

PLC Training Kit PEK-408

User's Manual



Please make sure whether cables are suitable for the input/output module before connection.



Incorrect cable connection may cause damages in the modules.

Contents

1. Introduction

1.1	Scope	3
1.2	Functions	3

2. Specifications

2.1	Standard Module Composition	4
2.2	Module Specification	4
2.3	Structure	9
2.4	Accessories	9
2.5	Internal Connection Diagram	10
2.6	Assigning Input/Output Addresses	16

3. Programming and Operating

3.1	Operating PLC	17
3.2	Writing Device Addresses	17
3.3	Examples of PLC Program	18
3.4	Linking with HMI S/W CIMON in RS232C Type	21
3.5	Examples of PLC Application	29
Ex. 1.	Toggling Output Contact by Using Input Contact	29
Ex. 2.	Controlling On-Off by Using a Timer	30
Ex. 3.	Controlling Garage Shutter	31
Ex. 4.	Measuring the Length of an Object by Using Limit S/W and Encoder	32
Ex. 5.	Decoding	33
Ex. 6.	Using a Cam Switch	34
Ex. 7.	Counting the Number of Moving Objects	35
Ex. 8.	Keeping the Counted Value	36
Ex. 9.	Network	37

1. Introduction

1.1 Scope

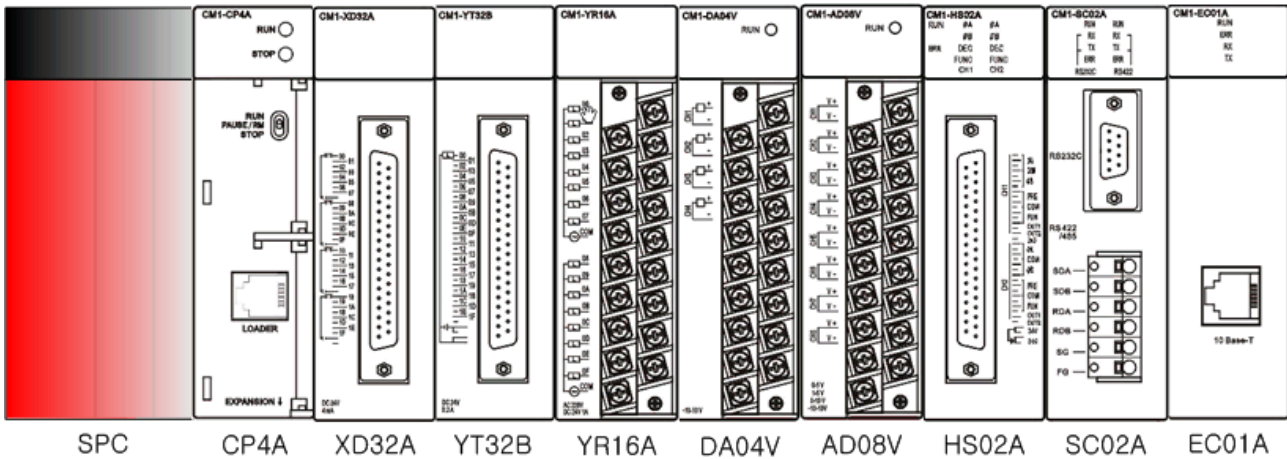
- ① To study a basic knowledge and applications on PLC
- ② To Improve applicable capability of trainees at site
- ③ To master the capability to make use of data link system between PLCs
- ④ To improve the capability to use PLC application instructions
- ⑤ To master the capability to control analog signals
- ⑥ To understand how to configure RS 232C/RS 422/RS 485
- ⑦ To master the capability to configure and operate a site monitoring & operation system

1.2 Functions

- ① Composed of high-performance module type PLC components.
- ② Enables to practice the advanced functions of various types like on-line editing, forced input/output, initialization program by using a programming tool software (CICON).
- ③ Enables to perform PLC training without connection with other devices.
- ④ Equipped with toggle switches, push buttons and so on to use output lamps and a display for a simulation load.
- ⑤ Equipped with a analog input signal generator and a level meter to make sure analog output signals.
- ⑥ Enables to practice PID control by using analog modules.
- ⑦ Equipped with an encoder to practice easily the high speed counter module.
- ⑧ Enables computer link in serial communication type through computer exclusive terminal of CPU.
- ⑨ Enables remote control and monitoring in connection with HMI S/W.
- ⑩ Composed of a system with the most suitable input/output points in module type to improve the capability of programming for site situation.
- ⑪ Composed of attachable-detachable type to switch input, output and optional modules freely, if necessary.
- ⑫ Enables training from basic to application.

2 Specifications

2.1 Standard Module Composition



◆ The modules can be changed according to user’s training use.

2.2 Module Specifications

① **CM1-SPC**

This is used to receive the power of AC 220V, supplying the power of DC +5V, +24V, ±15V to each part of a PLC.

Model		CM1-SPC
Input	Input Voltage	AC220V, 50/60Hz
	Input Current	0.25A MAX For 220VAC
	Inrush Current	30A or less
	Efficiency	70% or more(Rated Input/Load)
	Allowed Breakdown	20ms or less
Output	Output voltage / Output Current	+5V (3.5A), +24V (0.5A), +15V (0.5A), -15V (0.3A)
Voltage Status Indication		LED is turned on in case output voltage is normal.

② CM1-CP4A

The CM1-CP4A processes fast by high-speed MPU and Fractionizes the error codes in self-diagnosis by contents to find the reasons of them.

Model		Specification	Remarks
		CM1-CP4A	
Type of Program Control		Stored Program, Repeat Operation, Time Driven Interrupt	
Type of I/O Control		Indirect, Direct by Instructions	
Program Language		IL(Instruction List) , LD(Ladder Diagram)	
Instruction	Sequence	54 Instructions	
	Application	264 Instructions	
Baud Rate(Sequence)		200ns / Step	
Capacity of Memory		16K Steps	
Base Expansion		Not Available	
Capacity of Data Memory	X	384	
	Y	384	
	M	8,192	
	K	2,048	
	L	2,048	
	F	2,048	
	T	1024(Select 10 ms or 100 ms at user's option)	
	C	1,024	
	S	100Card * 100Step	
	D	2,000	
Timer	Type	On Delay, Off Delay, Accumulation, Monostable, Retriggerable	
	Range	0.01 sec ~ 655.35 sec	
Counter	Type	Up Counter , Down Counter , Up-Down Counter, Ring Counter	
	Range	-32,768 ~ +32,767	
Operation Mode		RUN , STOP , PAUSE , DEBUG	
Self-dignosis		Watch-dog Timer, Memory Check-sum, I/O Card, Battery, Power	
Type of Standard Base		3 slots, 5 slots, 8 slots, 12 slots	
Built-in Function		<ul style="list-style-type: none"> - Computer Link(RS232C) - PID Control - I/O Reservation - On-line Editing 	

③ CM1-XD32C

Model		CM1-XD32C
No. of Input Points		32 Points SINK/SRC Input
Rated Input Voltage		DC24V
Rated Input Current		4mA
On Voltage/On Current		DC19V/4mA
Off Voltage/Off Current		DC11V/1mA
Response Time	Off -> On	5mSec or less
	On -> Off	5mSec or less
Type of Common		8 Points
Operation Indication		LED is turned on incase input is turned on.
Type of Insulation		Photo coupler insulation

④ CM1-YT32B

Model		CM1-YT32B
No. of Output Points		32 Points SRC
Rated Load Voltage		DC12 ~ 24V
Rated Load Current	1 Point	0.2A
	1Com	4A
Response Time	Off -> On	1mSec or less
	On -> Off	1mSec or less
Type of Common		32 Points
Operation Indication		LED is turned on incase input is turned on.
Type of Insulation		Photo coupler

⑤ CM1-YR16A

Model		CM1-YR16A
No. of Output Points		16 Points
Rated Load Voltage		DC12/24V AC220V
Rated Load Current	1 Point	2A
	1Com	5A
Response Time	Off -> On	10mSec or less
	On -> Off	5mSec or less
Type of Common		8 Points
Operation Indication		LED is turned on incase input is turned on.
Type of Insulation		Relay

⑥ CM1-DA04V

Model	DA14Bit / 4CH / Voltage Output
	CM1-DA04V
No. of Input Channels	4 Channels
Digital Input	Signed 16 Bit Binary Value(Data: 14 Bits)
Analog Output	-10 ~ 10V
Max. Resolution	1.25mV
Precision	Within $\pm 0.3\%$
Max. Conversion Rate	10mSec
Absolute Max. Output	$\pm 15V$
Type of Insulation	Photo Coupler between input terminal and PLC

⑦ CM1-AD08V

Model		AD14Bit / 8CH / Voltage Input
		CM1-AD08V
No. of Analog Input Channels		8 Channels
Analog Input		0 ~ 5V, 1 ~ 5V, 0 ~ 10V, -10 ~ +10V
Digital Output		Signed 16 Bit Binary Value(Data: 14 Bits)
Max. Resolution	0 ~ 5V	0.3125mV
	1 ~ 5V	0.25mV
	0 ~ 10V	0.625mV
	-10 ~ 10V	1.25mV
	0 ~ 20mA	1.25 μ A
	4 ~ 20mA	1.0 μ A
Precision		Within $\pm 0.3\%$
Max. Conversion Rate		5mSec/1ch
Absolute Max. Input	Voltage	$\pm 12V$
	Current	$\pm 25mA$
Type of Insulation		Photo Coupler between input terminal and PLC

⑧ CM1-HS02B

Model		CM1-HS02B
Channel		2 Channels
Counting Input Signal	Signal	1-phase Input/2-phase Input
	Level of Signal	DC5 / 12 / 24V, 2 ~ 5mA
Range of Counting		32Bit (-2,147,483,648 ~ 2,147,483,647)
Counting Rate		200kPPS
Form		Up-down Preset Counting + Ring Counting
External Output	Type	Comparative Output (> , = , <)
	Form of Signal	Open Collector Output

⑨ CM1-SC02A

Model		CM1-SC02A
Interface		RS232C / RS422 / RS485
Comm. Mode	Exclusive	KDT's Exclusive Protocol(Supports 1 : n Communication)
	Graphic Loader	Graphic Loader Link Communication
	User	User Protocol
Form of Data	Data Bit	7 or 8 Bits
	Stop Bit	1 or 2 Bits
	Parity	Even / Odd / None
Form of synchronism		Non-synchronous
Baud Rate		300 / 600 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400
Modem Link		Long-distance communication by linking with a modem unit

⑩ CM1-EC01A

Model	CM1-EC01A
Type of Cable	10BASE-T
Baud Rate	10 Mbps
Type of Transmission	Base Band
Max. Length of Segment	100m (Node to Hub)
Max. Number of Nodes	Hub 4 Steps
Max. Size of Protocol	1500 Byte
Type of Network Access	CSMA / CD

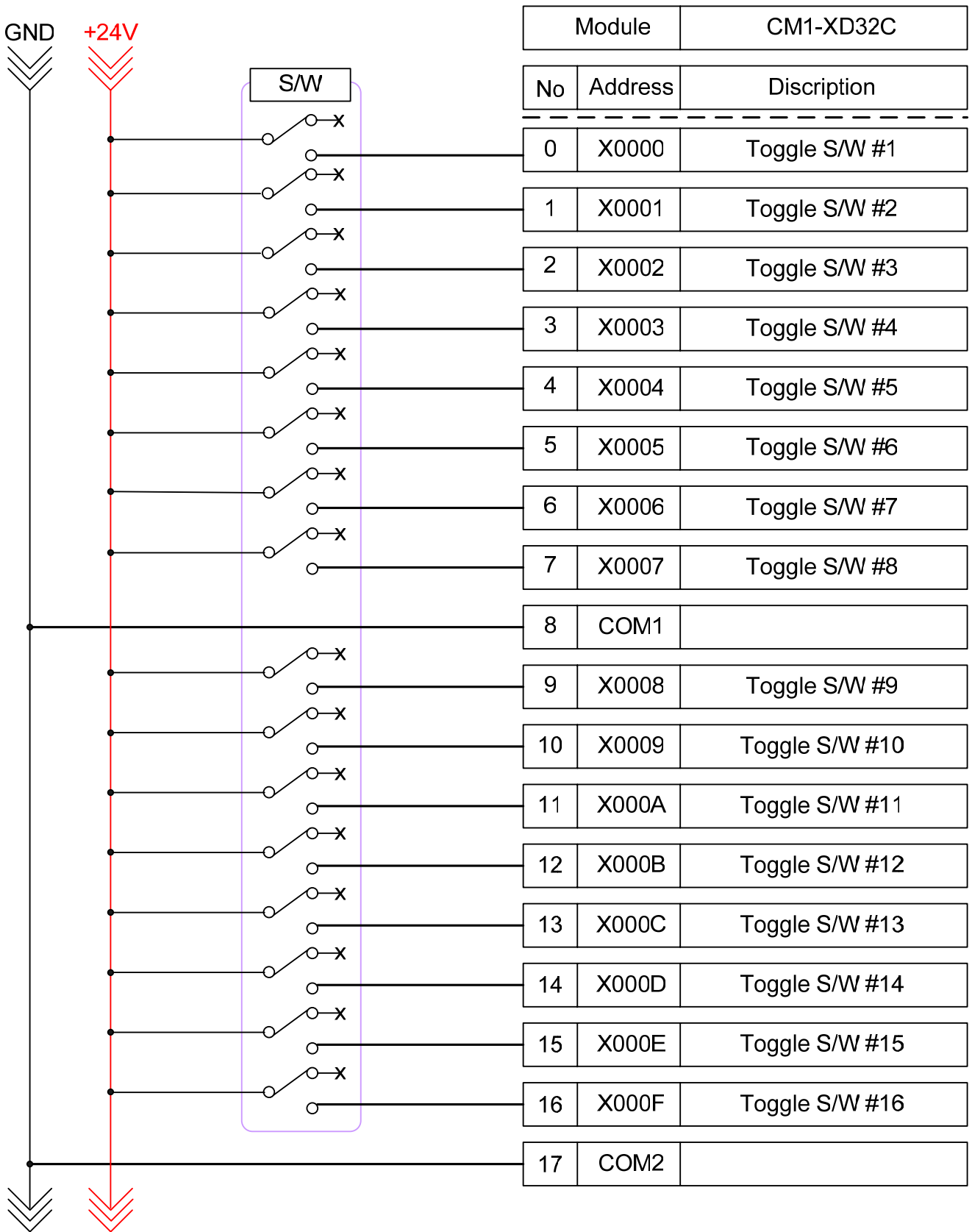
2.3 Structure

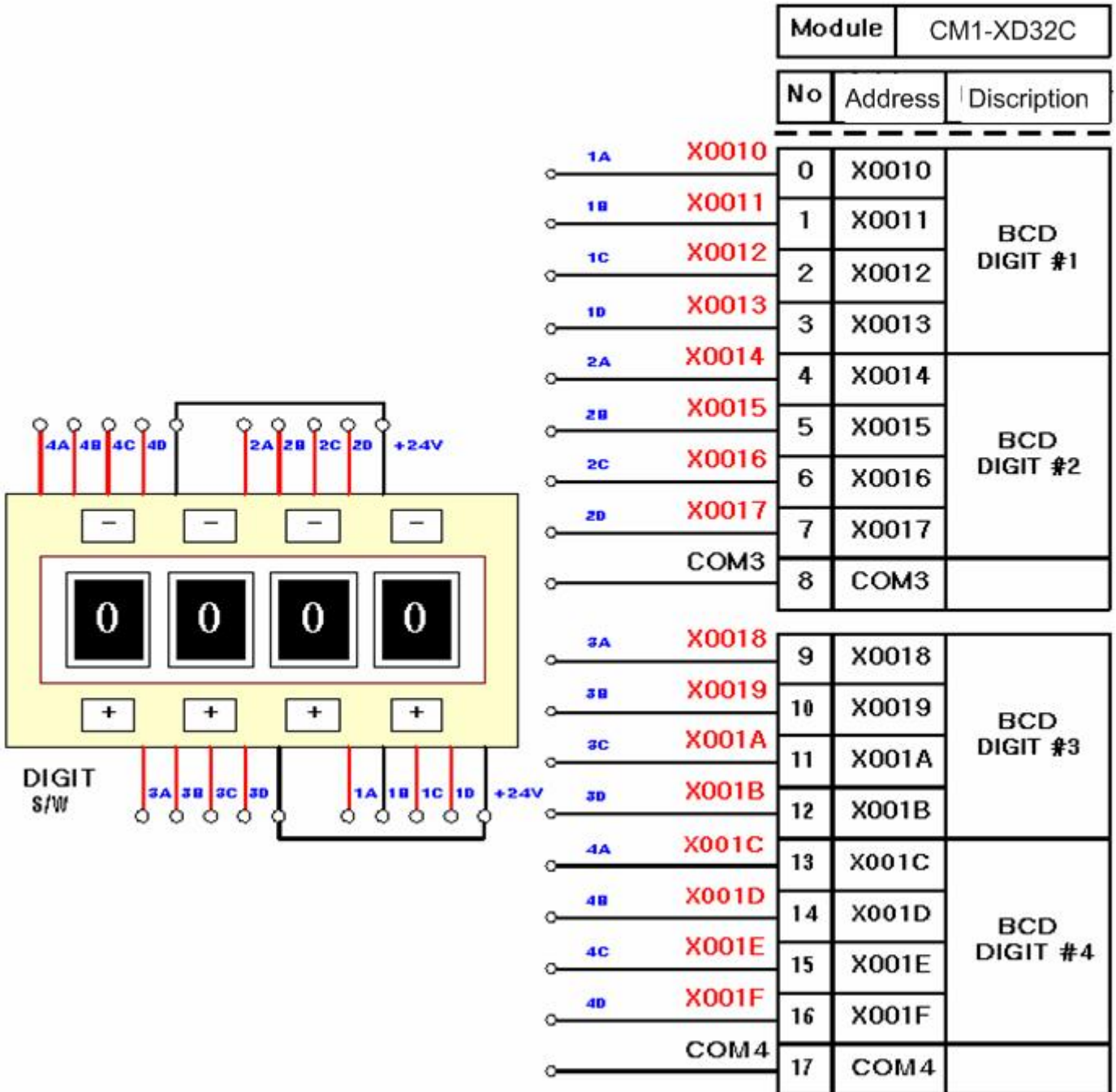


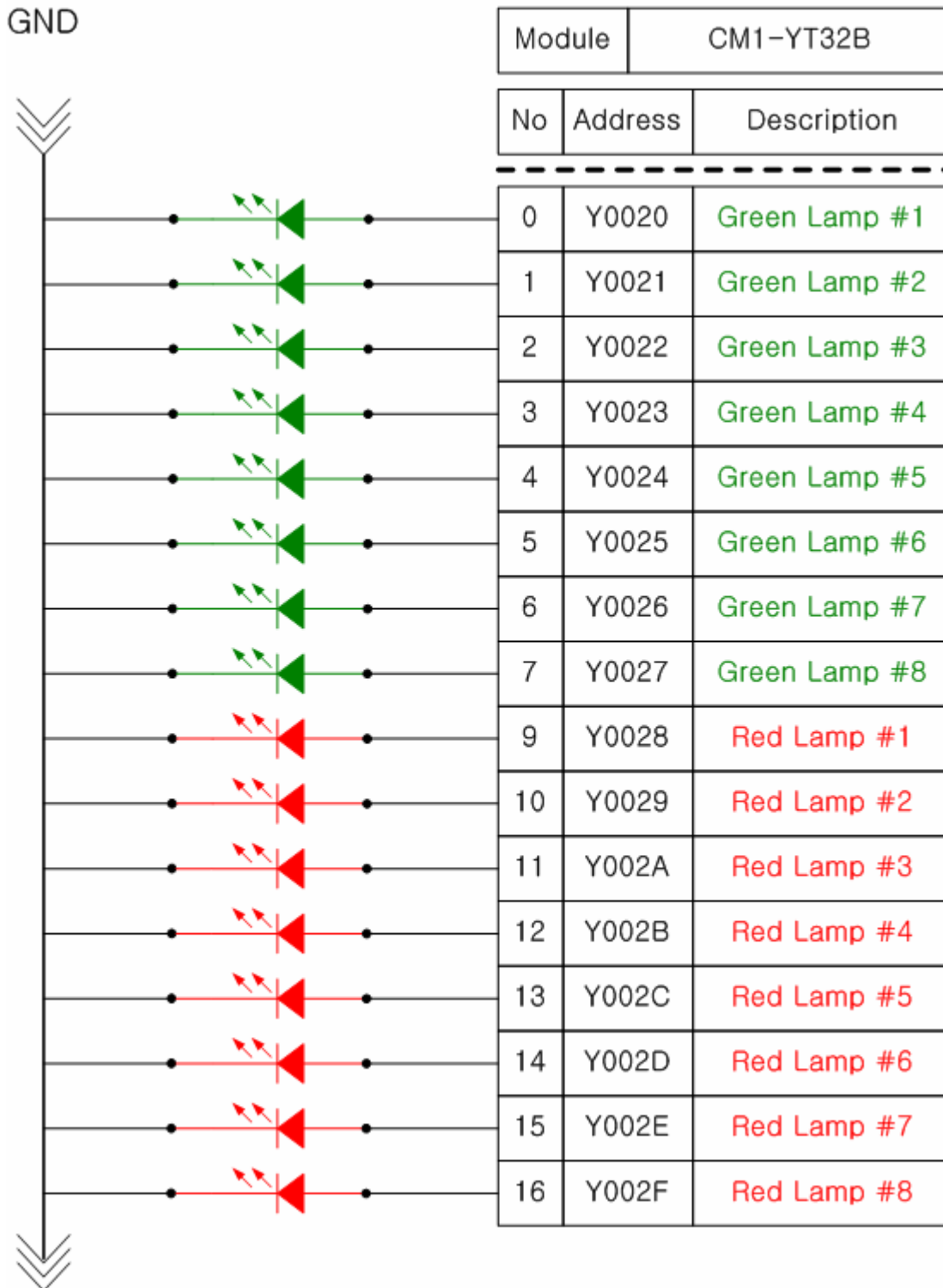
2.4 Accessories

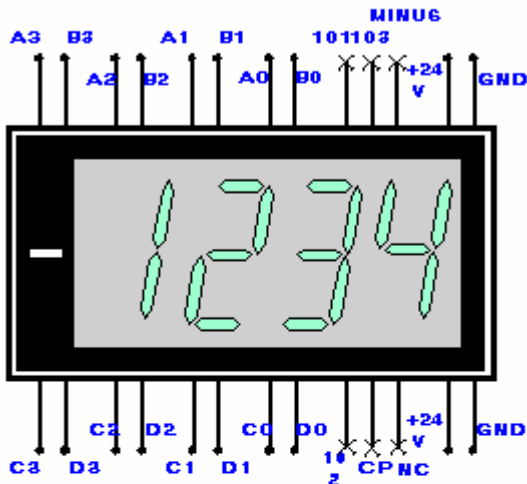
- ① Power cable (Rating 7A 250V)
- ② CM1-CBL15 1.5m Loader Cable
- ③ User's manual
- ④ RS-232C Cable
- ⑤ CD for CIMON and program examples(Including CIMON HMI S/W demo)

2.5 Detailed Module Connection Diagram







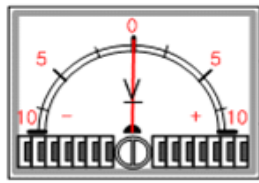


SIGNAL	A	R	C	D	Display
H	L	L	L	L	0
H	H	L	L	L	1
H	L	H	L	L	2
H	H	H	L	L	3
H	L	L	H	L	4
H	H	L	H	L	5
H	L	H	H	L	6
H	H	H	H	L	7
H	L	L	L	H	8
H	H	L	L	H	9
H	X	X	X	X	Blank

Module	CM1-YT32B	
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No	Address	Description
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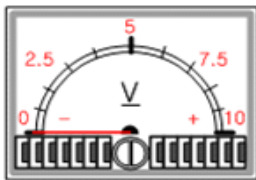
A0	0	Y0030	10 ⁰ DIGIT
B0	1	Y0031	
C0	2	Y0032	
D0	3	Y0033	
A1	4	Y0034	10 ¹ DIGIT
B1	5	Y0035	
C1	6	Y0036	
D1	7	Y0037	
A2	9	Y0038	10 ² DIGIT
B2	10	Y0039	
C2	11	Y003A	
D2	12	Y003B	
A3	13	Y003C	10 ³ DIGIT
B3	14	Y003D	
C3	15	Y003E	
D3	16	Y003F	
+24V	17	+24V	
GND	18	GND	



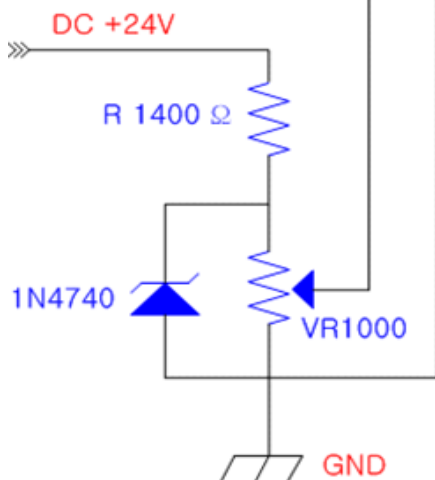
Analog Output
CM1-DA04V CH2

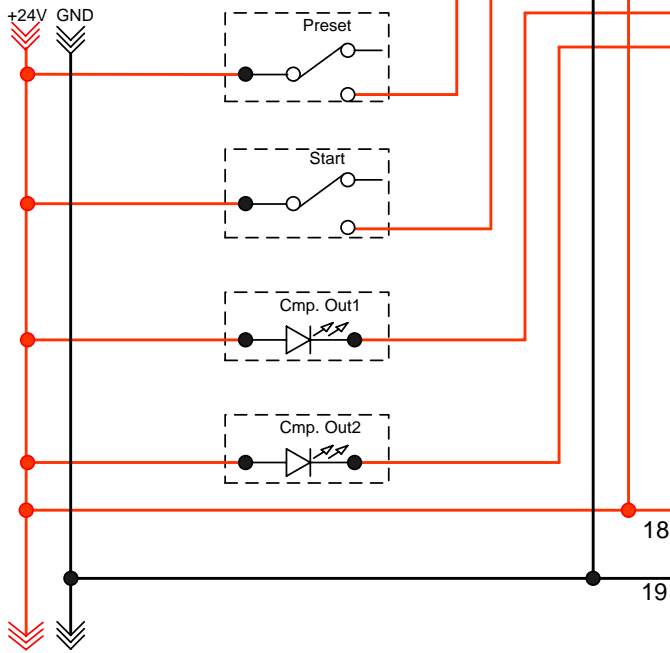
Module		CM1-DA04V	
No	CH	Description	
0	CH1 +V	CH1 VOLTAGE OUTPUT	
1	CH1 -V		
2	CH2 +V	CH2 VOLTAGE OUTPUT	
3	CH2 -V		
4	CH3 +V	X	
5	CH3 -V		
6	CH4 +V	X	
7	CH4 -V		

Analog Input
CM1-AD08V CH2



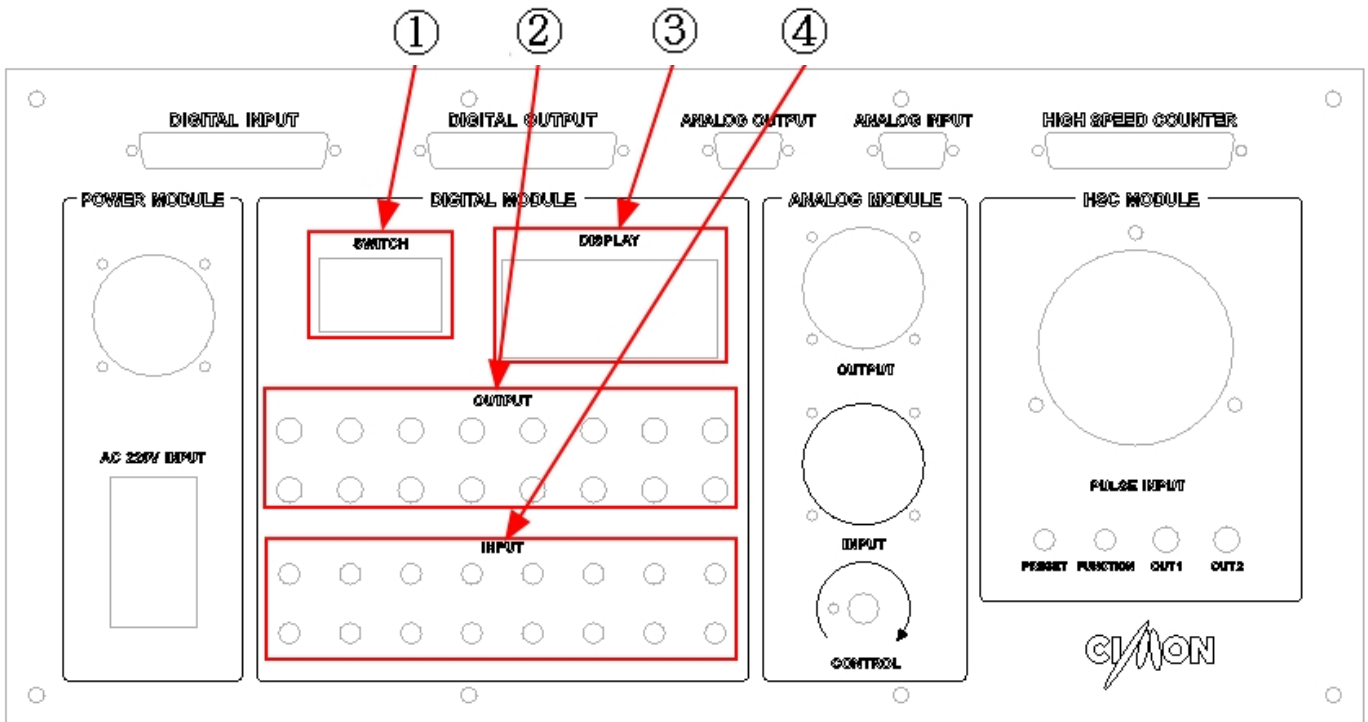
Module		CM1-AD08V	
No	CH	Description	
0	CH1 +V	CH1 VOLTAGE INPUT	
1	CH1 -V		
2	CH2 +V	CH2 VOLTAGE INPUT	
3	CH2 -V		
4	CH3 +V	X	
5	CH3 -V		
6	CH4 +V	X	
7	CH4 -V		





Module		CM1-HS02B
No	Ch	Description
1	1	24V Pulse Input (A)
20		X
2		X
21		AB Common
3		24V Pulse Input (B)
22		X
4		X
23		Preset Input 24V
5		X
24		X
6		Common (Preset/Start)
25		24V External Input
7		X
26		X
8	Cmp. Out1	
27	Cmp. Out2	
9 ~ 17 28 ~ 35	2	X
18,36		+24V
19,37		GND

2.6 Assigning Input/Output Addresses



- ① DIGIT Switch Input X0000 ~ X0007
- ② LED Lamp Output Y0020 ~ Y002F
- ③ DISPLAY(BCD) Unit Output Y0030 ~ Y003F
- ④ Toggle switch input X0000 ~ X000F

3 Programming and Operating

3.1 Operating PLC

- ① Install the CICON software in a computer.
- ② Select the menu to open the new program in the new project and to write a program.
- ③ After you finish writing the program and select the menu to compile it, make sure whether there is an error in the compiled one.
- ④ Connect the COM Port of a computer to the Loader Port of a CPU with a loader cable.
- ⑤ Select the menu to set up special cards.
- ⑥ Put the CPU on the 'Stop' mode and select the menu to download the program.
- ⑦ Put the mode switch on 'Run' mode.

3.2 Writing Device Addresses

Type	Bit Data	Word Data	Timer, Counter Output Contact	Step Controller Contact	Bit Device in Words
Type of Device	[Device Symbol] + [Card No.] + [Bit No.]	[Device Symbol] + [Card No.]	[Device Symbol] + [Bit No.]	[Device Symbol] + [Card No.] + [.] + [Bit No.]	[Device Symbol] + [Card No.] + [0]
Usable Device	X, Y, M, K, L, F	D, Z, T, C	T, C	S	X, Y, M, K, L, F
Card No.	Decimal 3 Character	Decimal 4 Character	Decimal 4 Character	Decimal 2 Character	Decimal 3 Character
Bit No.	Hexadecimal 1 Character	-	-	Decimal 2 Character	-
Example	X000E Y0012 M034F K0120 L023C F0093	D1234 Z0001 T0011 C1023	T0003 C0567	S00.00 S12.78	X0110 Y0330 M0440 K0000 L0040 F0130

3.3 Examples of PLC Program

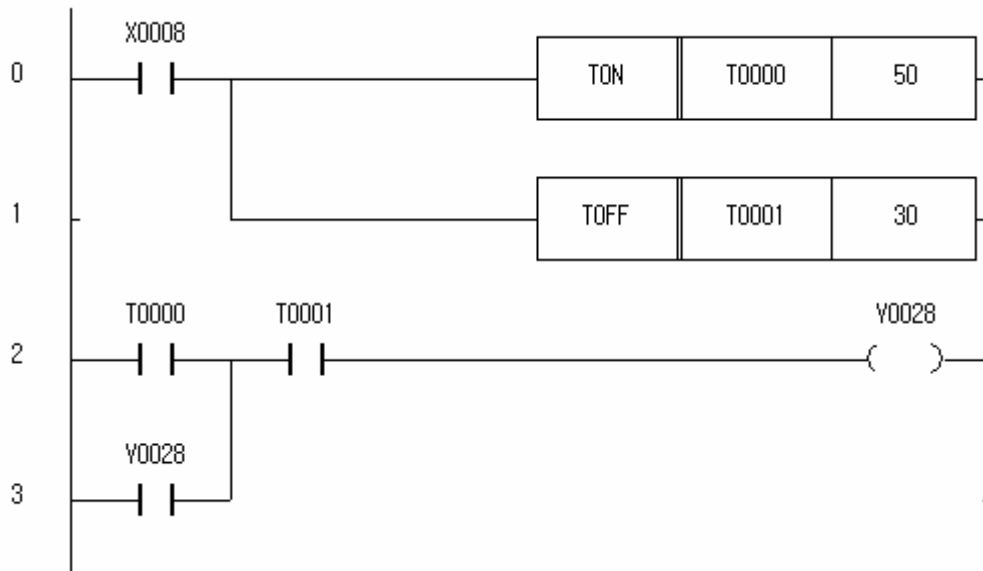
- ① If the input signal(X0000) comes, the LED lamp for the output(Y0020) is turned on.



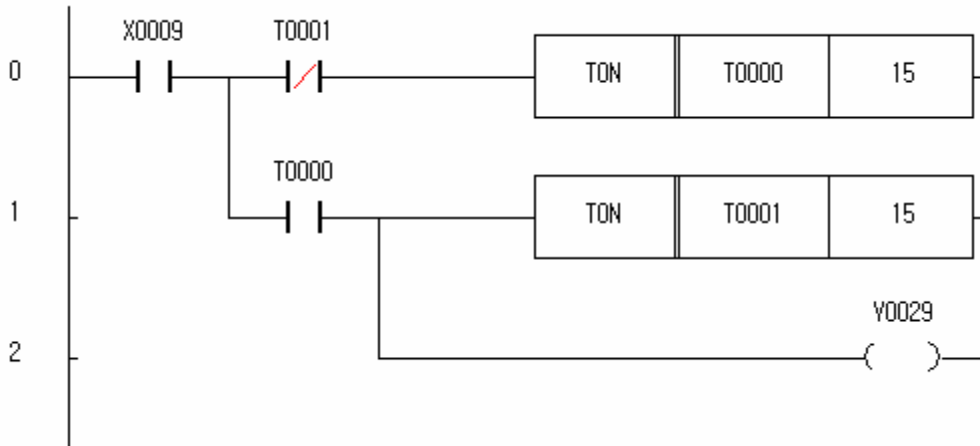
- ② If the input signal(X0001) comes, the LED lamp for the output(Y0021) is turned on even the switch is turned off. If another input signal(X0002) comes, the output is turned off.



- ③ If the input signal(X0008) comes, the LED lamp for the output(Y0028) is turned on in 5 seconds. If the switch is turned off, the LED lamp for the output(Y0028) is turned off in 3 seconds.



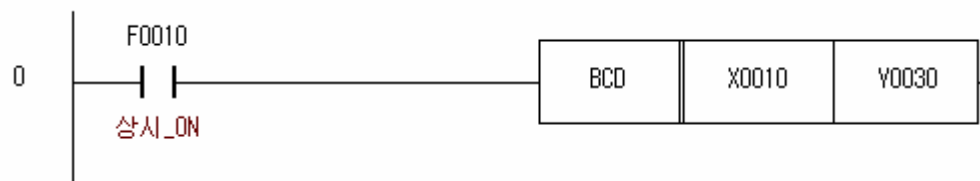
- ④ While the input signal(X0009) is turning on, the LED lamp for the output(Y0029) blinks at the intervals of 3 seconds.



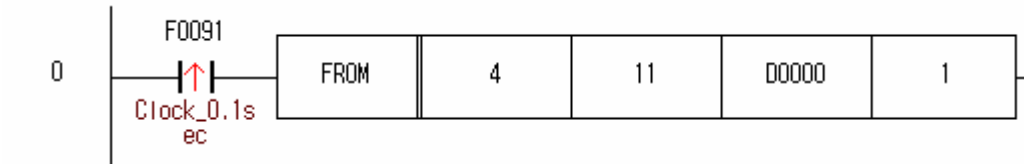
- ⑤ If the input signal(X0003) comes at five times, the LED Lamp for the output(Y0023) is turned on. If an input signal(X0004) comes, the output and counting are reset.



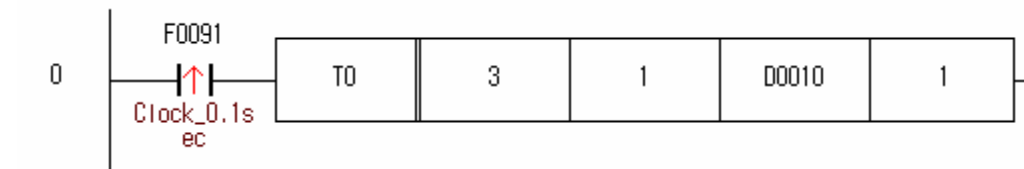
- ⑥ The numerals indicated as DIGIT S/W X0010 ~ X001F are output in DISPLAY UNIT(Y0030 ~ Y003F).



- ⑦ The voltage input from CM1-AD08V is converted to digital value and the result is stored in D0000.



- ⑧ The digital value stored in D0010 is voltage-output through CM1-DA04V.



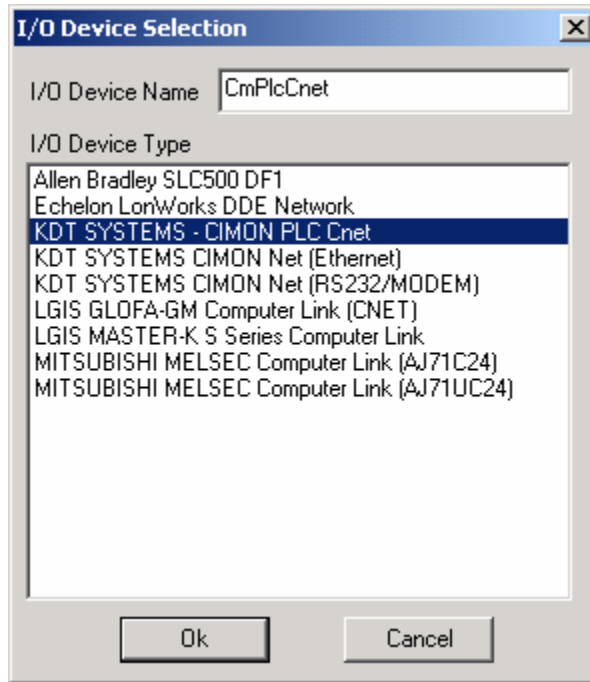
3.4 Linking with HMI S/W CIMON in RS232C Type

- ◆ To understand easily, a written CIMON program is explained.

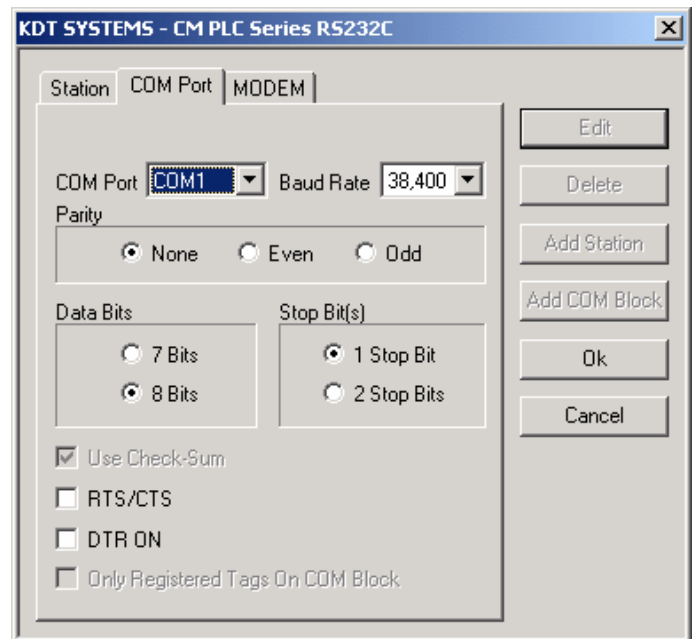
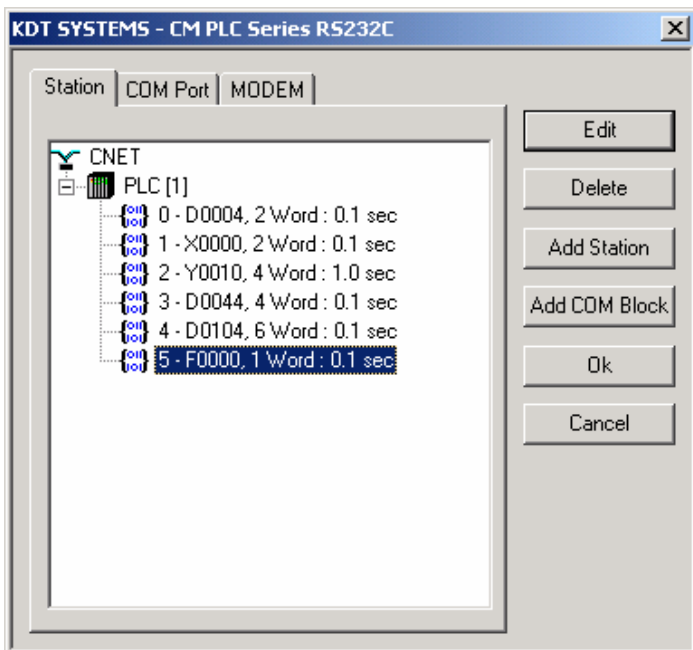
① Setting up Communication

Connect the COM Port1 of a computer with Module CM1-SC02A in RS-232C Type.

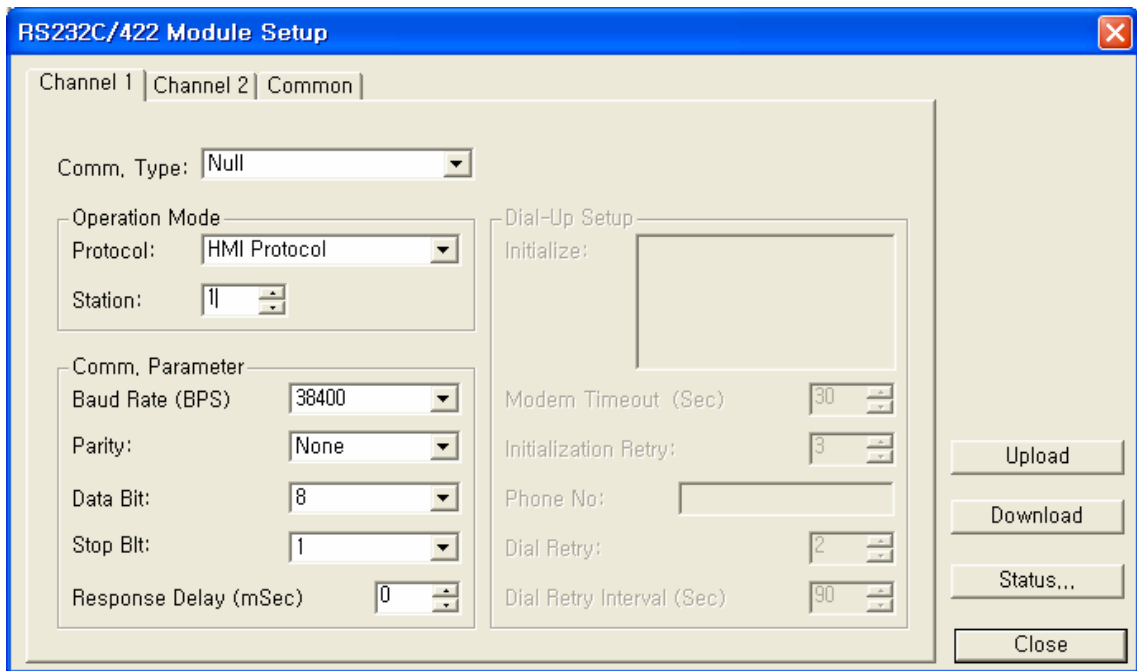
In the I/O device setup, select the KDT Systems CIMON-PLC RS232C/422/485 after entering the name as follows.



Select the menu to set up the communication block and the environment for actual communication.



In the CICON, select the menu to set up Module CM1-SC02A as follows.



Make sure whether they are actually communicated when selecting the menu to run after setup as the above.

The communication status should be normal as follows.

Node	Device	Station	Number	Desc.	Status	Rea...	Readi...	Read(%)	Writing	Writin...	Written(%)
CIMON					Normal	1384	3	99	0	0	0
	PLC				Normal	1384	3	99	0	0	0
		PLC	01		Normal	1384	3	99	0	0	0

② Address Map

Address	Data	Tag	Device	Name of Tag
F0000	Digital	Real Tag	PLC.PLC	F0
X0010	Analog	Real Tag	PLC.PLC	DIGITSW (BCD16)
Y0030	Analog	Real Tag	PLC.PLC	DISPLAY (BCD16)
Y0020 ~ Y003F	Digital	Real Tag	PLC.PLC	OUTPUT.Y20 ~ OUTPUT.Y3F
X0000 ~ X001F	Digital	Real Tag	PLC.PLC	INPUT.X0 ~ INPUT.X1F
D0000	Analog	Real Tag	PLC.PLC	AD.CH1
D0044	Analog	Real Tag	PLC.PLC	HSC.CH1
-	Digital	Virtual Tag		HC_CH1_CHANGED

③ Window Configuration

◆ Main Window

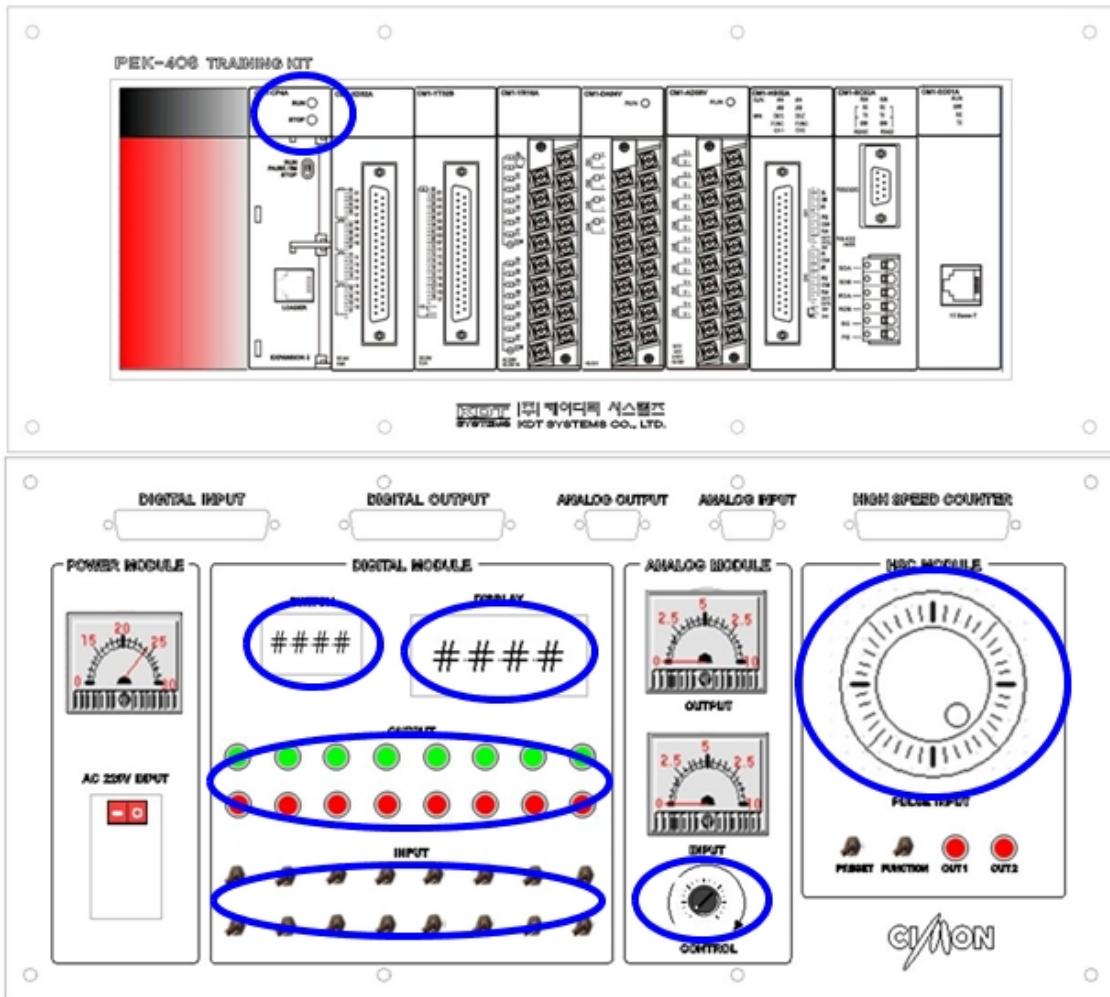


Figure 1 Main Window

◆ HSC1

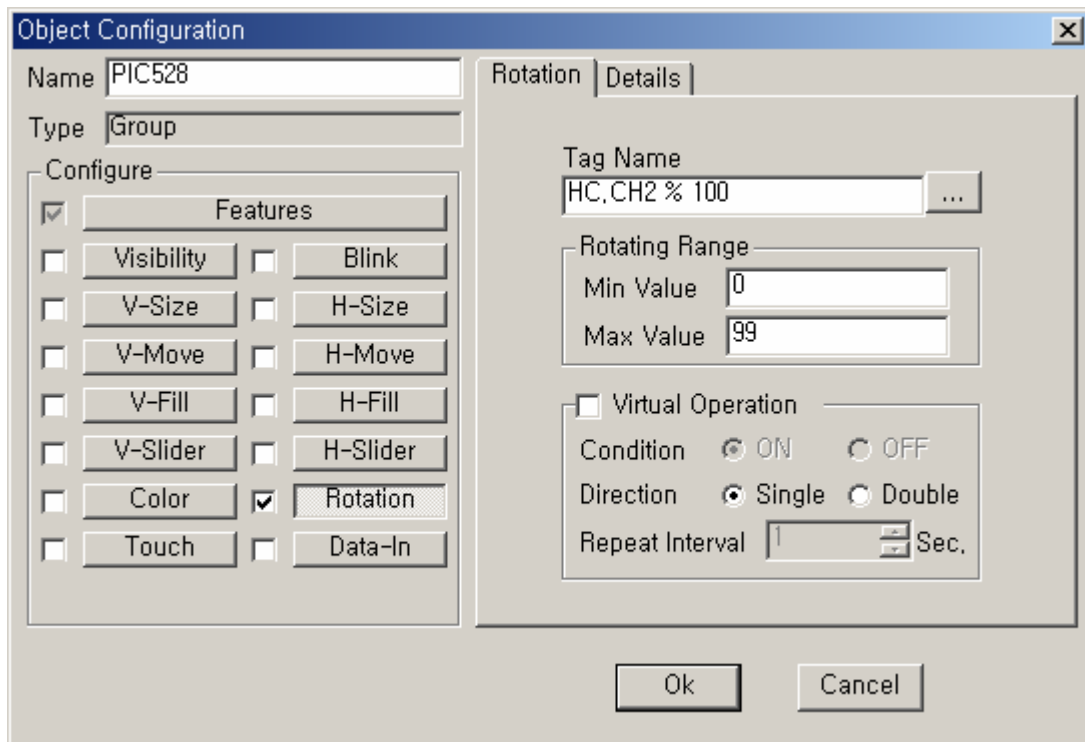


Figure 2 Revolution of HSC 2

◆ AD Input

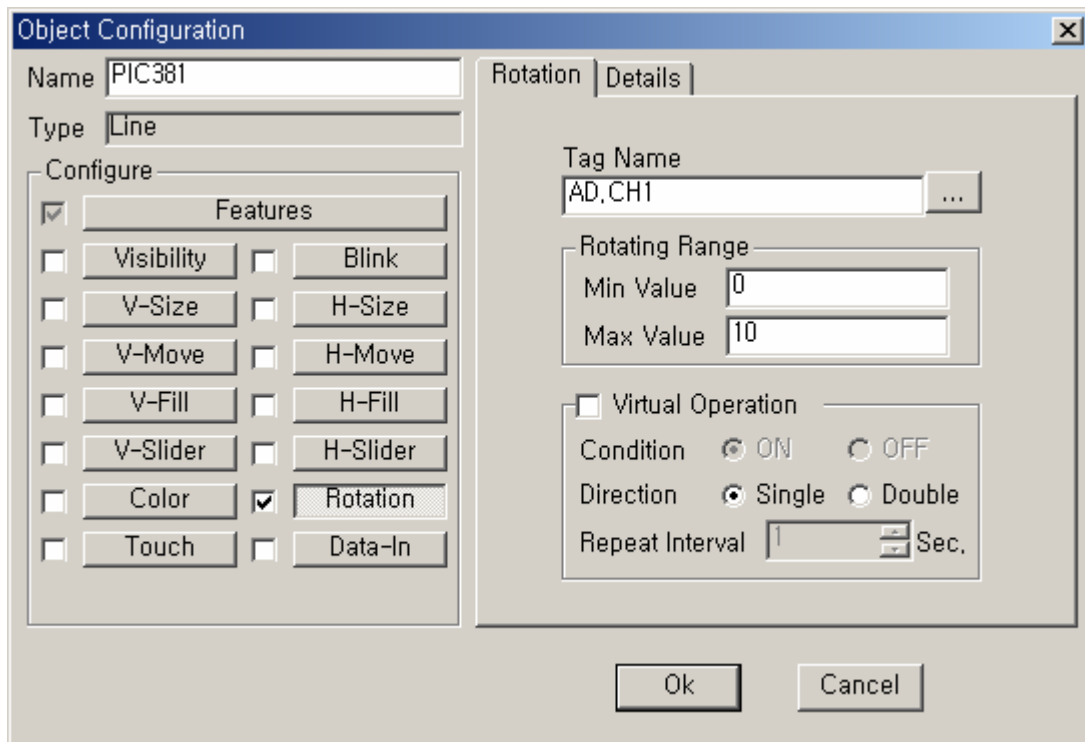
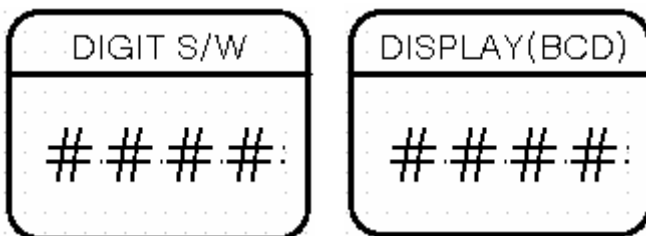


Figure 4 AD Input (CH 1)

◆ Indicating BCD Value



DIGIT S/W

Tag Name : DIGITSW

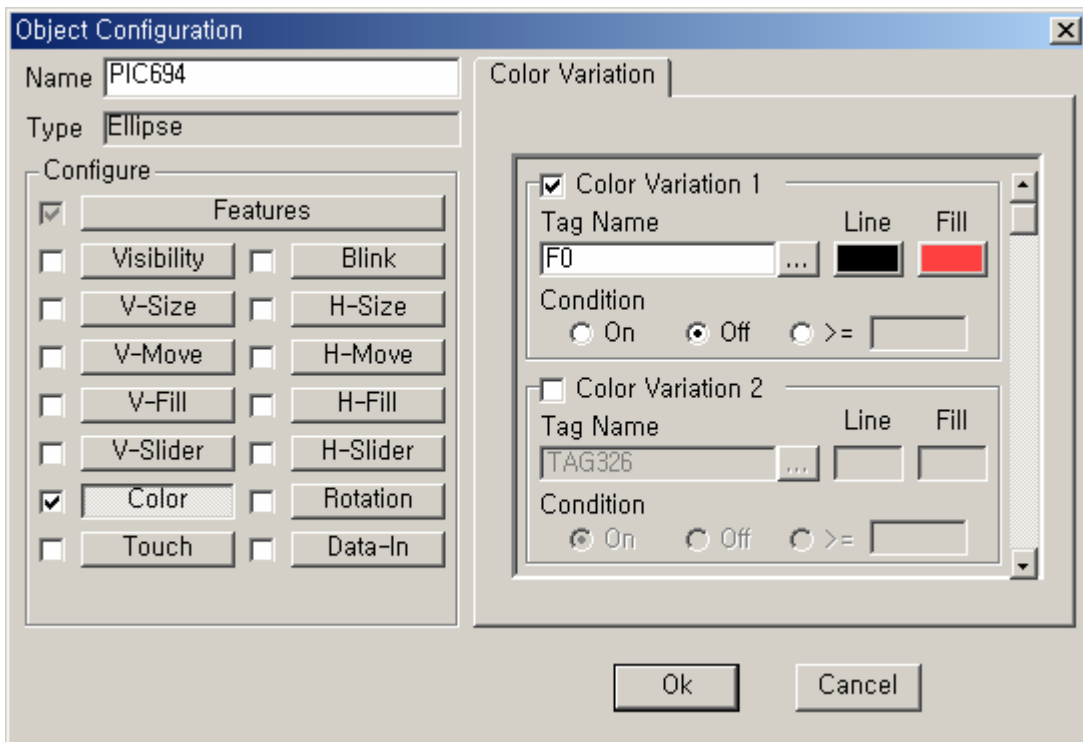
Data Type : BCD

DISPLAY BCD

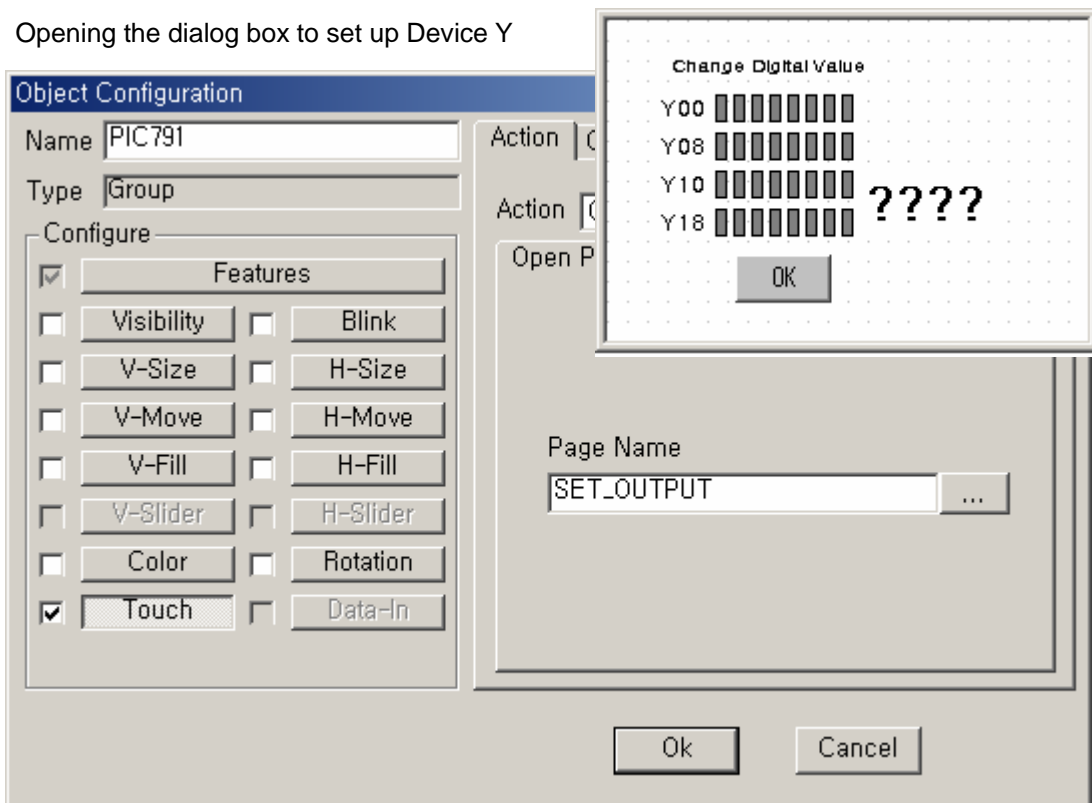
Tag Name : DISPLAY

Data Type : BCD

◆ Lamp Indicating RUN/STOP Status

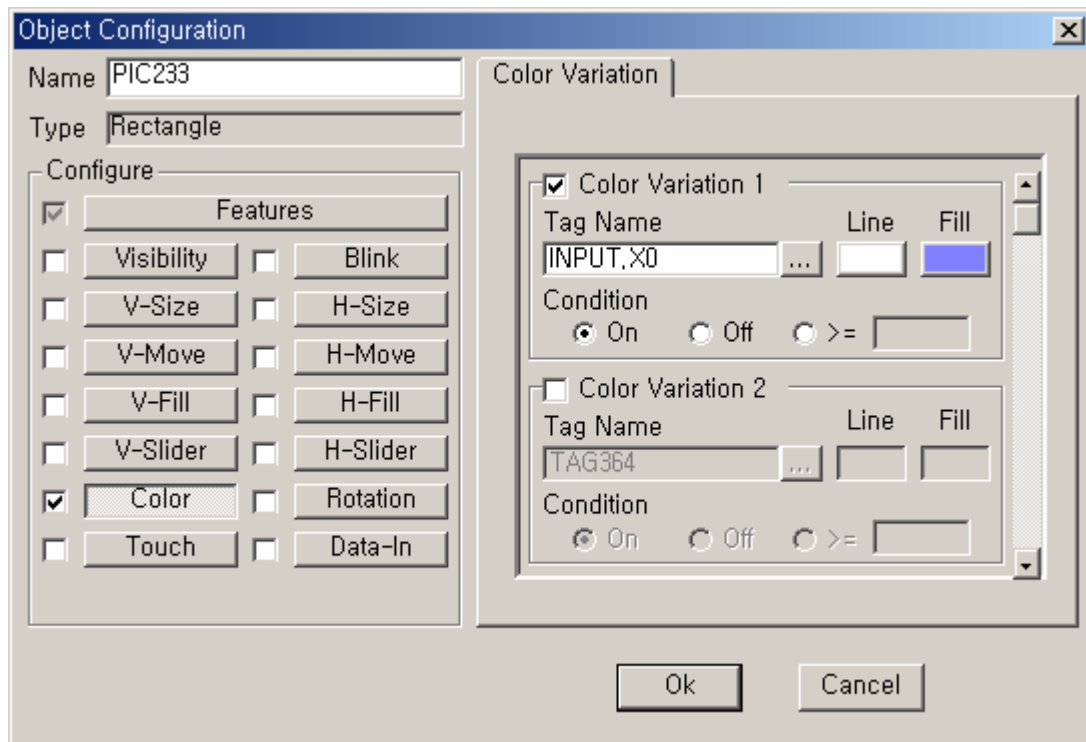


◆ Opening the dialog box to set up Device Y

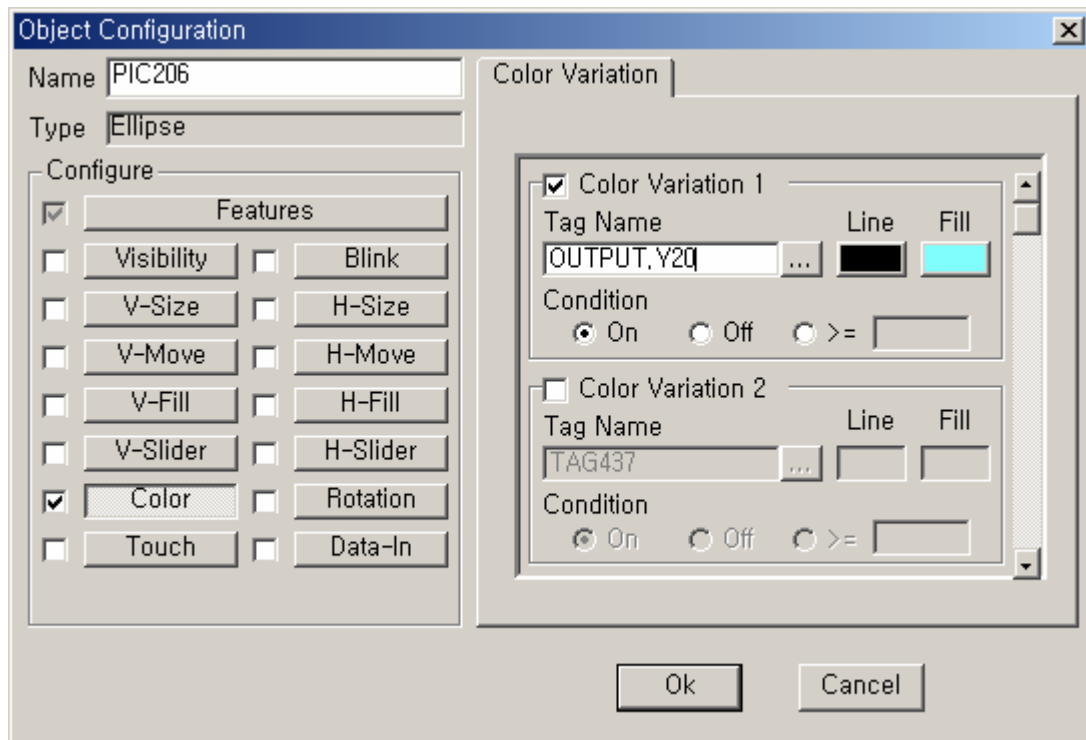


Dialog box to open a page and set digital value

◆ Color Variation of Input(Device X)



◆ Color Variation of Output(Device Y)

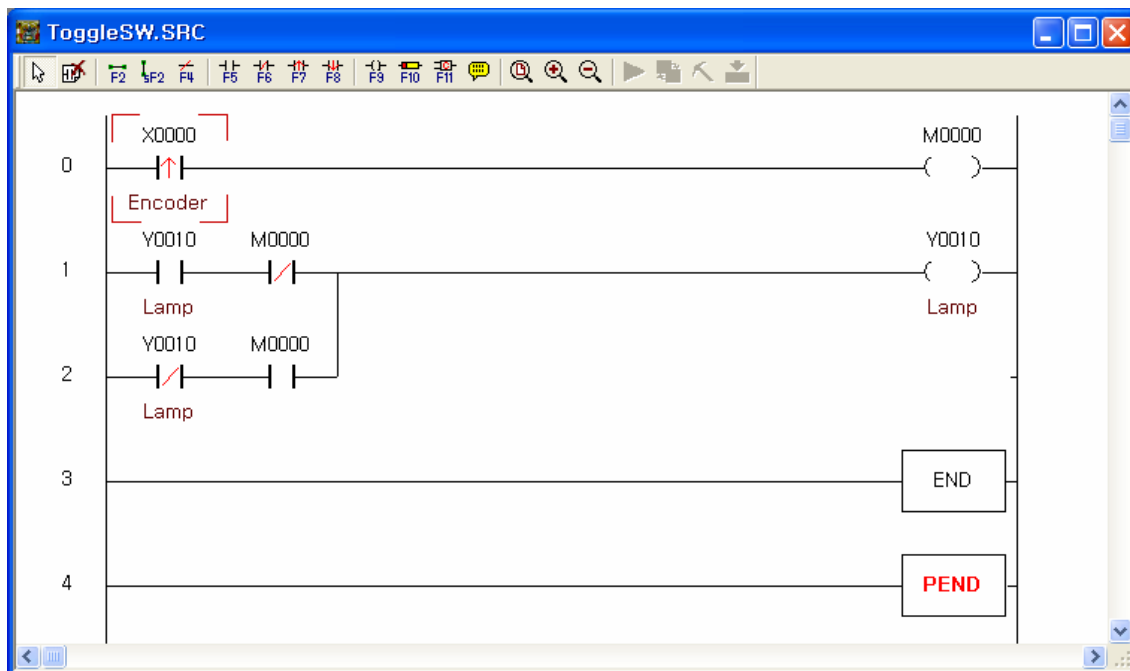
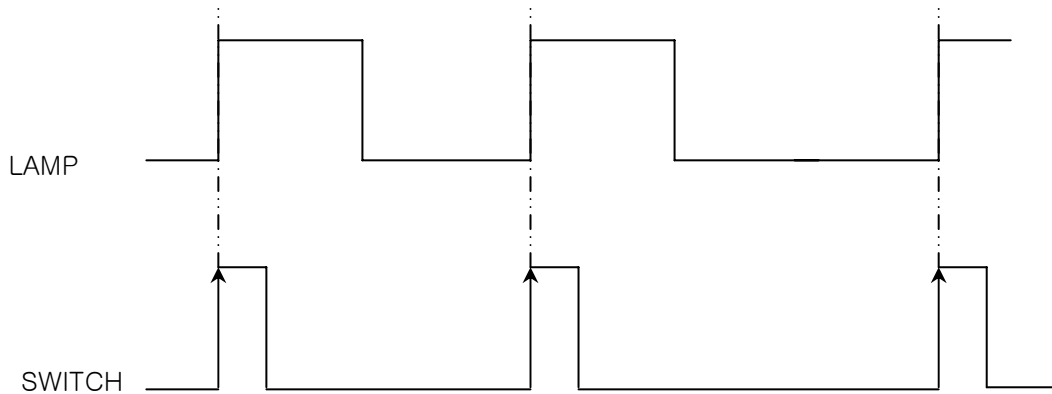


3.5 Examples of PLC Application

Example 1. Toggling Output Contact by Using Input Contact

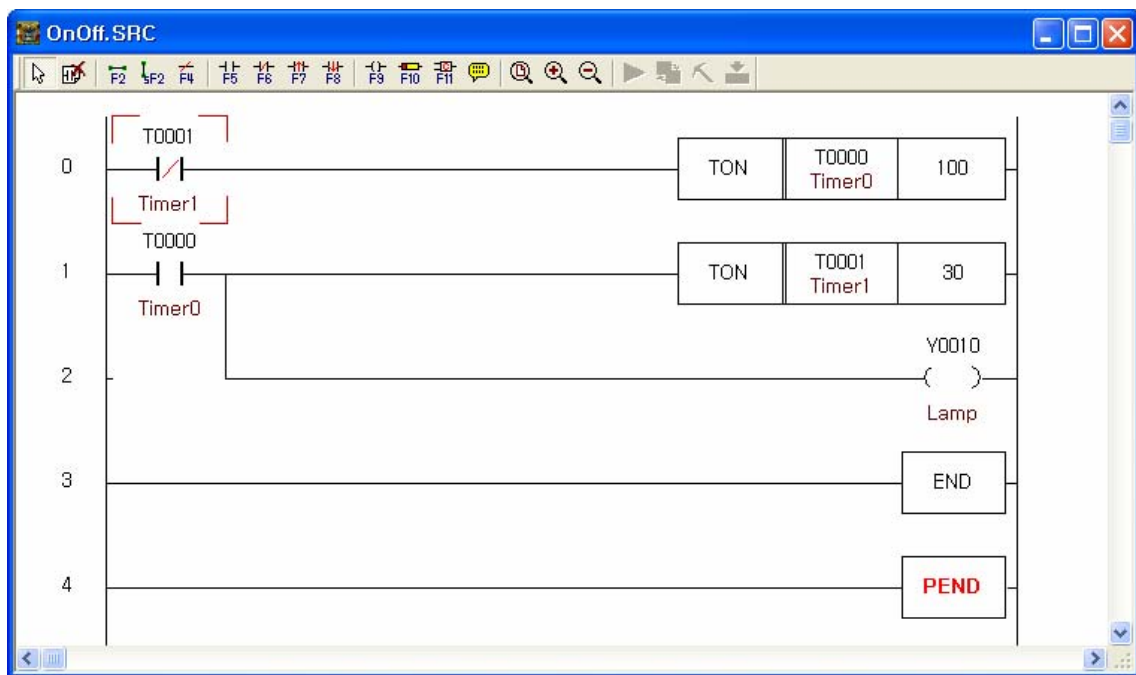
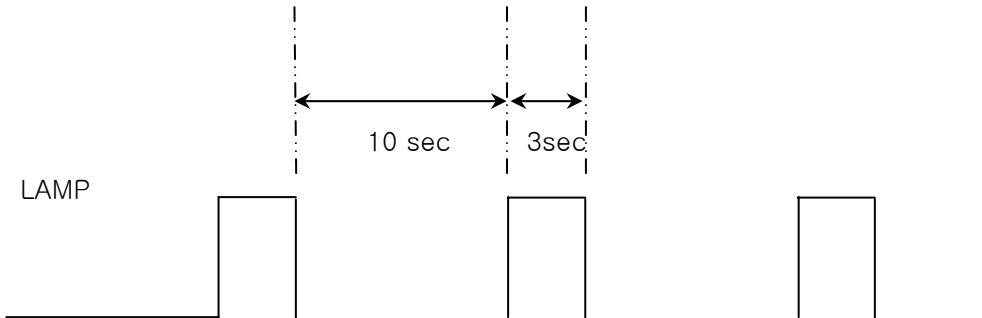
Operation) Lamp(Y0010) is turned on and off whenever the input switch(X0000) is turned on.

If Switch X0000 is turned on in the status that the current lamp is turned on, the lamp is turned off. If Switch X0000 is turned on in the status that the current lamp is turned off, the lamp is turned on.



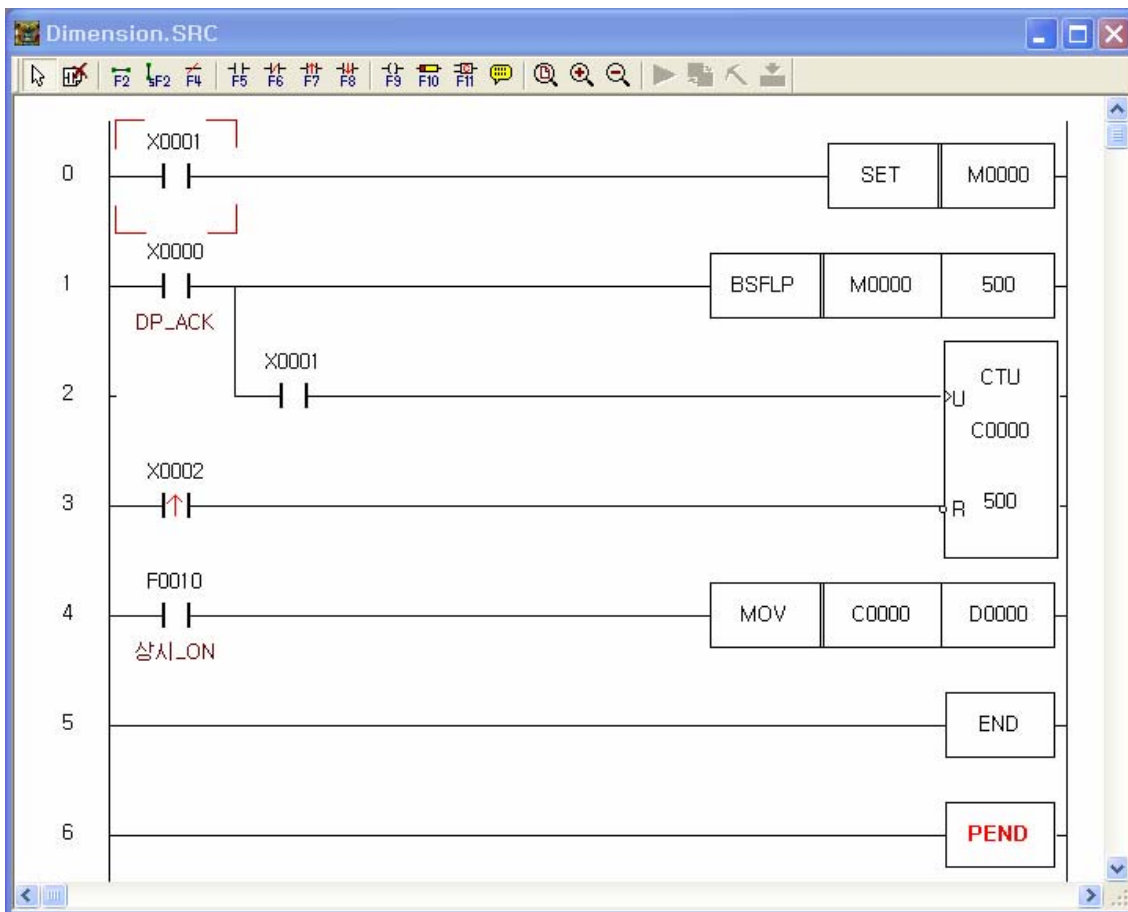
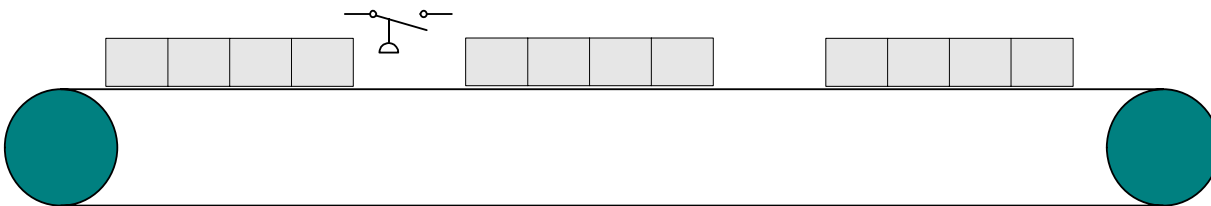
Example 2. Controlling On-Off by Using a Timer

Operation) The lamp is turned off for 10 seconds and on for 3 seconds by using a 100ms timer.



Example 4. Measuring the Length of an Object by Using Limit S/W and Encoder

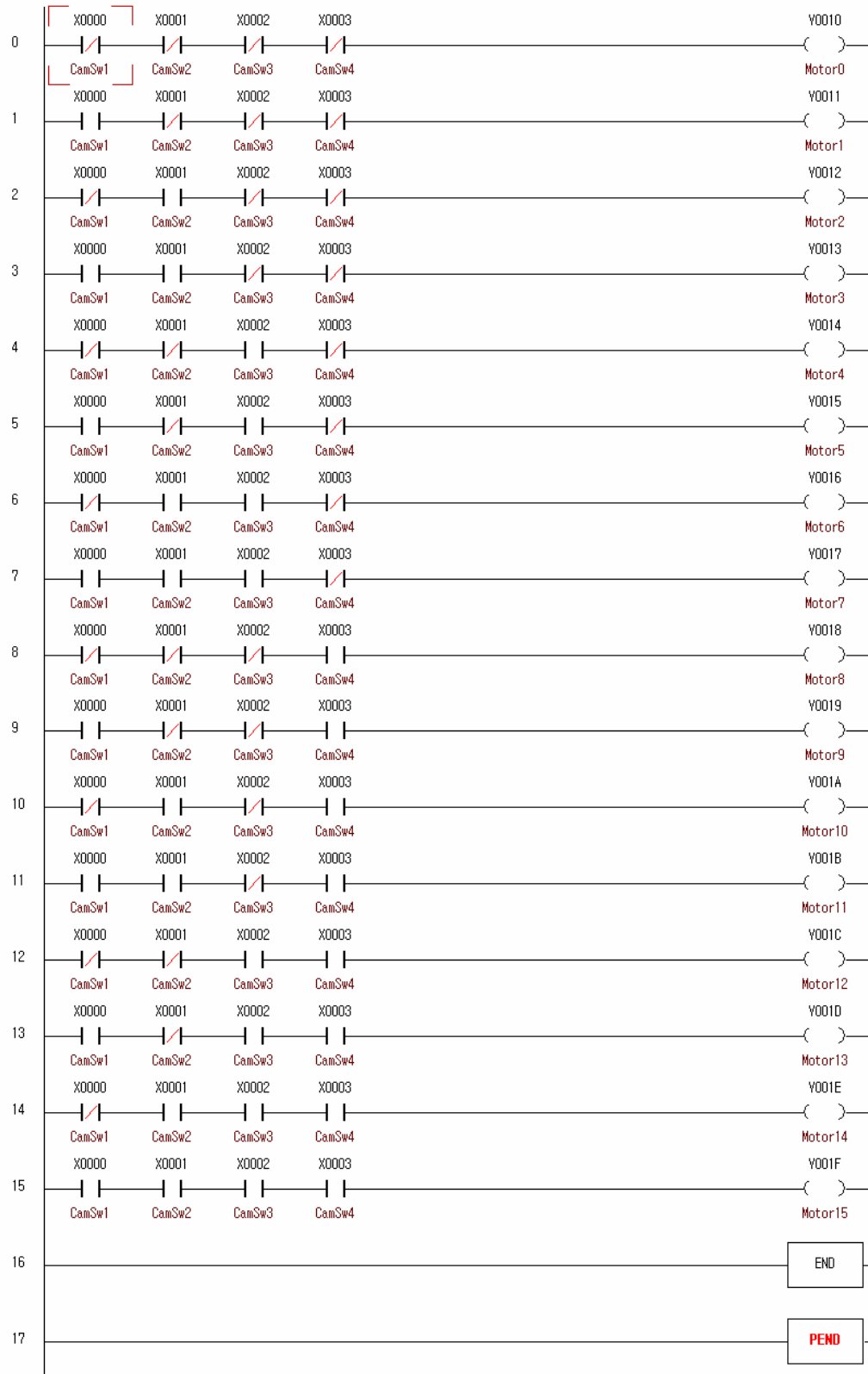
Operation) The length of an object is measured through the conveyor in which a motor moving as much as 1 cm for 1 pulse is installed. The following is a PLC program to measure the length of the currently passing object by detecting the front and rear of the object passing on a conveyor with a limit switch.



Example 6. Using a Cam Switch

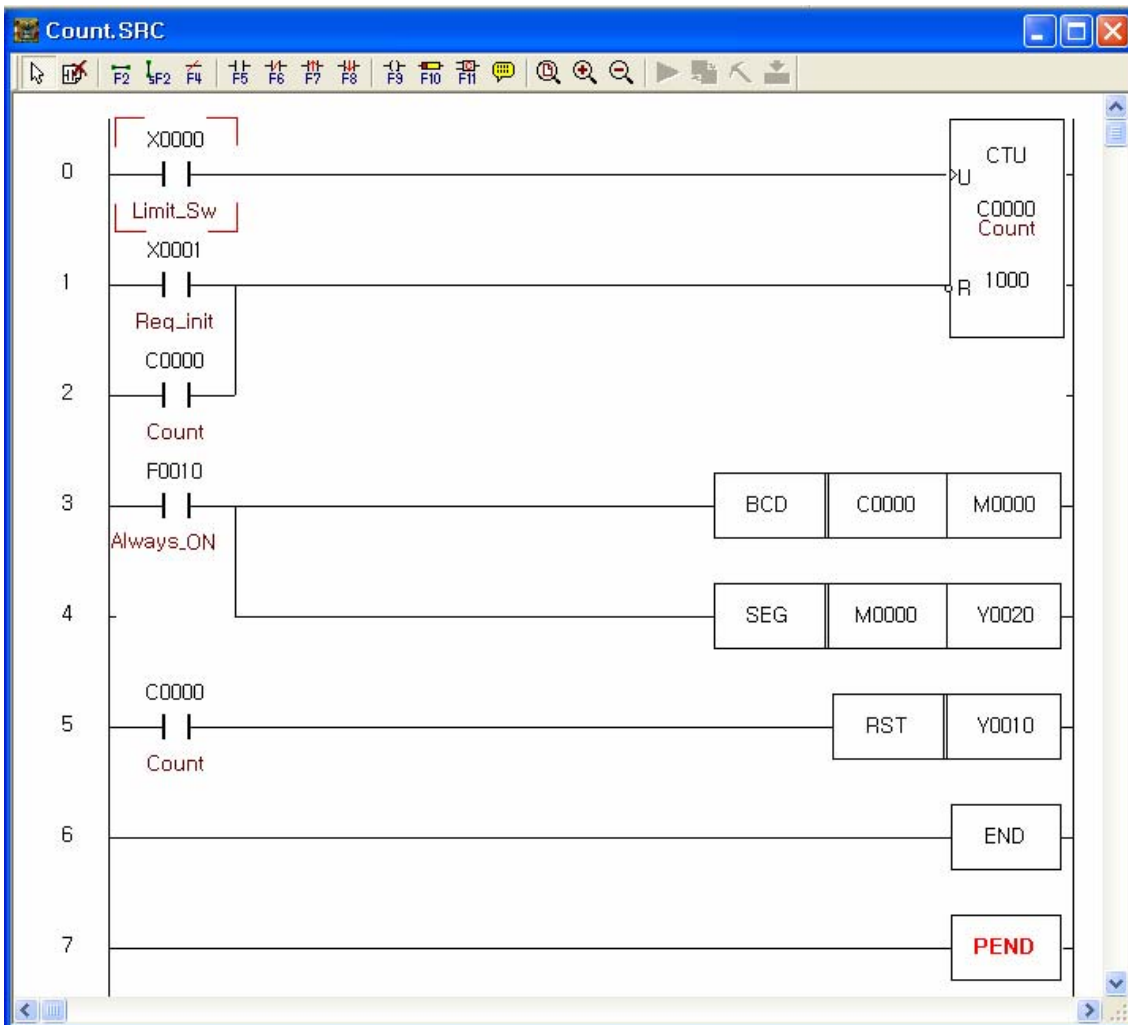
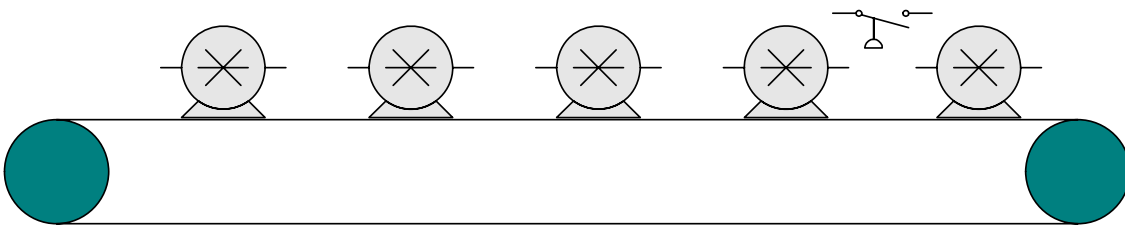
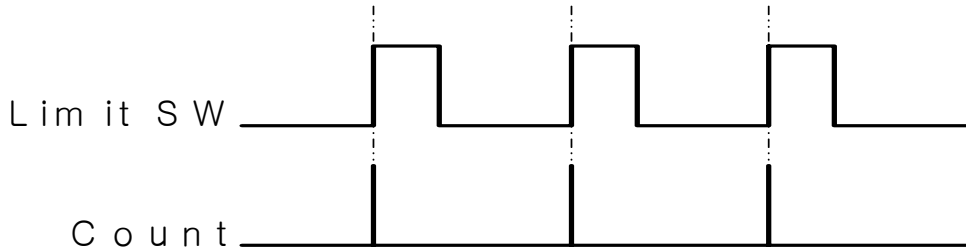
Operation) The following is a PLC program to output bit data to 16 terminals as maximum by using the cam switch with 4 input terminals.

Input terminal(Cam switch) : X0000 ~ X0003, Output terminal(Motor) : Y0010 ~ Y001F



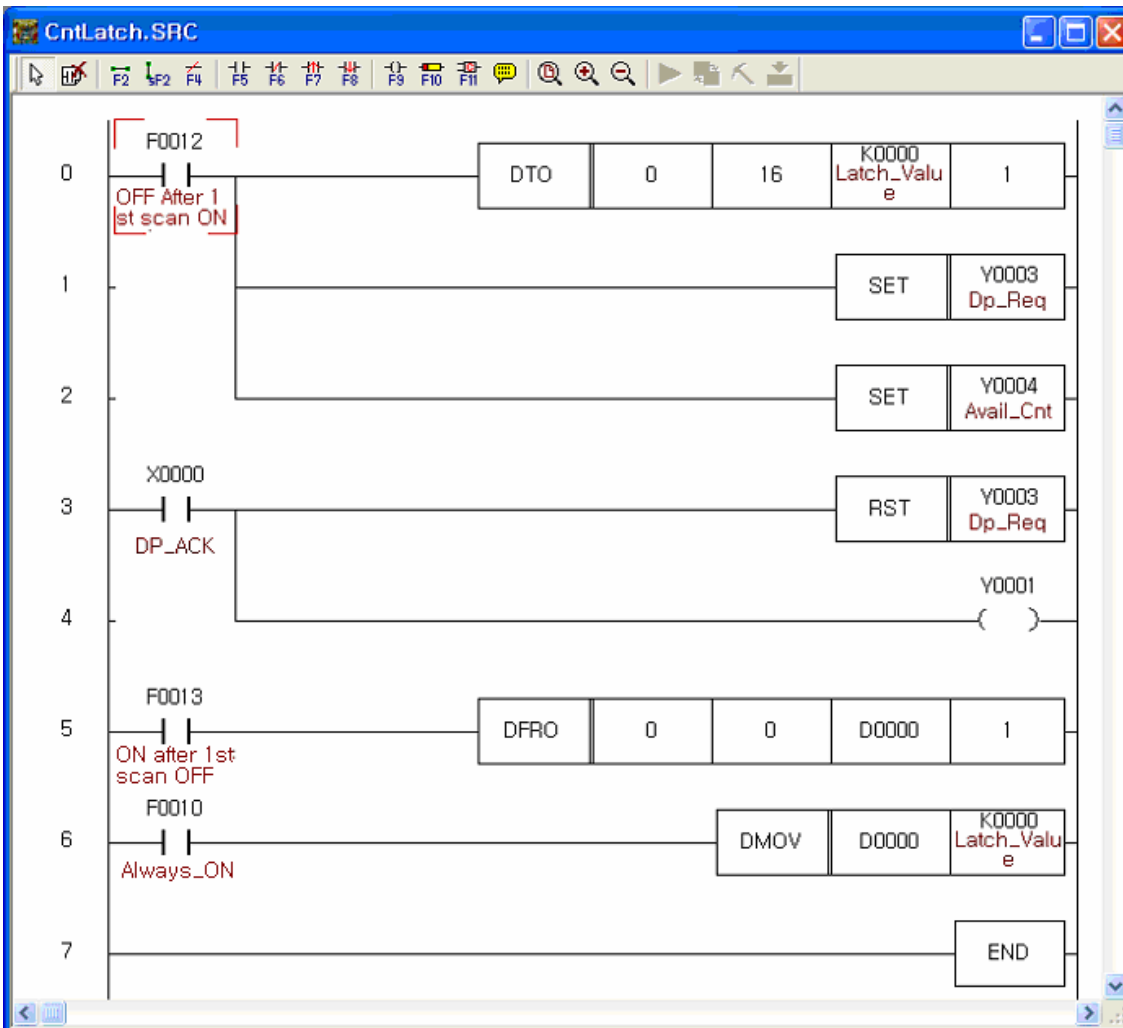
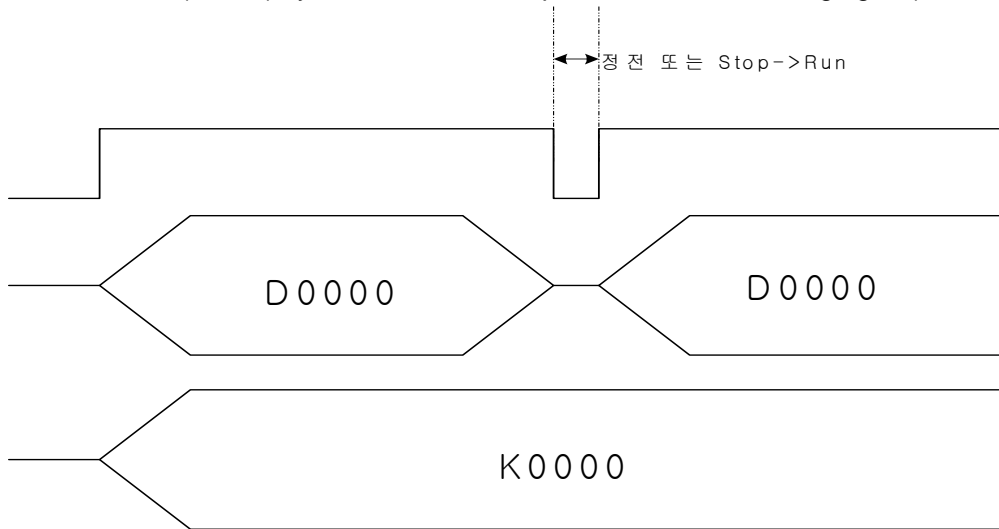
Example 7. Counting the Number of Moving Objects

Operation) The following is a PLC program to count the number of the objects passing on a conveyor belt and show the number on a segment indicator, and to stop the conveyor belt and clear the number on the segment indicator, if the number of the objects having passed on the conveyor belt is 1000.



Example 8. Keeping the Counted Value

Operation) In case the power is off while counting pulses by using a HSC module or CPU status is switched from Stop to Run, the counted value is cleared. The following is a PLC program to keep the counted value as it is even though such situation occurs. (The counted value is always stored in the latched device(K0000) by MOV. The value is preset in case of running again.)



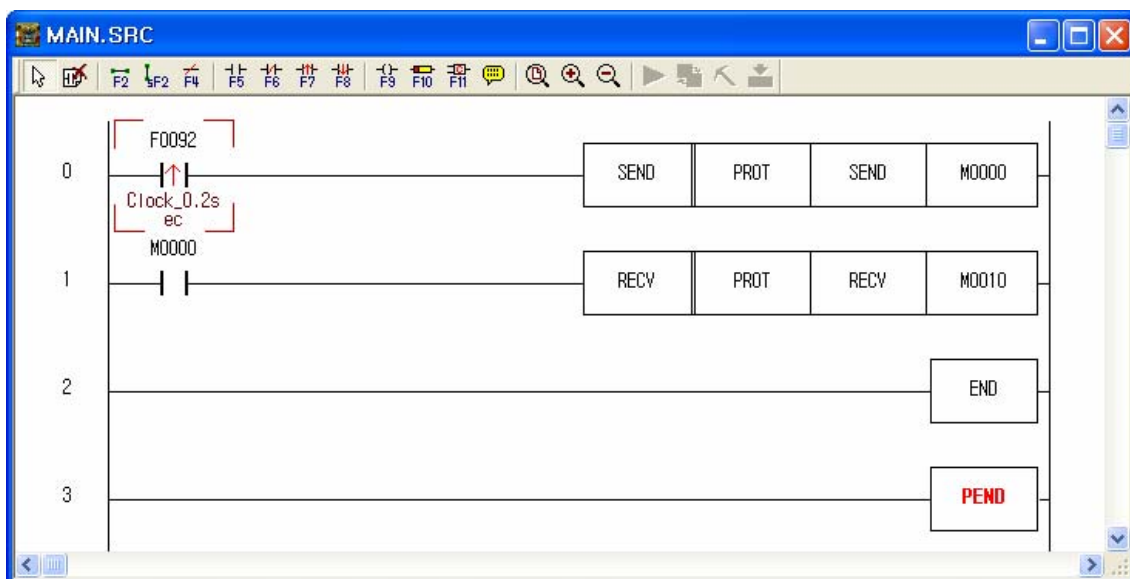
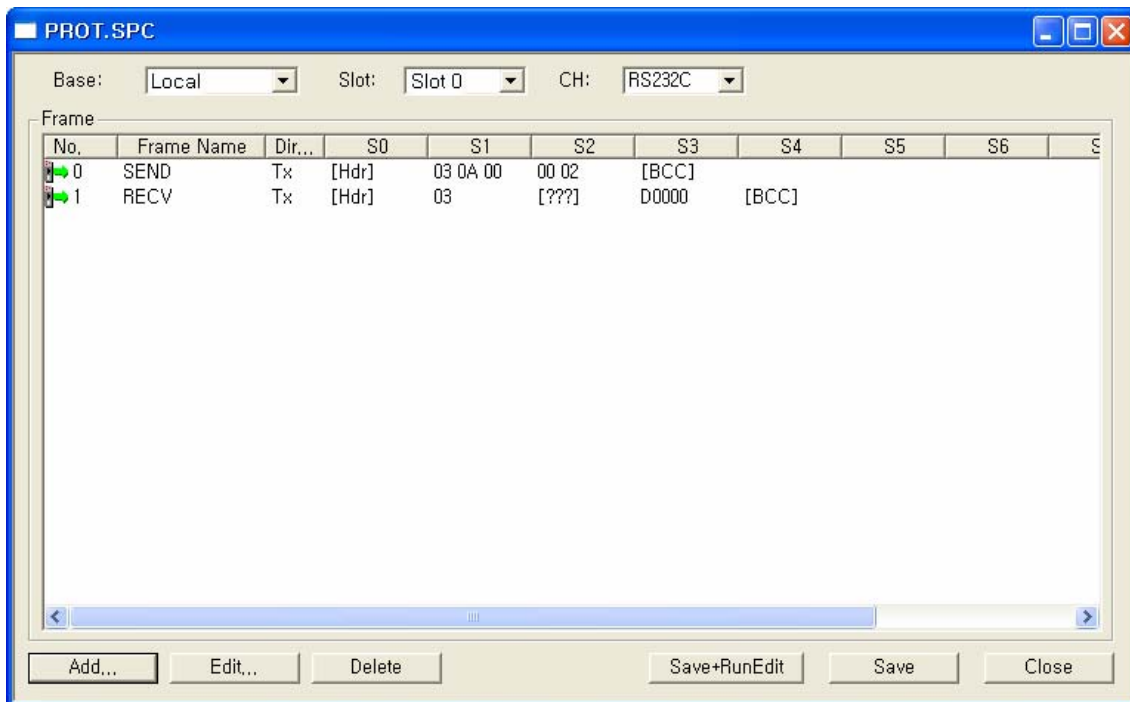
Example 9. Network

Operation) A CIMON-PLC can communicate with an other manufacturers' PLC using Modicon(Modbus) Protocol.

The following is a PLC program to read 2-byte data of an other manufacturers' PLC from a CIMON-PLC by using Modbus Protocol and store the data in the memory of the CIMON-PLC.(But, data are read every 200ms.)

Other manufacturer's PLC: Internal Memory(Address: 402561)

CIMON-PLC: Data Memory(Address: 403073 -> D0000)



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