction

2.5.26 SRAM Write Instruction (SRAM Write)

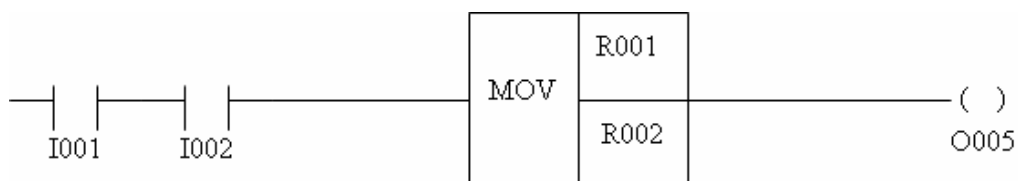
- When I001 and I002 turn from OFF to ON, SRAM Write instruction is executed. Data Register No. D001 retrieves the value of Data Register No. R001. When the instruction is finished, the output relay (O005) is ON.
- D001=R001
- When input is ON, SRAM Read instruction will be executed one time per scan time. SRAM Write instruction is to save Register values in a CF card for storage; however, the action of writing values into a CF card may influence the performance of ELC system.



<Figure 59> SRAM Write Instruction

2.5.27 MOVE Instruction

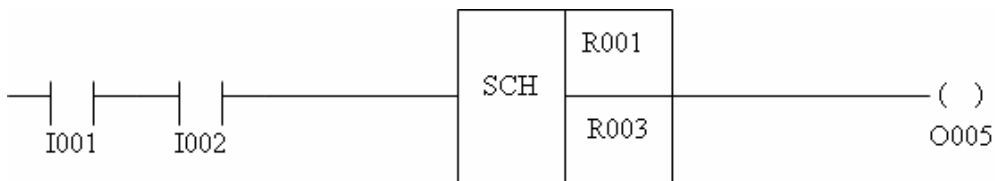
- When I001 and I002 turn from OFF to ON, MOV instruction is executed. Data Register No. R001 is moved to Data Register No. R002. After the instruction is finished, the output relay (O005) is ON.
- R002=R001
- The value to be moved can be a long integer or a decimal value 1234.
- When the value that is moved is 0 or when input is OFF, the output relay (O005) is OFF.
- When input is ON, MOV instruction will be executed one time per scan time.



<Figure 60> MOVE Instruction

2.5.28 SCH Instruction (Data Search)

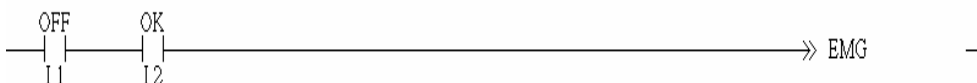
- a. When I001 and I002 turn from OFF to ON, SCH instruction is executed. When execution is finished, the output relay (O0005) is ON.
- b. This instruction searches for the location where the assigned tool number is saved in the data chart.
- c. Input :
 - ※ R001 : The tool number to be searched.
 - ※ R002 : The last (tool pot) number. Because the data chart starts from zero, the total capacity of the data chart would be the value of R002 plus 1. The default setting of R002 is the address next to R001.
 - ※ D000~D126 : Data chart for saving tool numbers. The number to start with is 0.
- d. Output
 - ※ R003 : Save the operation result. Note: The result cannot be the address next to R001.
- e. When input is ON, SCH instruction will be executed one time per scan time.



<Figure 61> SCH Instruction

2.5.29 JMP Instruction (Jump)

- a. JMP instruction can be executed in Level 1 & Level 2 in the ladder. The JMP label must be in the same level as the level of JMP instruction or there will be an error.
- b. When I001 and I002 turn from OFF to ON, JMP instruction is executed. The program will execute from the location where EMG is labeled. If I001 and I002 signals are OFF, JMP instruction will not be executed.



2.5.30 Ladder Figure Call Subroutine JSR Instruction (Jump Subroutine)

- a. When Jump Subroutine instruction is executed, the program will go to and execute first the subroutine marked by the JSR label.
- b. When I001 and I002 turn from OFF to ON, ladder figure JSR instruction is executed. The program will execute from the location where STOP is labeled. After execution is finished, the program will return to execute the next component instruction of the previous program.



<Figure 63> Ladder Figure Subroutine Call JSR Instruction

2.5.31 Ladder Figure Subroutine Return Instruction (Return Subroutine)

- a. A Return Subroutine instruction and a subroutine label must be a pair or the program check result will be error.
- b. This is the instruction that ends the execution of a ladder figure subroutine.



<Figure 64> Ladder Figure Subroutine Return Instruction

2.5.32 Label

- a. A label is used by JMP or JSR.
- b. A label contains 6 characters.



<Figure 65> Label

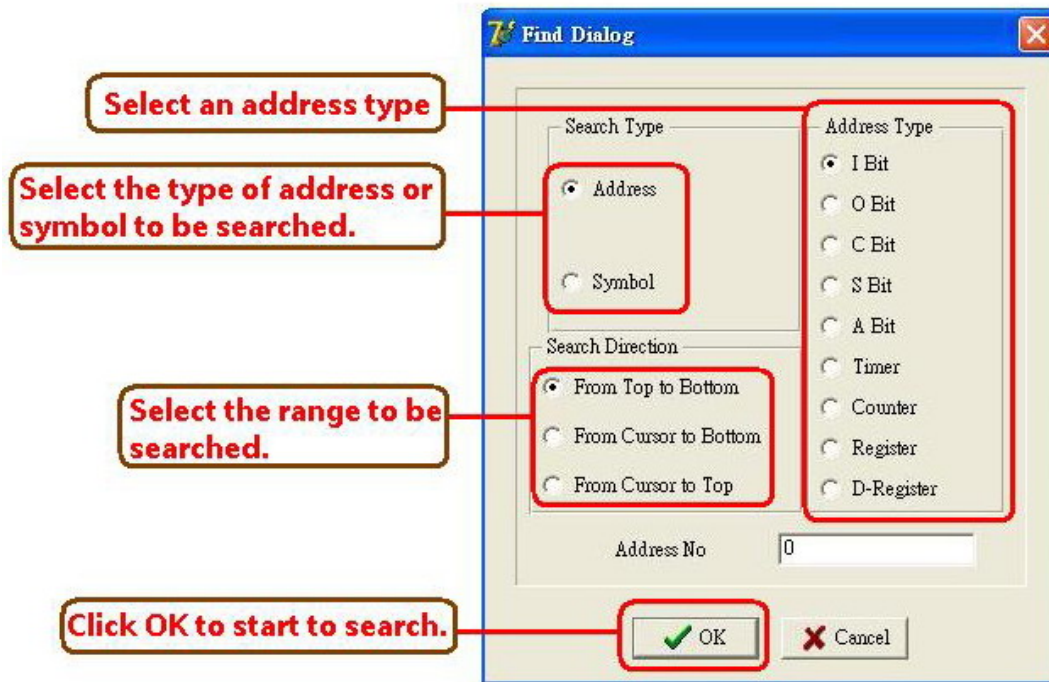
2.5.33 Ladder Figure END Instruction

- a. The ladder figure END instruction is used to separate Level 1 / Level 2 / Subroutine.

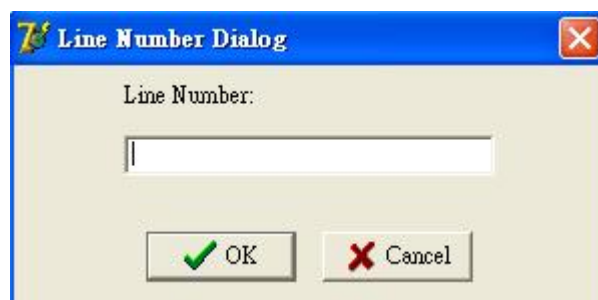


<Figure 66> Ladder Figure END Instruction

2.6 PLC PROGRAM Find Function



<Figure 67> Find Dialog Box



<Figure 68> Line Number Dialog Box

- ※ Find : Open the Find dialog box as shown in <Figure 67> (Ctrl+F).
- ※ Find Next : Find the next component that meets the preset conditions or click the function key F3.
- ※ Go to Line Number : Go to the line number that is entered as <Figure 68> (Ctrl+G).

2.7 Functions of the keys of the mouse



The function of the left key of the mouse :

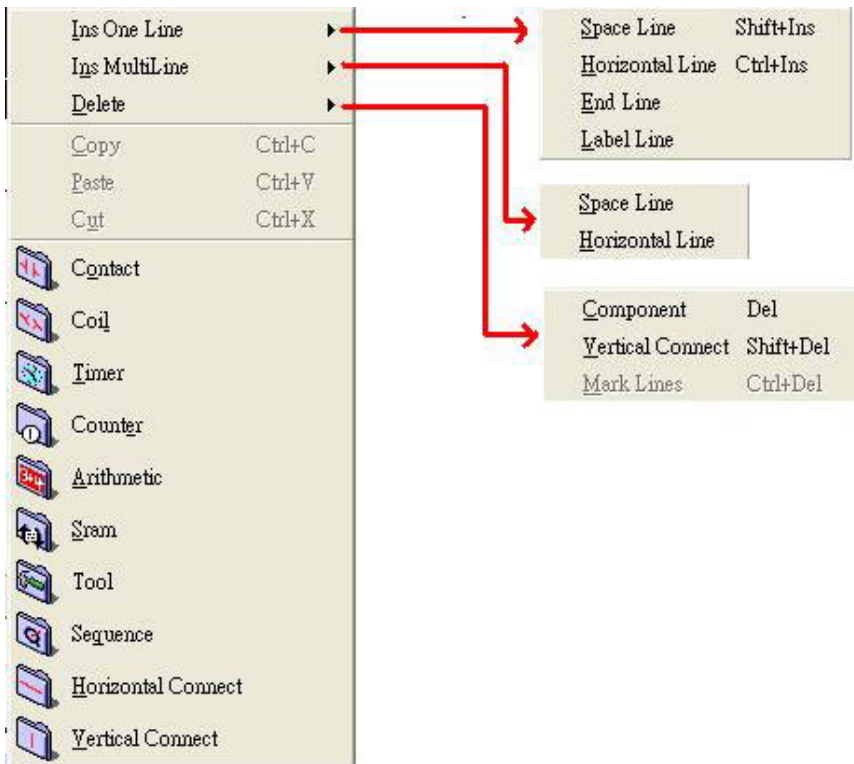
- ※ Left-click to drag and select.



The function of the right key of the mouse :

.....

- ※ Tool list

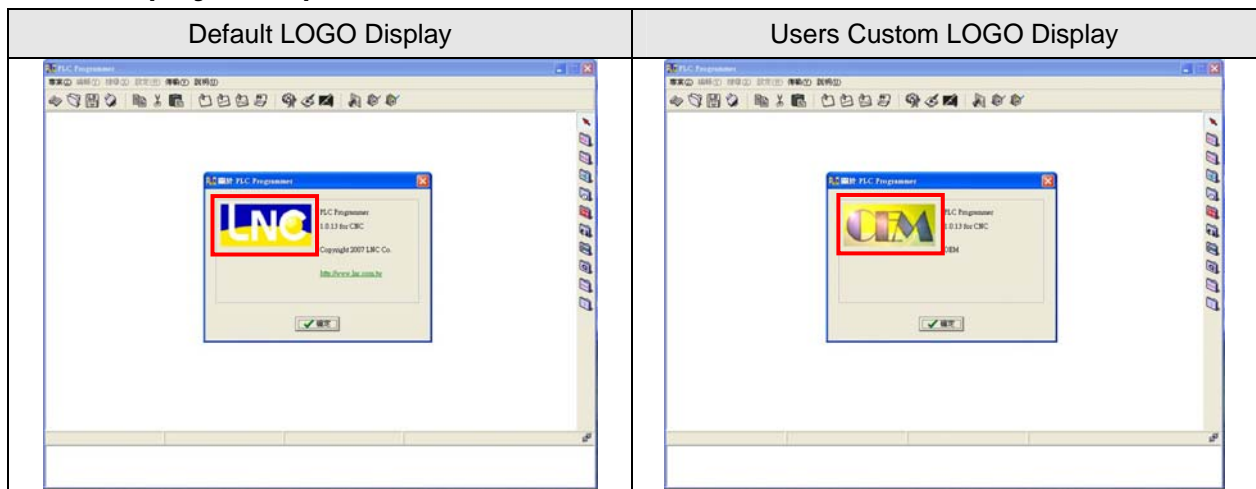


Appendix A Import of Custom LOGO Operation

● Introduction

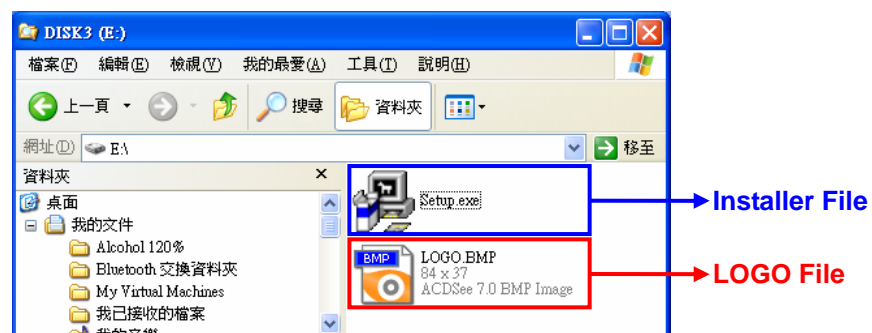
During installation, the import function of external custom LOGO file is provided. With convenient and fast operation, it can satisfy users' need of changing custom LOGO.

● LOGO Display Examples:



● Timing and Method of Import

Users can replace the original LOGO display in the program with a custom LOGO by performing the following steps during program installation: First, save the custom LOGO image in BMP format in the same directory as the Installer file (Setup.exe). Then execute the Installer file. When the installation is completed, the custom LOGO is also automatically imported.



● LOGO Format Description

File Format	LOGO.BMP
Image Format	BMP
Image Width	84 pixels
Image Length	37 pixels