Training Kit Operation Manual

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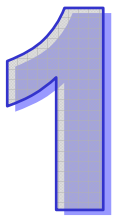

Chapter 1 Introduction of PLCs

The functions of PLCs and the features of modules described in this chapter help users choose the proper models they need to perform some functions.

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1.1 Introduction of DVP12SE

DVP-SE is a 12-point (8 DI+4 DO) PLC MPU, offering various instructions and with 16K steps program memory, able to connect to all DVP Slim type series extension modules and high-speed extension modules, including digital I/O (max. 480 I/O points) and analog modules (for A/D, D/A conversion and temperature measurement). 2 points of 100 kHz and 2 points of 10 kHz high-speed pulse output satisfy all kinds of applications. DVP-SE is small in size, and can be installed easily. Users do not have to install any batteries in DVP-SE series PLCs. The PLC programs and the latched data are stored in the high-speed flash memories.

1. Setting the Ethernet

   The DVP-SE series PLC contains a built-in Ethernet communication port. Users have to set the network parameter before the PLC connects to other network devices. The default parameter setting values are 192.168.1.5 (the IP address) and 255.255.255.0 (the subnet mask). Users can set the parameter by using DCISoft, or by using the PLC program to write the values into the network control register (CR).

   - Software: Start the DCIsoft, and connect the PC to the DVP-SE series PLC through the ehternet cable. Enter “Communication Setting” page in DCISoft, and choose “Ethernet” communication port. Then, click “Search” to search for the picture representing the DVP-SE series PLC. After users click the picture twice, the setting page appears. Finally, enter the related parameters, and click “Apply” to finish the setting.
   - PLC program: Users use the instruction “To” to write the IP address (CR#88, 89) and the subnet mask (CR#90, 91). For example, when the IP address is 192.168.1.5, users write 192.168 (H’C0A8) into CR#89, and .1.5 into CR#88 (H’105).

   Note: When users use the instruction “From/To” to read the data from the network control register and write the data into it, the module number is K108.

2. Specifications
   - Program capacity: 16k steps/Data register: 12k words
   - Higher execution speed compared to the competition: LD: 0.64μs, MOV: 2μs
   - Built-in Ethernet supports MODBUS TCP and Ethernet/IP
   - IP Filter function is a firewall that offers the first line of defense and provides protection from malware and network threats
   - Supports DVP-S series left-side and right-side modules
   - No battery required. Maintenance-free.

     (Real time clock operates for 15 days after power off)

3. Motion control functions
   - 4 setos of high-speed pulse output: 100 kHz/2 sets, 10 kHz/2 sets
   - 8 sets of high-speed pulse input: 100 kHz/2 sets, 10 kHz/6 sets
   - Supports 2-axis linear and arc interpolation

4. Built-in High-speed Counters

1-phase 1 input		1-phase 2inputs		2-phase 2 inputs	
Sets	**Bandwidth**	**Sets**	**Bandwidth**	**Sets**	**Bandwidth**
2/6	100 kHz/10 kHz	2	100 kHz	1/3	50 kHz/5 kHz

1.2 Introduction of DVP20SX2

DVP-SX2 is a 20-point (8 DI+6 DO+4 AI+2 AO) PLC MPU, offering various instructions and is with 16k steps program memory, able to connect with all Slim series extension models, including digital input/output (max. 480 input/output extension points), analog modules (A/D, D/A transformation and temperature units) and all kinds of new high-speed extension modules. Its 2-group high-speed (100 kHz) pulse outputs and the one new 2-axis interpolation instructions satisfy all kinds of applications. DVP-SX2 is small in size, and it can be installed easily. Users do not have to install any batteries in DVP-SX2 series PLCs. The PLC programs and the latched data are stored in the high-speed flash memories.

1. Specifications
   - Program capacity: 16k steps/Data register: 10k words
   - Higher execution speed compared to the competition: LD: 0.35μs, MOV: 3.4μs
   - Built-in mini USB, RS-232 and RS-485 ports (Master/Slave)
     Supports standard MODBUS ASCII/RTU protocol and PLC Link function
   - Supports real time clocl for version 2.0 and above (no battery required)
     It operates for at least one week after power off.
   - Supports DVP-S series left-side and right-side modules
2. Motion control functions
   - 4 sets of high-speed pulse output: 100 kHz/2 sets, 10 kHz/2 sets
   - 8 sets of high-speed pulse input: 100 kHz/2 sets, 10 kHz/6 sets
   - Supports 2-axis linea and arc interpolation
3. Built-in Analog I/O

Analog input		Analog output	
Points	4	**Points**	2
Resolution	12-bit	**Resolution**	12-bit
Sepc.	-20~20 mA or -10~10 V 4~20mA	**Sepc.**	0~20 mA or -10~10 V 4~20mA

1.3 Introuction of DVP28SV2

DVP-28SV2 is a 28-point (16 inputs+12 outputs) PLC MPU, offering various instructions and with 30K (SV2) steps program memory, able to connect to all Slim type series extension models, including digital I/O (max. 512 points), analog modules (for A/D, D/A conversion and temperature measurement) and all kinds of high-speed extension modules.

1. Excellent motion control
   - High-speed pulse output: 4 sets of 200 kHz pulse output
   - Supports max. 4 hardware 200 kHz high-speed counters
   - Increases many motion control instructions to meet the applications that require high-speed and high-precision positioning control such as labeling machines, packaging machines and printing machines.
   - Offers linear/arc interpolation motion control
   - Provides up to 16 external interrupt pointers
2. Complete program protection
   - Auto backup function to prevent losing programs and data even when the battery runs out
   - Second copy functions provides a backup for extra insurance in the event that one set of programs and data are damaged
   - Up to 4-level password protection protects your source programs and intellectual property
3. Built-in 4 hardware high-speed counters

Standard		**Hardware high-speed counter**					
1-phase 1 input		**1-phase 1 input**		**1-phase 2 inputs**		**2-phase 2 inputs**	
Sets	**Bandwidth**	**Sets**	**Bandwidth**	**Sets**	**Bandwidth**	**Sets**	**Bandwidth**
8	10 kHz	4	200 kHz	2/2	200 kHz/20 kHz	2/2	200 kHz/20 kHz

1.4 Introduction of DVP12SA2

DVP-SA2 is a 12-point (8 DI+4 DO) PLC MPU, offering various instructions and with 16K steps program memory, able to connect to all DVP-S series extension modules and high-speed extension modules, including digital I/O (max. 480 I/O points) and analog modules (for A/D, D/A conversion and temperature measurement). 2 points of 100 kHz and 2 points of 10 kHz high-speed pulse output satisfy all kinds of applications. DVP-SA2 is small in size and easy to install. Users do not have to install any batteries in DVP-SA2 series PLCs. The PLC programs and the latched data are stored in the high-speed flash memories.

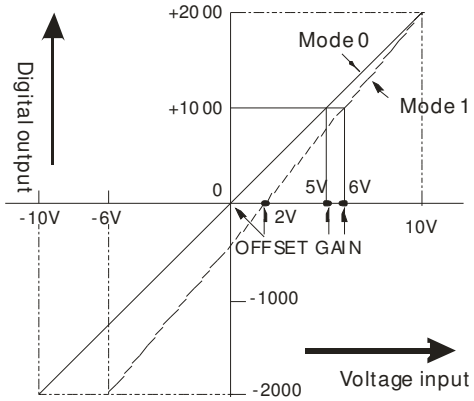
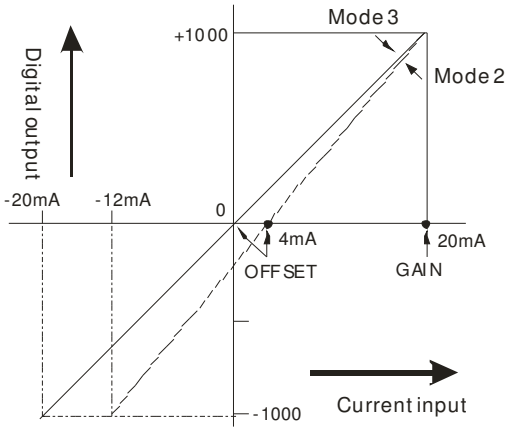
1. Specifications
   - Program capacity: 16K steps
   - Data registers: 10K words
   - Higher execution speed compared to the competition: LD: 0.35μs, MOV: 3.4μs
   - Built-in 1 RS-232 and RS-485 ports (Master/Slave)
     Supports standard MODBUS ASCII/RTU protocol and PLC Link function
   - No battery required, maintenance-free
     (Real time clock operates for 15 days after power off)
   - Supports DVP-S series left-side and right-side modules
2. Motion control functions
   - 4 sets of high-speed pulse output: 100 kHz/2 sets, 10 kHz/2 sets
   - 8 sets of high-speed putlut input:
     100 kHz/2 sets, 10 kHz/6 sets, 1 group of A/B phase 50 kHz
   - Supports 2-axis linear and arc interpolation
3. Built-in high-speed counters

1-phase 1 input		1-phase 2 inputs		2-phase 2 inputs	
Sets	Bandwidth	Sets	Bandwidth	Sets	Bandwidth
2/6	100 kHz/10 kHz	2	100 kHz	1/3	50 kHz/5 kHz

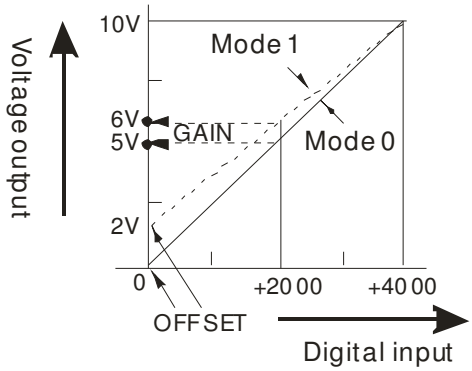
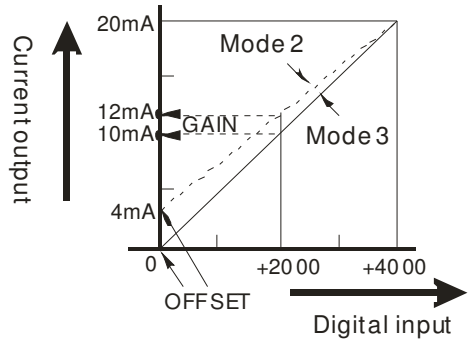
1.5 Introduction of DVP06XA-S

1. Introduction
   - DVP06XA-S is able to receive 4 points of analog input signals (voltage or current) and convert them into 12-bit digital signals. DVP06XA-S receives 2 groups of 12-bit digital data from the PLC MPU and converts them into 2 points of analog signals for output (in voltage/current). There are 49 16-bit control registers (CR) in DVP06XA-S, and the data in it can be read and written by using FROM/TO instructions in DVP Slim series PLC MPU program.
   - The system version of DVP06XA-S can be updated via RS-485 communication. The power unit is separate from it and is small in size and easy to install.
   - The user can select voltage or current input by wiring. Range of voltage input: ±10 V DC (resolution: 5 mV). Range of current input: ±20 mA (resolution: 20 μA).
   - The user can also select voltage or current output by wiring. Range of voltage output: 0 V~+10 V DC (resolution: 2.5mV). Range of current output: 0 mA~20 mA (resolution: 5 μA).
2. Specifications

Mixed analog/digital (A/D) module	**Voltage input**	**Current input**
Power supply voltage	24 V DC (20.4 V DC~28.8 V DC) (–15%~+20%)	
Analog input channel	4 channels per module	
Analog input range	±10 V	±20 mA
Digital data range	±2,000	±1,000
Resolution	12 bits(1_{LSB}=5 mV)	11 bits (1_{LSB}=20 μA)
Input impedance	200 kΩ and above	250 Ω
Overall accuracy	±0.5% of full scale of 25℃ (77℉) ±1% of full scale during 0~55℃ (32~131℉)	
Response time	3 ms × channels	
Isolation method	There is no isolation between channels	
Absolution input range	±15 V	±32 mA
Digital data format	2's complement of 16-bit, (11 significant bits)	
Average function	Yes (CR#2~CR#5 can be set and the range is K1~K4,096)	
Self diagnostic function	Upper bound and lower bound detection per channel	

Mixed analog/digital (A/D) module	Voltage input	Current input
Conversion Curve (Default setting: Mode 0)	Mode 0: (-10 V~+10 V); Mode 1: (-6 V~+10 V)  	
	Mode 2: (-12 mA~+20 mA); Mode 3: (-20 mA~+20 mA)  	

Mixed digital/analog (D/A) module	Voltage output	Current output
Analog signal output channels	2 channels per module	
Analog output range	0~10 V	0~20 mA
Digital data range	0~4,000	0~4,000
Resolution	12 bits (1_{LSB}=2.5 mV)	12 bits (1_{LSB}=5 μA)
Overall accuracy	±0.5% of full scale of 25℃ (77℉) ±1% of full scale during 0 ~ 55℃ (32 ~ 131℉)	
Output impedance	0.5 Ω or lower	
Response time	3 ms × channels	
Max. output current	10 mA (1 kΩ~2 MΩ)	-
Tolerance carried impedance	-	0~500 Ω
Digital data format	2's complement of 16-bit, (11 significant bits)	
Isolation method	There is no isolation between channels.	
Protection	Voltage output has short circuit protection but long period of short circuit may cause internal wiring damage and current output break.	

Mixed digital/analog (D/A) module	Voltage output	Current output
Communication mode (RS-485)	MODBUS ASCII/RTU Mode. Communication baud rate of 4,800/9,600/19,200/38,400 /57,600/115,200. For ASCII mode, date format is 7 bits, even, 1 stop bit (7, E, 1). For RTU mode, date format is 8 bits, even, 1 stop bit (8, E, 1). The RS-485 is disabled when the DVP06XA-S is connected in series with MPU.	
Connect to DVP-PLC MPU in series	When DVP06XA-S modules are connected to an MPU, the modules are numbered from 0-7. 0 is the closest to the MPU and 7 is the furthest. The Maximum number of modules is 8 modules and they do not occupy any digital I/O points of the MPU.	
Conversion Curve (Default setting: Mode 0)	Mode 0: (0 V~+10 V); Mode 1: (2 V~+10 V)  	
	Mode 2: (4 mA~+20 mA); Mode 3: (0 mA~+20 mA)  	

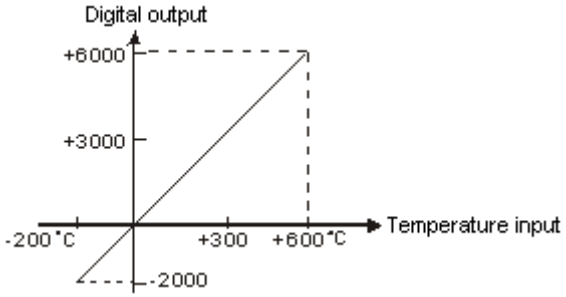
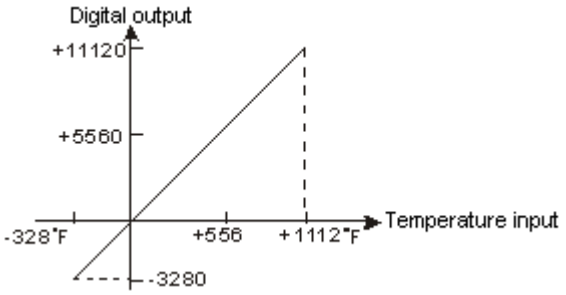
3. Other specifications

Power supply	
Maximum power consumption	2 W at 24VDC (20.4 V DC~28.8 V DC) (-15%~+20%), supplied by external power
Environment	
Operation/storage	Operation: 0℃~55℃ (temperature); 50~95% (humidity); pollution degree 2 Storage: -25℃~70℃ (temperature); 5~95% (humidity)
Vibration/shock immunity	International standards: IEC 61131-2, IEC 68-2-6 (TEST Fc)/IEC 61131-2 & IEC 68-2-27 (TEST Ea)

1.6 Introdunction of DVP04PT-S

1. Introduction
   DVP04PT-S is able to receive 4 points of platinum temperature sensors and convert them into 16-bit digital signals. Besides, through FROM/TO instructions in DVP Slim series MPU program, the data in DVP04PT-S can be read and written. There are many 16-bit control registers (CR) in DVP04PT-S. The power unit is separate from it and is small in size and easy to install.
2. Specifications

DVP04PT-S	Celsius (℃)	Fahrenheit (℉)
Power supply voltage	24 V DC (20.4V DC~28.8 V DC) (-15%~+20%)	
Analog input channel	4 channels per module	
Sensors type	2-wire/3-wire PT100/Ni100/PT1000/Ni100 3850 PPM/℃ (DIN 43760 JIS C1604-1989)	
Current excitation	1.53 mA/204.8 uA	
Temperature input range	-200℃~600℃	-328℉~1112℉
Digital conversion range	K-2000~K6000	K-3280~K11120
Resolution	16 bits (0.1℃)	16 bits (0.1℉)
Overall accuracy	±0.6% of full scale during 0 ~ 55℃ (32 ~ 131℉)	
Response time	200 ms × channels	
Isolation method	Isolation between digital and analog circuitry. There is no isolation between channels. 500VDC between digital circuits and Ground 500VDC between analog circuits and Ground 500VDC between analog circuits and digital circuits 500VDC between 24VDC and Ground	
Digital data format	2's complement of 16-bit	
Average function	Yes (CR#2~CR#5)	
Self diagnostic function	Upper bound and lower bound detection per channel	
Communication mode (RS-485)	MODBUS ASCII/RTU Mode. Communication baud rate of 4,800/9,600/19,200/38,400 /57,600/115,200. For ASCII mode, date format is 7 bits, even, 1 stop bit (7, E, 1). For RTU mode, date format is 8 bits, even, 1 stop bit (8, E, 1). The RS-485 is disabled when the DVP04PT-S is connected in series with MPU.	
Connect to DVP-PLC MPU in series	When DVP04PT-S modules are connected to an MPU, the modules are numbered from 0-7. 0 is the closest to the MPU and 7 is the furthest. The Maximum number of modules is 8 modules and they do not occupy any digital I/O points of the MPU.	

<table>
<tr><th>DVP04PT-S</th><th>Celsius (℃)</th><th>Fahrenheit (℉)</th></tr>
<tr><td rowspan="2">Temperature/Digital Value Characteristic Curve</td><td colspan="2">Mode of measuring Celsius temperature:
 
</td></tr>
<tr><td colspan="2">Mode of measuring Fahrenheit temperature:
 
</td></tr>
</table>

3. Other specifications

Power supply	
Maximum power consumption	2 W at 24 V DC (20.4 V DC~28.8 V DC) (-15%~+20%), supplied by external power
Environment	
Operation/storage	Operation: 0℃~55℃ (temperature); 50~95% (humidity); pollution degree 2 Storage: -25℃ ~70℃ (temperature); 5 ~ 95% (humidity)
Vibration/shock immunity	International standards: IEC 61131-2, IEC 68-2-6 (TEST Fc)/IEC 61131-2 & IEC 68-2-27 (TEST Ea)

1.7 Introduction of DVPEN01-SL

1. Introduction

   DVPEN01-SL is an Ethernet communication module for remote setting and communication through WPLSoft. DVPEN01-SL is able to send E-mails, automatically correct the RTC in a PLC and exchange data. It supports Modbus TCP communication protocol and can conduct remote monitoring by using SCADA (Supervisor Control and Data Acquisition) software or HMI (Human Machine Interfaces). DVPEN01-SL can be the master of Modbus TCP, sending out Modbus TCP instructions and controlling the peripheral equipment. In addition, under MDI/MDI-X auto-detection, it does not need to use a crossing cable.

   - Auto-detects 10/100 Mbps transmission speed
   - MDI/MDI-X auto-detection
   - Supports Modbus TCP protocol (at the same time supports Master and Slave mode)
   - Able to send out E-mails
   - Auto-corrects the RTC in a PLC through the Internet time correction function
   - Supports point-to-point data exchange (Max. data exchange length: 200 bytes)

2. Specifications

   ■ Internet interface

Item	Specifications
Interface	RJ-45 with Auto MDI/MDIX
Number of ports	1 Port
Transmission method	IEEE802.3, IEEE802.3u
Transmission cable	Category 5e
Transmission speed	10/100 Mbps Auto-Defect
Network protocol	ICMP, IP, TCP, UDP, DHCP, SMTP, NTP, MODBUS TCP

   ■ Serial communication interface

Item	Specifications
Interface	RS-232
Number of ports	1 Port
Transmission cable	DVPACAB215/DVPACAB230/DVPACAB2A30/DVPACAB2B10

   ■ Environment

Item	Specifications
Noise immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8K V Air Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line: 2K V, Digital I/O: 1K V, Analog & Communication I/O: 1KV Damped-Oscillatory Wave: Power Line: 1K V, Digital I/O: 1K V RS (IEC 61131-2, IEC 61000-4-3): 26 MHz~1 GHz, 10 V/m
Environment	Operation: 0℃~55℃ (temperature), 50~95% (humidity), Pollution degree 2 Storage: -25℃~70℃ (temperature), 5~95% (humidity)
Vibration/shock resistance	International standard: IEC 61131-2, IEC 68-2-6 (TEST Fc)/IEC 61131-2 & IEC 68-2-27 (TEST Ea)
Certificates	Standards: IEC 61131-2, UL508

   ■ Electrical specifications

Item	Specifications
Power supply voltage	24 V DC (-15%~20%) (Power is supplied by the internal bus of MPU.)
Power consumption	1.5 W

Item	Specifications
Insulation voltage	500 V
Weight (g)	92 (g)

1.8 Introduction of DVPCOPM-SL

1. Introduction

   DVPCOPM-SL can be used as the master in CANopen network, as well as the slave for other masters.

   As a master, DVPCOPM-SL features:

   - Complying with CANopen standard protocol DS301v4.02
   - Supporting NMT Master Service
   - Error control: Supporting Heartbeat/Node Guarding Protocol
   - Supporting PDO Service

     Max. 200 RxPDOs and 390 bytes of data

     Max. 200 TxPDOs and 390 bytes of data

     Each slave can be allocated maximum 8 TxPDOs and 8 RxPDOs.
   - PDO transmission type: Supporting event trigger, time trigger, synchronous cycle, and synchronous non-cycle
   - PDO mapping: Every PDO is able to map maximum 32 parameters.

     Type of mapping data supported:

Storage space	Data type
1 bit	BOOL
8 bits	SINT USINT BYTE
16 bits	INT UINT WORD
32 bits	DINT UDINT REAL DWORD
64 bits	LINT ULINT LREAL LWORD

   - Supporting SDO Service

     Number of servers: 0

     Number of users: 3
   - Supporting standard expedited SDO transmission mode
   - Supporting Auto SDO function.

     Able to execute maximum 20 Auto SDOs to each slave
   - Supporting reading/writing of data in slave by using SDO Service in the ladder diagram in PLC
   - Supporting Emergency Protocol:

     Able to store 5 latest Emergency messages for each slave

     Able to indicate Emergency messages in slave from digital display

     Able to read Emergency message through the ladder diagram in PLC
   - SYNC producer; Range: 0~65,535 ms
   - As the interface between Delta CANopenBuilder software and CANopen network

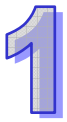
     The software can configure the network directly through DVPCOPM-SL
   - In the auto data exchange with a PLC, the user only has to program the D register mapped in the PLC without applygin FROM/TO instructions. When connected to a PLC, registers after D6000 will be adopted temporarily.

   As a slave, DVPCOPM-SL features:

   - Complying with CANopen standard protocol DS301v4.02
   - Supporting NMT Slave Service
   - Error control: Supporting Heartbeat Protocol
   - Supporting PDO Service: Each slave can be allocated maximum 8 TxPDOs and 8 RxPDOs.
   - PDO transmission type: Supporting event trigger, time trigger, synchronous cycle, synchronous non-cycle
   - Supporting SDO Service

     Number of servers: 1

     Number of users: 0
   - Supporting standard expedited SDO transmission mode



- Supporting Emergency Protocol
  Able to indicate Emergency event in slave through digital display

2. Sepcifications

■ CANopen connection

Item	Specifications
Transmission method	CAN
Electrical isolation	500 V DC
Interface	Removable connector (5.08 mm)
Transmission cable	2 communication cables, 1 shielded cable, and 1 ground cable

■ Communication

Item	Specifications
Message type	PDO, SDO, SYNC (synchronous object), Emergency (Emergency object), NMT
Baud rates	10K bps, 20K bps, 50K bps, 125K bps, 250K bps, 500K bps, 800K bps, 1M bps (bit/second)

■ Electrical specification

Item	Specifications
Power voltage	24 V DC, supplied by internal bus from PLC MPU (-15%~20%)
Power consumption	1.7 W
Isolation voltage	500 V

■ Environment

Item	Specifications
Noise immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8K V Air Discharge, 4K V Contact Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line: 2K V, Digital I/O: 1K V Analog & Communication I/O: 1KV Damped-Oscillatory Wave: Power Line: 1K V, Digital I/O: 1K V RS (IEC 61131-2, IEC 61000-4-3): 80 MHz~1000 MHz , 1.4 GHz~2.0 GHz , 10 V/m
Opeartion	0℃~55℃ (temperature); 50~95% (humidity); pollution degree 2
Storage	-25℃~70℃ (temperature); 5~95% (humidity)
Shock/vibration immunity	International standards: IEC 61131-2, IEC 68-2-6 (TEST Fc)/IEC 61131-2 & IEC 68-2-27 (TEST Ea)
Certificates	IEC 61131-2, UL508

Chapter 2 Setting an HMI

Delta DOP-BN series human machine interfaces are introduced in this chapter. Users can create new projects and set functions by means of DOPSoft. Please refer to DOPSoft User Manual for more information.

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2.1 Introduction of DOP-B07E515

2.1.1 Hardware Specifications

Model		B07E515
LCD module	Display type	7” TFT LCD (65536 colors)
	Resolution	800 x 600 pixels
	Backlight	LED Back Light (less than 10,000 hours half-life at 25°C) (Note 1)
	Display size	141 x 105.75mm
Operation system		Delta Real Time OS
MCU		32-bit RISC Micro-controller
NOR flash ROM		Flash ROM 128 MB (OS System: 30 MB/Backup: 16 MB/User Application: 82 MB)
SDRAM		64M bytes
Backup memory (Bytes)		16M bytes
Sound effect output	Buzzer	Multi-Tone Frequency (2K~4K Hz)/85 dB
	AUX	Stereo output
Ethernet interface		IEEE 802.3, IEEE 802.3u
		10/100 Mbps auto-sensing (has built-in isolated power circuit (Note 3))
Memory card		SD card (supports SDHC)
USB		1 USB Host (Note 2) Ver 1.1/1 USB Slave Ver 2.0
Serial COM port	COM1	RS-232 (supports hardware flow control)
	COM2	RS-232 / RS-485 (has built-in isolated power circuit (Note 3))
	COM3	RS-422 / RS-485 (has built-in isolated power circuit (Note 3))
Function key		N/A
Perpetual calendar		Built-in
Cooling method		Natural air circulation
Safety approval		CE/UL (Note 4)/KCC (Note 4)
Waterproof degree		IP65 / NEMA4
Operation voltage (Note 5)		DC+24 V (-10%~+15%) (has built-in isolated power circuit (Note 3))
Voltage endurance		AC 500 V for 1 minute (between charging (DC 24 V terminal) and FG terminals)
Power consumption (Note 5)		7.68 W
Backup battery		3 V lithium battery CR2032 × 1
Backup battery life		It depends on the temperature used and the conditions of usage, about 3 years or more at 25°C
Operation temperature		0°C~50°C
Storage temperature		-20°C~+60°C
Ambient humidity		10%~90% RH【0~40°C】, 10%~55% RH【41 ~ 50°C】,Pollution degree 2
Vibration		IEC 61131-2 compliant 5 Hz≦f < 8.3 Hz=Continuous: 3.5 mm, 8.3 Hz≦f≦150 Hz=Continuous: 1.0 g
Shock		IEC 60068-2-27compliant 15 g peak for 11 ms duration, X, Y, Z directions for 6 times
Dimensions (W)x(H)x(D) mm		184x144x50

Model	B07E515
Panel cutout (W)x(H)mm	172.4x132.4
Weight	Approx. 800 g

Note1: The half-life of backlight is defined as original luminance being reduced by 50% when the maximum driving current is supplied to HMI. The life of LED backlight shown here is an estimated value under 25oC normal temperature and humidity conditions.

Note2: USB Host port can provide up to 5 V/500 mA of power.

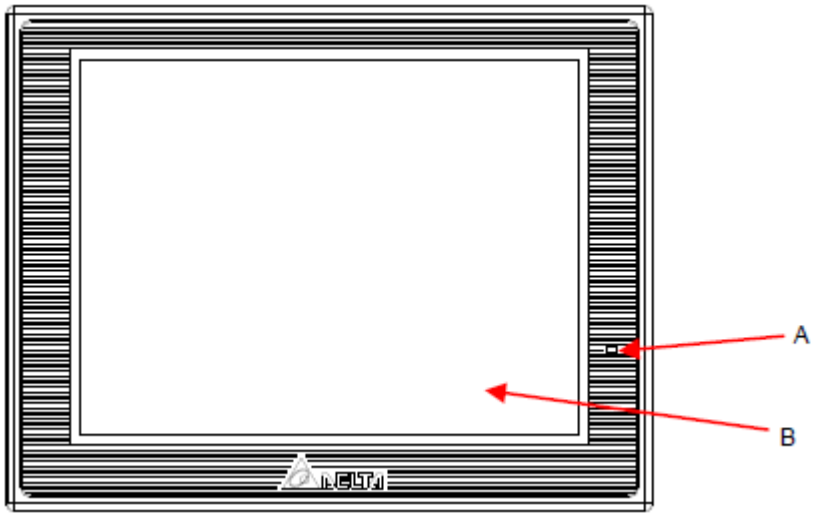
Note3: The withstand voltage of the isolated power circuit is 1500 V peak for 1 minute.

Note4: Some models are in the process of application to UL and KCC. For more information, please consult our distributors.

Note5: The value of the power consumption indicates the electrical power consumed by HMI only without connecting to any peripheral devices. In order to ensure the normal operation, it is recommended to use a power supply which the capacity is 1.5~2 times the value of the power consumption.

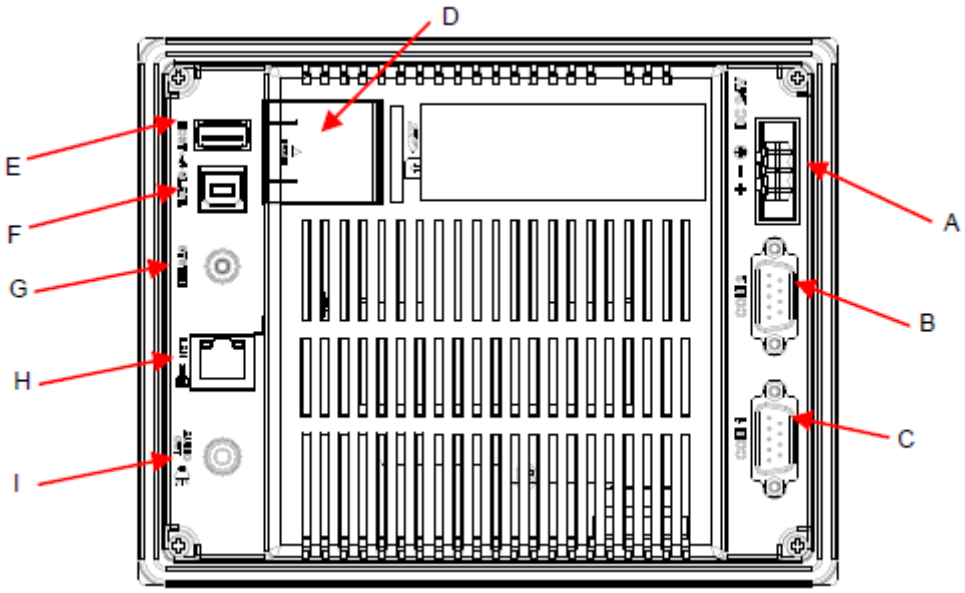
2.1.2 Part Names

- **Front view**



A	Power LED indicator (Lights in green when HMI works normally)
B	Touch screen/Dispaly

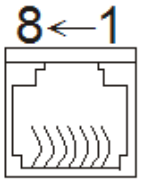
- **Rear view**



A	Power input terminal	**F**	USB Slave
B	COM2 (can be extended to COM3) (Note)	**G**	System key
C	COM1	**H**	Ethernet interface (LAN)
D	Memory card slot/Battery cover	**I**	Audio output interface
E	USB Host	**-**	-
Note: For the setting method, please refer to the pin definition of serial communication.			

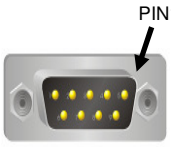
2.1.3 Pin Definition of Serial Communication

- **Ethernet Interface (LAN)**

Ethernet interface (LAN)	Pin	Contact
		Ethernet
	1	TX+
	2	TX-
	3	RX+
	4	
	5	
	6	RX-
	7	
	8	

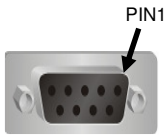
Note: Blank=No connection

- **COM1 port (Supports flow control)**

COM port	Pin	Contact
		RS-232
	1	
	2	RXD
	3	TXD
	4	
	5	GND
	6	
	7	RTS
	8	CTS
	9	

Note: Blank=No connection

- **COM2 and COM3 port**

COM port	Pin	MODE 1		MODE 2		MODE 3	
		COM2	COM3	COM2	COM3	COM2	COM3
		RS-232	RS-485	RS-485	RS-485	RS-232	RS-422
	1			D+			TXD+
	2	RXD				RXD	
	3	TXD				TXD	
	4		D+		D+		RXD+
	5	GND		GND		GND	
	6			D-			TXD-
	7						
	8						
	9		D-		D-		RXD-

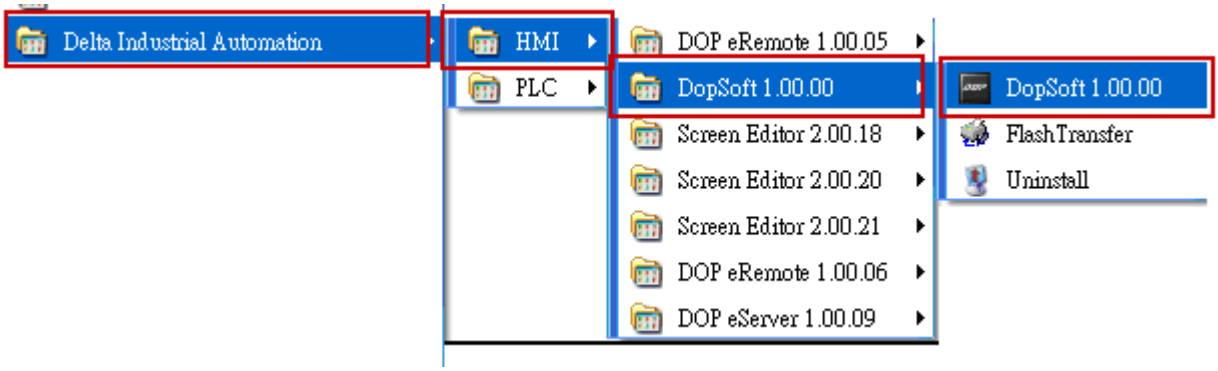
Note 1: Blank=No connection

Note 2: B07E515 series models do not support RS-422 flow control function.

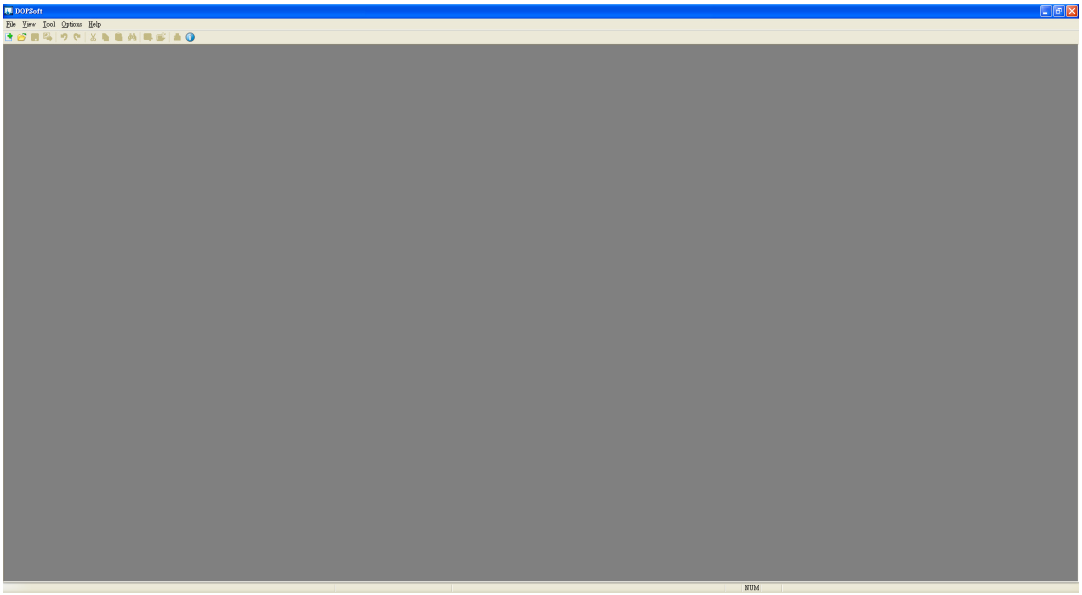
2.2 Introduction of DOPSoft

2.2.1 Executing DOPSoft

Click 【Start】→【All Programs】→【Delta Industrial Automation】→【HMI】→【DOPSoft 1.00.00】→【DOPSoft 1.00.00】to execute DOPSoft.

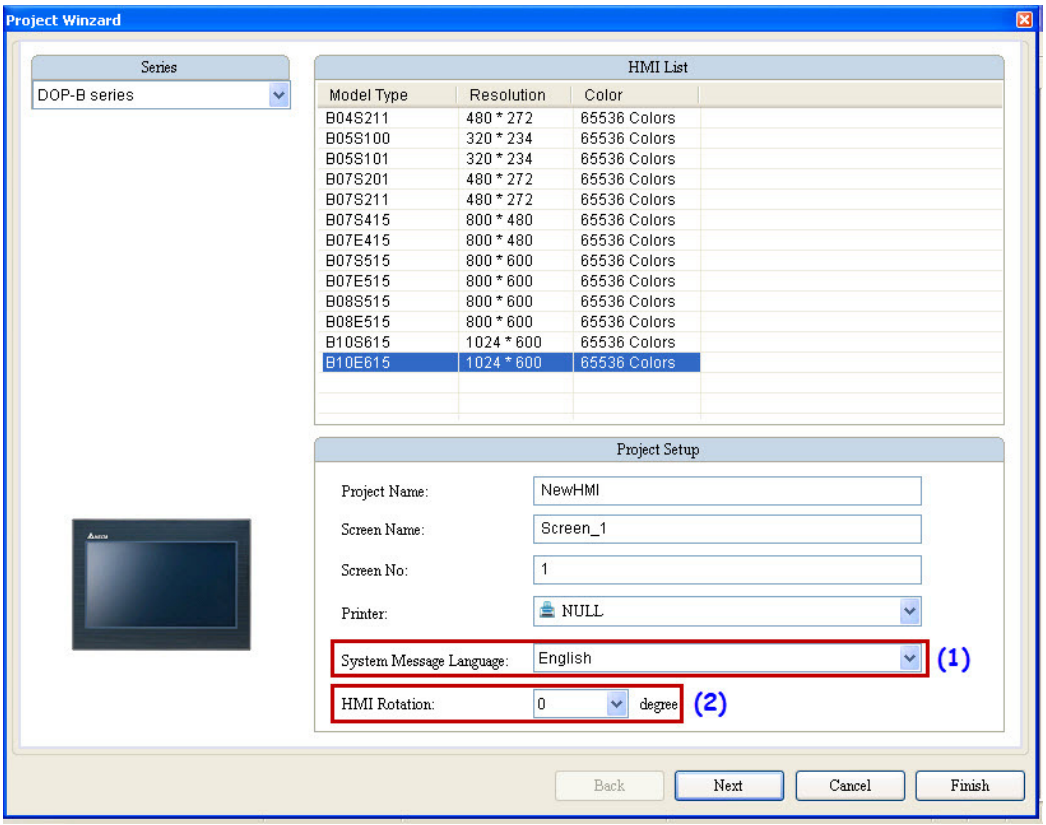


Once the software is executed, a screen with not new project will show up, as shown below.



2.2.2 Adding New Projects

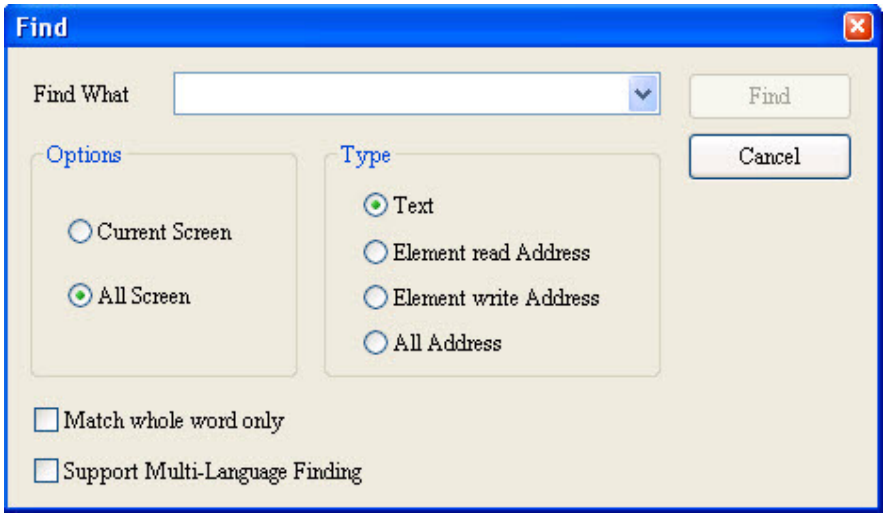
Please click  or use the system-defined hotkey 【Ctrl+N】 to add a new project. The Configuration Wizard of DOPSoft will pop up, which allow the user to select the model number of HMI unit or printer and edit project and screen names. Upon completion of the basic configuration of the project, please click 【Next】 to configure the communication protocol.



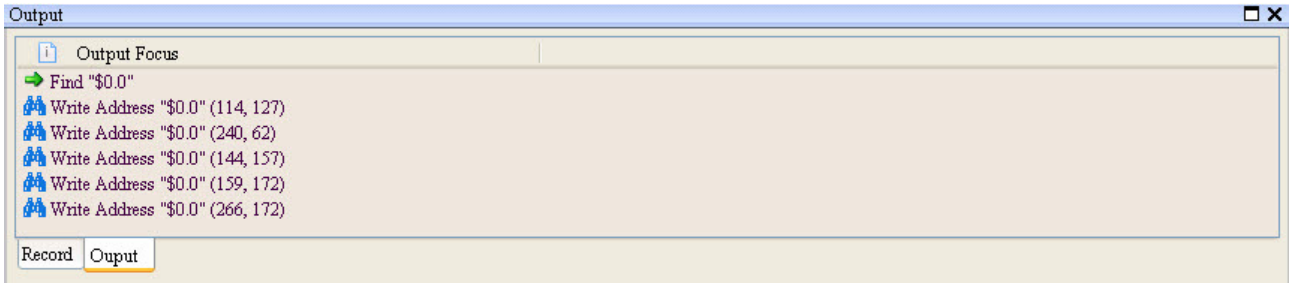
No.	Item to note	Description
(1)	System message language	English, Traditional Chinese, and Simplified Chinese are available for selection as the language of system index.
(2)	HMI rotation	Select the degree for HMI rotation to be 0 degrees, 90 degrees, 180 degrees, and 270 degrees.

2.2.3 Find

To find the designated texts and addresses, one can click 【Edit】→【Find】 or use the hotkey CTRL+F provided by the system. This function can enable the user to quickly find the results. Once the Find function is clicked, please first enter the content to find, followed by choosing to search the current screen or All Screen in the find selections. The find type can be used to find the text, read address, write Address, or all address of the element, as shown below



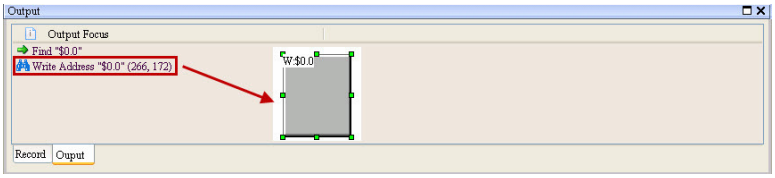
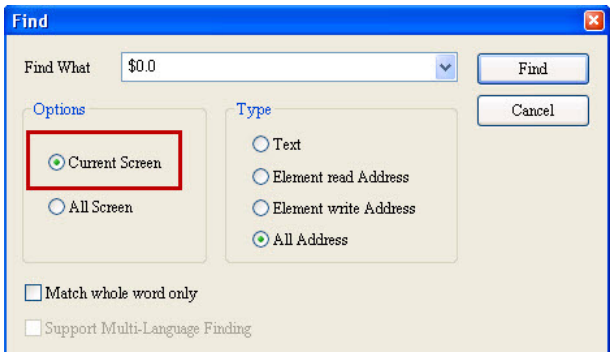
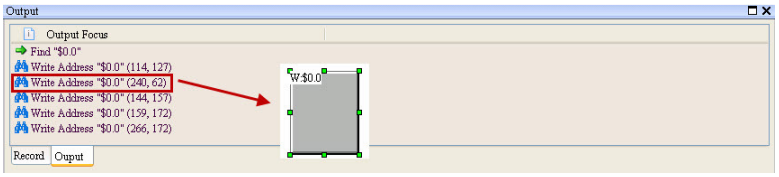
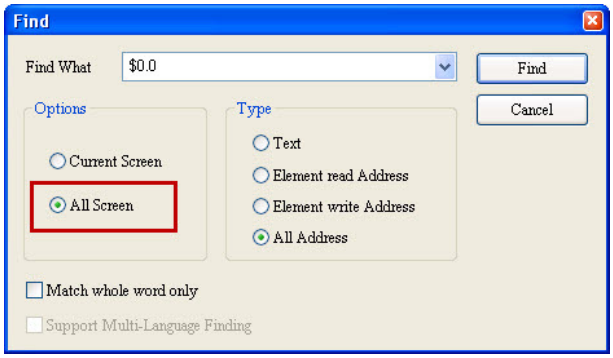
Once the method of finding is verified, click “Find” and the system will start searching for the content that matches the entry. Once the matched content is located, the associated element will be output to the options in the output field. When once clicks the options in the output field, the cursor will automatically lock in this particular element, as shown below.



The detailed configuration screen of the Find function will be described below.

Find

《Table 2.3.1 Description of Find Function》

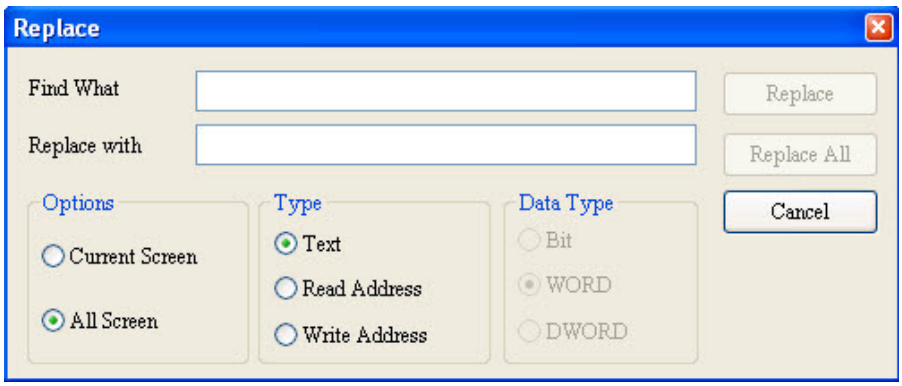
Find What	Enter the data content to find.	
Options	Current screen	The finding is limited to the screen currently being edited. All devices in the current screen will be compared and those that match the find content will be displayed in the window of the output field. The users can double-click in the “Output” to find the devices that are found.  
	All screen	The finding will cover all the screen and compare all elements in all the screen. Those that match the find content will be displayed in the window of output field. Similarly, the user can double-click in the “Output” to find the elements that are found.  

Find 《Table 2.3.1 Description of Find Function》		
Type	Text	Compare the text entered by element
	Element read address	Compare the read address of element
	Element write address	Compare the write address of element
	All address	Compare the read and write addresses of element
Checkbox	Match whole word only	All entered finding contents will be compared. If unchecked, it is a match if part of the entered contents is found. On the contrary, if checked, it is only a match when all entered contents match.
	Support multi-languag e finding	Only effective when the finding type is text. If unchecked, the matching is done by only finding texts in the current language. On the contrary, if checked, the matching will not be limited to the current language while all languages will be compared.

2.2.4 Replace

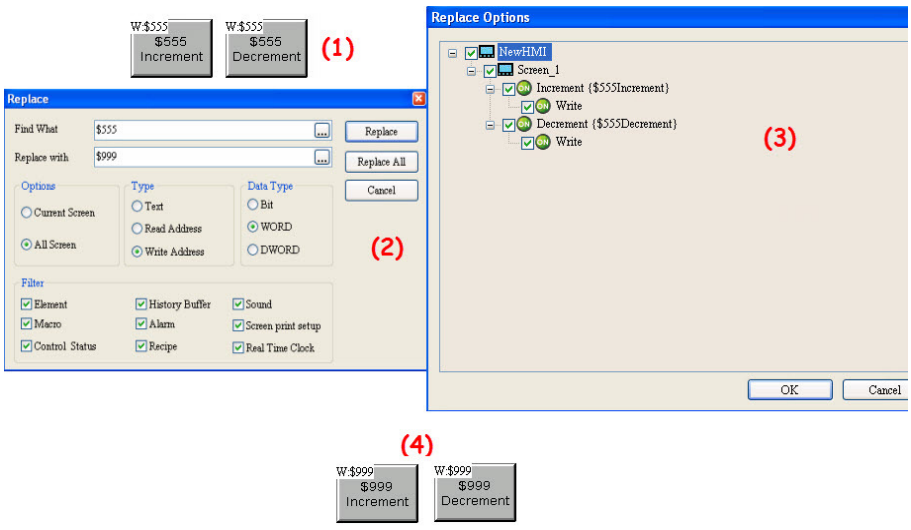
1. Replacing a text or an address

   To replace a certain designated text or address, one can use 【Edit】→【Replace】or use the hotkey CTRL+R provided by the system. Enter the content of Find What, followed by choosing Current Screen or All Screen in Options. The replacement type can be Text, Read Address, or Write Address. The item for the Data Type is only available when the replacement type is Read Address or Write Address, with options of Bit, WORD, or DWORD, as shown below.



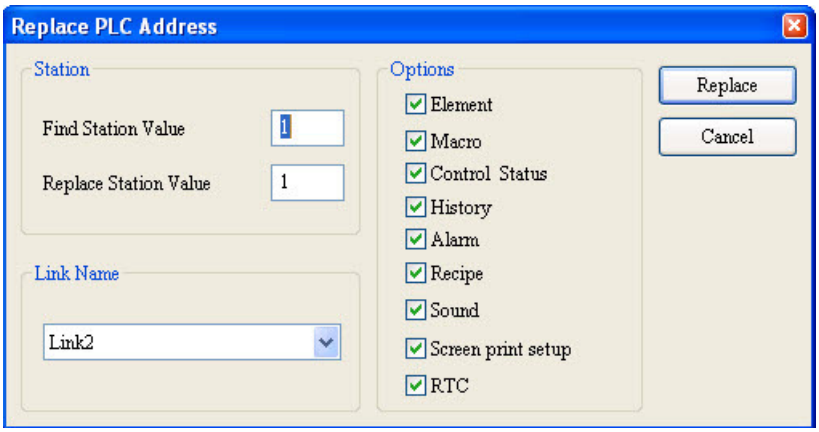
The detailed configuration screen of the replacing function will be described below.

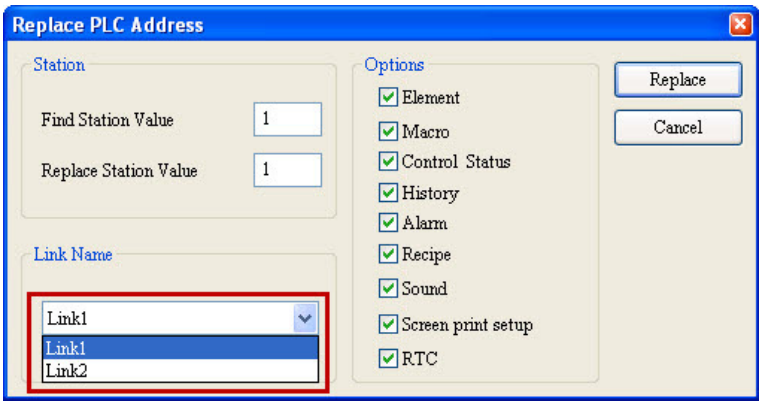
Replace 《Table 2.4-1 Example of Replace》		
Find What	Enter the data content to find	
Replacement Content	Enter the data content to replace	
Options	Current screen	The search is only limited to the screen currently being edited and all elements in this screen will be compared. Those that match the search conditions will be substituted by order.
	All screen	The search will cover all the screen and compare all elements therein. Those that match the search conditions will be substituted by order.

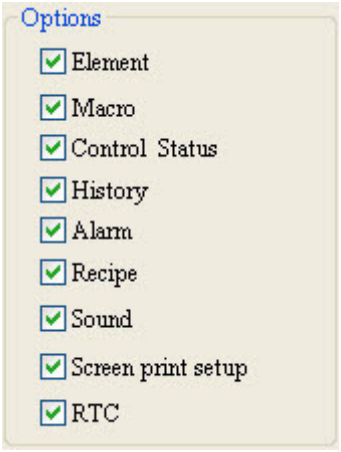
<table>
<tr><th colspan="3">Replace
《Table 2.4-1 Example of Replace》</th></tr>
<tr><td rowspan="3">Replacement Type</td><td>Text</td><td>Replace those with matched text after search</td></tr>
<tr><td>Read address</td><td>Replace those with matched Read Address after search</td></tr>
<tr><td>Write address</td><td>Replace those with matched Write Address after search</td></tr>
<tr><td rowspan="3">Data Type</td><td>Bit</td><td rowspan="3">The data type is only effective when the replacement type is “Read Address” or “Write Address”, with available options of “Bit”, “WORD”, or “DWORD”.
Selection of “Bit”, “WORD”, or “DWORD” is determined by the format of the data type of the elements being searched.</td></tr>
<tr><td>WORD</td></tr>
<tr><td>DWORD</td></tr>
<tr><td>Filtering Condition</td><td colspan="2">The filtering condition is only enabled when the replacement type is “Read Address” or “Write Address”, with available options of “Element”, “Macro”, “Control State”, “History Buffer”, “Alarm”, “Recipe”, “Sound”, and “Screen print setup”.</td></tr>
<tr><td>Example</td><td colspan="2">(1) Set the write address for the add and minus buttons to be $555.
(2) Execute the replacement function and enter the find content of 【$555】 and replacement content of【$999】. Since the address of the add and minus buttons are set to be the memory to write in, the replacement type is therefore selected to be 【Write Address】. When the data type of the add and minus buttons is Word, 【Word】must be selected.
(3) Upon configuration, click【Replace All】to show the screen with No. (3).
(4) Click 【Yes】 in screen No. (3) and the $555 of the add and minus buttons will be changed to $999.
 
</td></tr>
</table>

2. Replacing a station

To replace the PLC address, one can directly click 【Edit】→【Station Replace】. This function allows the user to quickly obtain the station number, replace it with the new number, and select the link name and the associated replacement type. If there are multiple links in the project file, one can also select other link names and replace the corresponding station numbers. ◦



Replace PLC Address 《Table 2.4.2 Example of Replacing PLC Address》	
Find Station Value	Enter the data content to be found
Replace Station Value	Enter the data content that replaces the existing data
Link Name	The Link Name for replacement can be determined based on the Base Port created by the user, as shown in the figure below. 
Replacement Type	There are eight categories in the replacement type available for the user to select from, which are listed in the figure below.

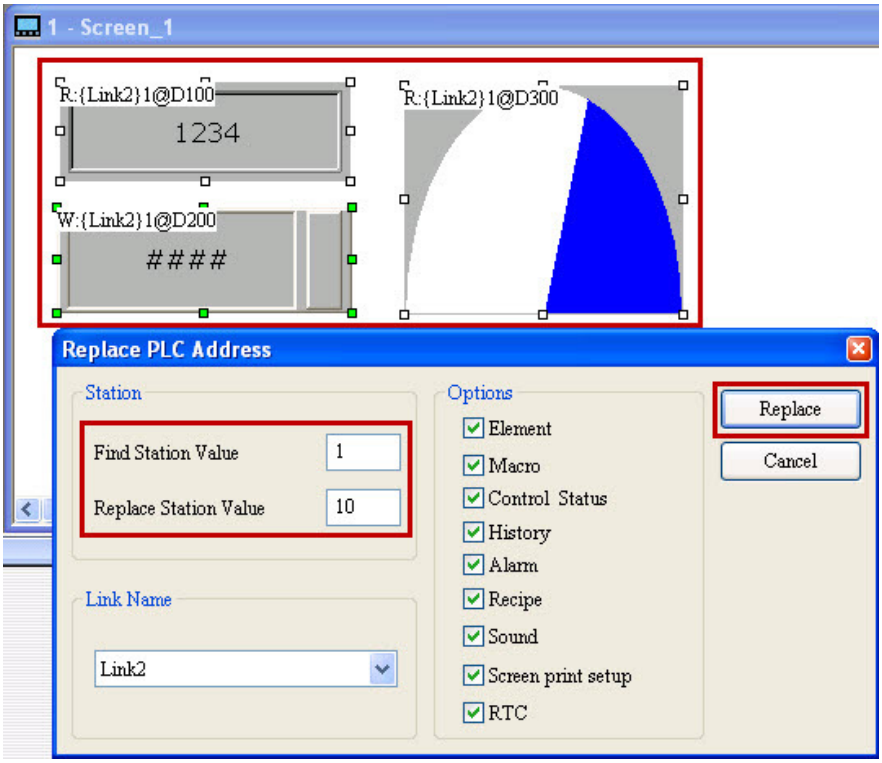
Replace PLC Address 《Table 2.4.2 Example of Replacing PLC Address》	
	

Replace PLC Address

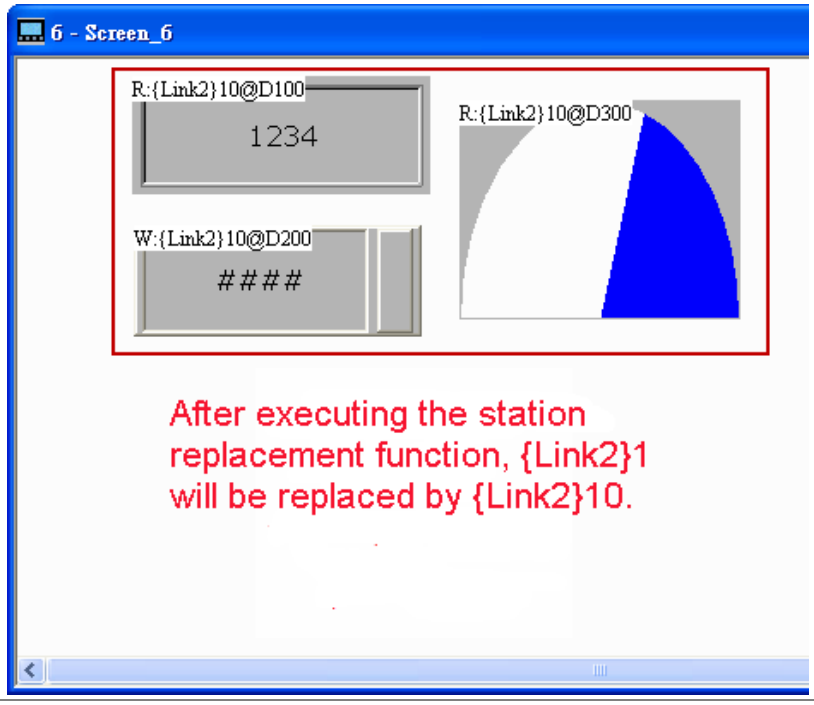
《Table 2.4.2 Example of Replacing PLC Address》

Example

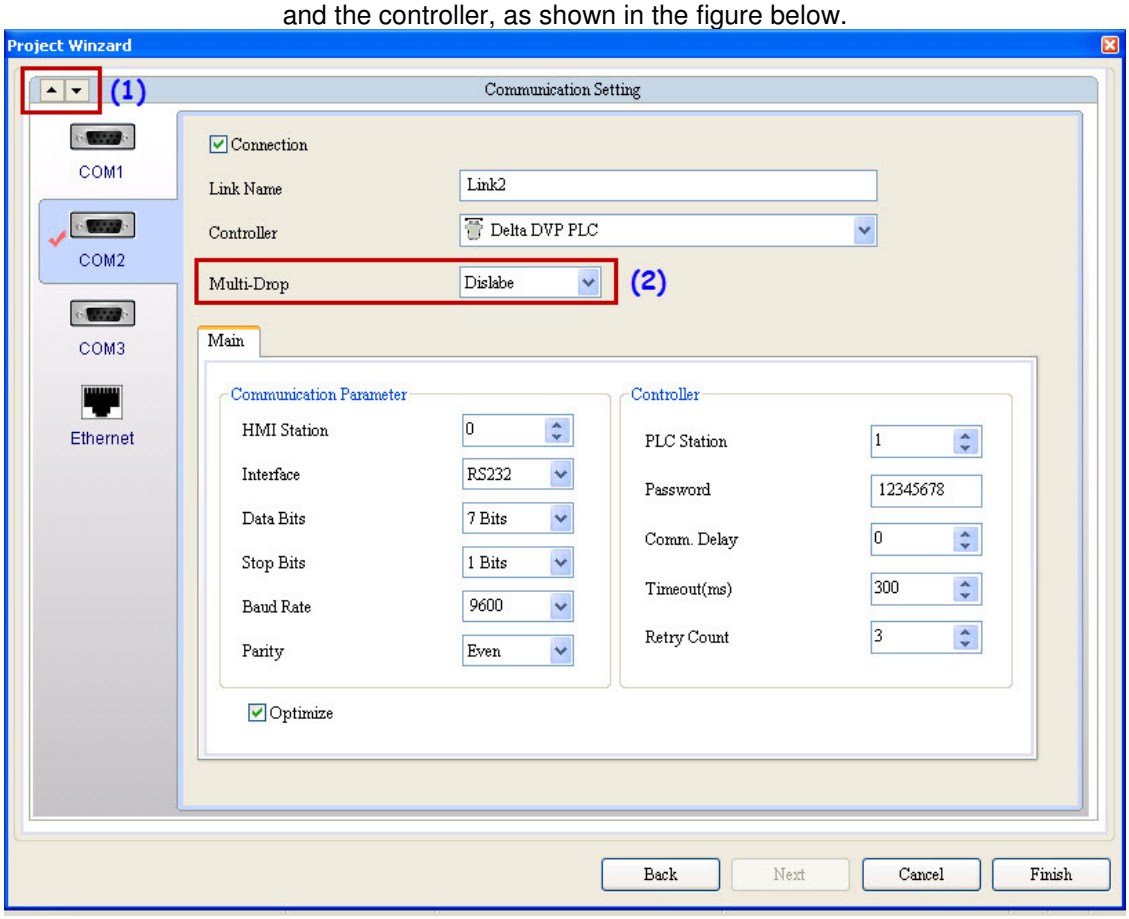
- **Before station number replacement**



- **After station number replacement**

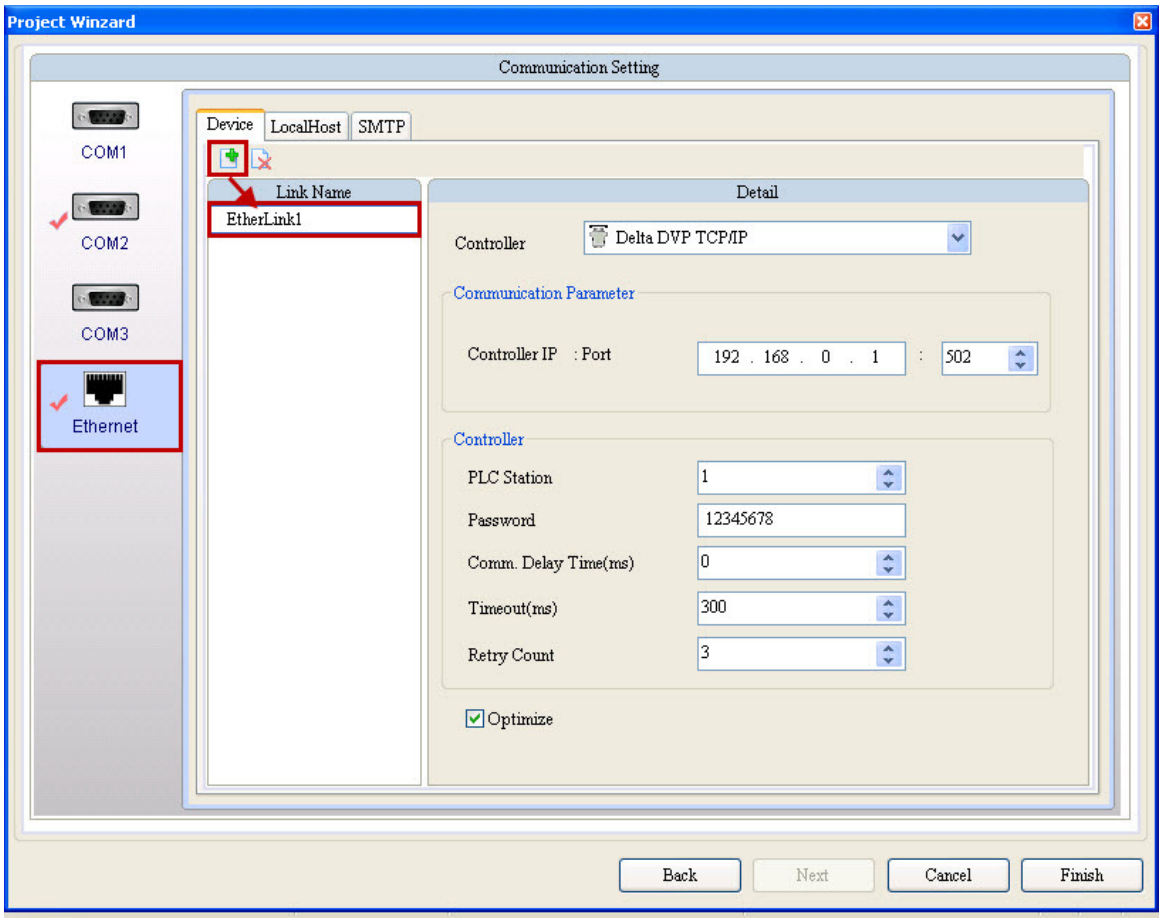


Regarding the communication setting, the user can set the model number of the controller, select COM Port or Ethernet as the communication port, and communication parameter between the HMI and the controller, as shown in the figure below.

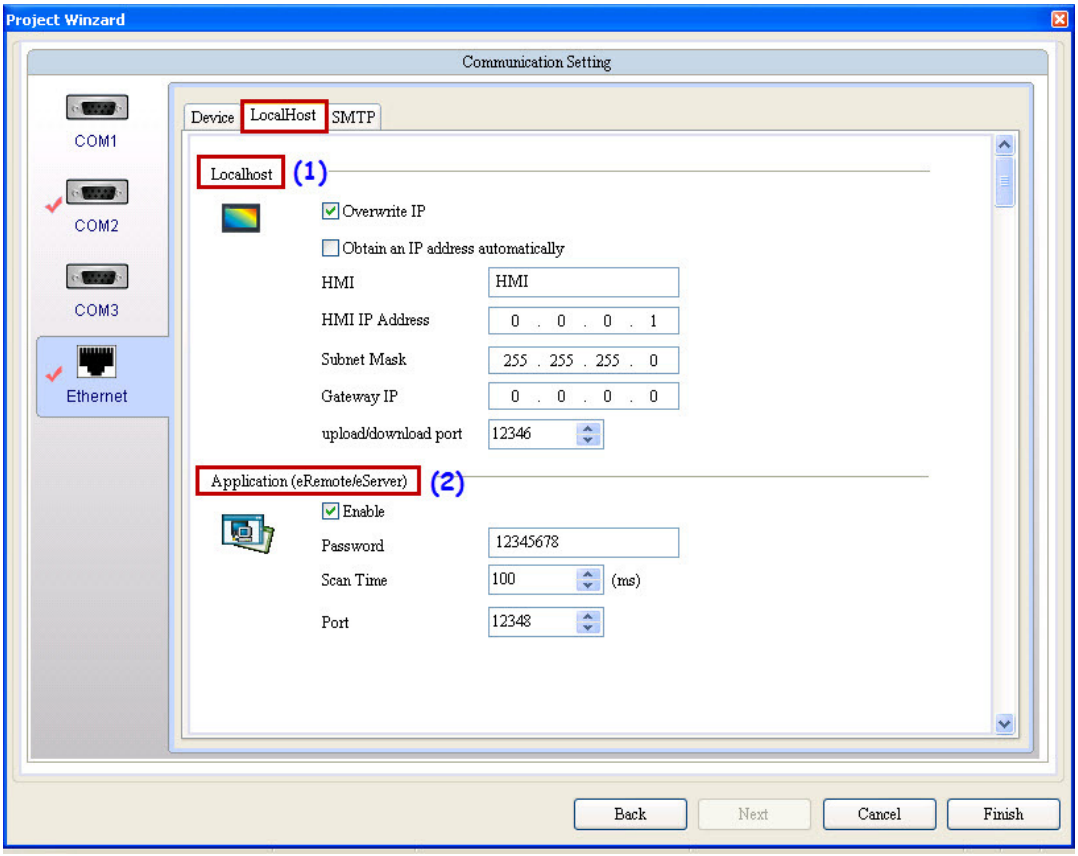


Tag	Item to Note	Description
(1)	Up and down arrows	The user can use the up and down small arrows to switch between COM port 1, COM port 2, and COM port 3.
(2)	Multi-drop	To run the system in multi-drop mode, one only needs to open the multi-drop mode by selecting “Host” or “Client” in “Multi-Drop”. Select “Disable” to turn off the multi-drop communication.

If the communication is through Ethernet, Please directly click the 【Ethernet】 icon to enter the configuration of network controller. Click  in the 【Device】 page to add a new Ethernet Link, configure parameters such as the model number of the associated controller, controller IP address, communication delay time, timeout, and retry count, as shown in the figure below.



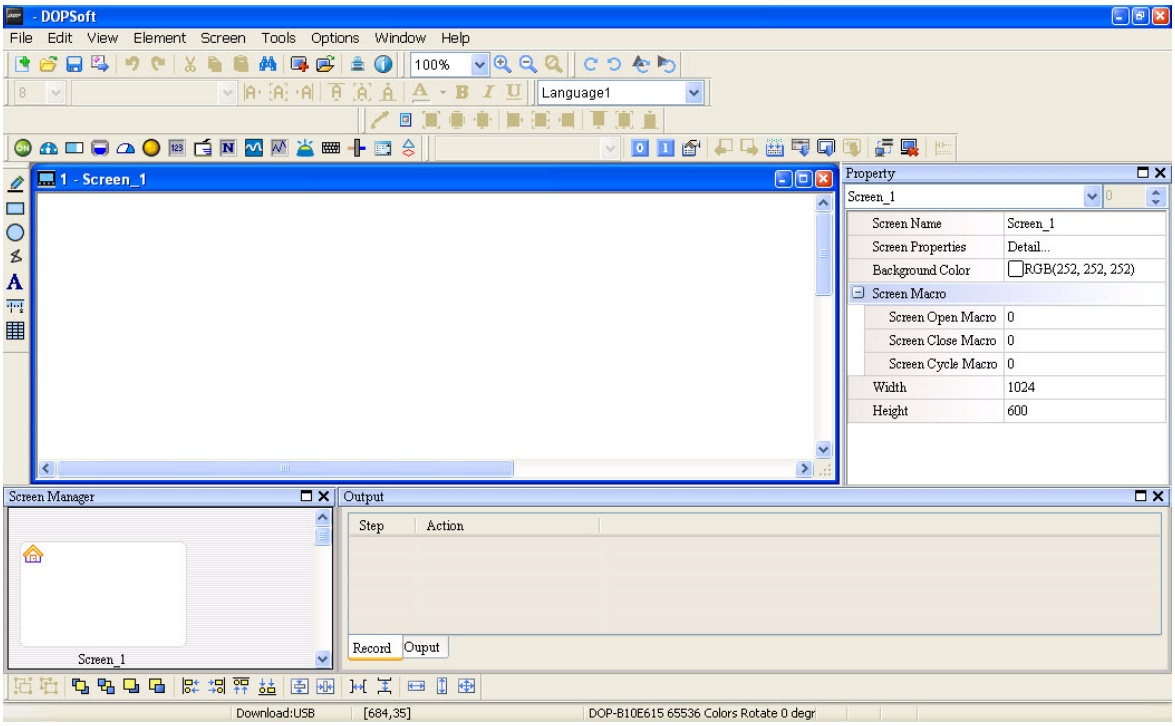
One can also switch to the 【Local Host】 page to configure the IP address and enable network applications for the local host of the HMI, as shown in the figure below.



Tag	Item to Note	Description
(1)	HMI local host	The HMI local host indicates the IP address of the HMI. The IP address can be manually configured or automatically acquired. ➢ Uncheck 【Overwrite IP】. When this option is unchecked, the HMI will use the default IP address 0.0.0.0. If the user chooses not to write in the IP from the software, he/she can still change the IP address through the system screen 【System Setting】→【Network】. ➢ Check 【Overwrite IP】. If this option is checked, it indicates the IP address is to be changed from the software end. As a result, the user can configure the parameters such as the IP address to write in and name of the HMI unit. ➢ Check【Overwrite IP】 and 【Obtain an IP address automatically】. If both options are checked, it indicates that the HMI will acquire the IP address by DHCP mode. The user can learn about the current IP address by entering the system screen through 【System Setting】→【Network】.

Tag	Item to Note	Description
(2)	Application	Network application means that the HMI can be combined with the eRemote and eServer software for applications. If the user wants to execute the eServer or eRemote software, he/she must first check “enable” in DOPSoft to activate the eServer and eRemote functions in the HMI. The associated link password and communication port also need to be configured.

Upon the completion of all configurations, please click 【Finish】 to open the project editing page in DOPSoft.



2.2.5 Numeric Display

123	Numeric display

The numeric display reads the value content of the memory address and displays the value on the element. The data display also displays the state response values of other elements, such as “0” or “1”.

Example of a Numeric Display

《Table 2.5.1 Example of a Numeric Display》

Read memory address

Numeric Display Element		Numeric Entry Element	
Read memory address	$555	Write memory address	$555

Properties

Numeric Display Element			
Data type	**Data Format**	**Integer Digit**	**Decimal Place**
Word	Unsigned decimal	4	0

Execution results

- After creating elements, run “Compile” and download them to the HMI. Next, input “100” in the numeric entry element, and the numeric entry in Numeric Entry will be displayed in the numeric display element.

Input value “100” and write to the chosen address ($555)

The numeric display supports two data types:【Word】and【Double Word】. The valid range of the numeric display is as shown in the table below.

Numeric Display

《Table 2.5.2 Valid Range of the Numeric Display》

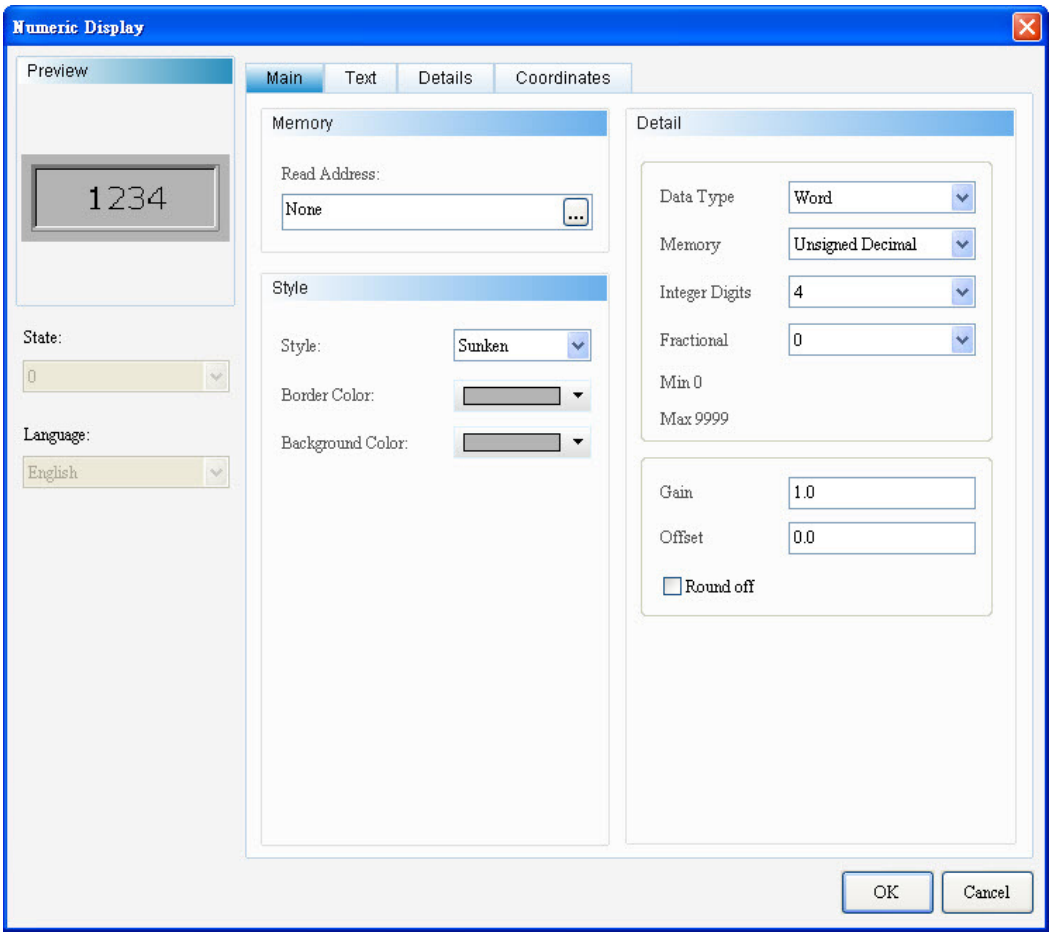
Word

Data Format	Valid Range of the Numeric Display
BCD	0~9999
Signed BCD	-999~9999
Signed decimal	-3278~32767
Unsigned decimal	0~65535
Hex	0~0xFFFF
Binary	0~0xFFFF

Double word

Data Format	Valid Range of the Numeric Display
BCD	0~99999999
Signed BCD	-9999999~99999999
Signed decimal	-2147483648~2147483647
Unsigned decimal	0~4294697295
Hex	0~0xFFFFFFFF
Binary	0~0xFFFFFFFF
Floating	0~9999999

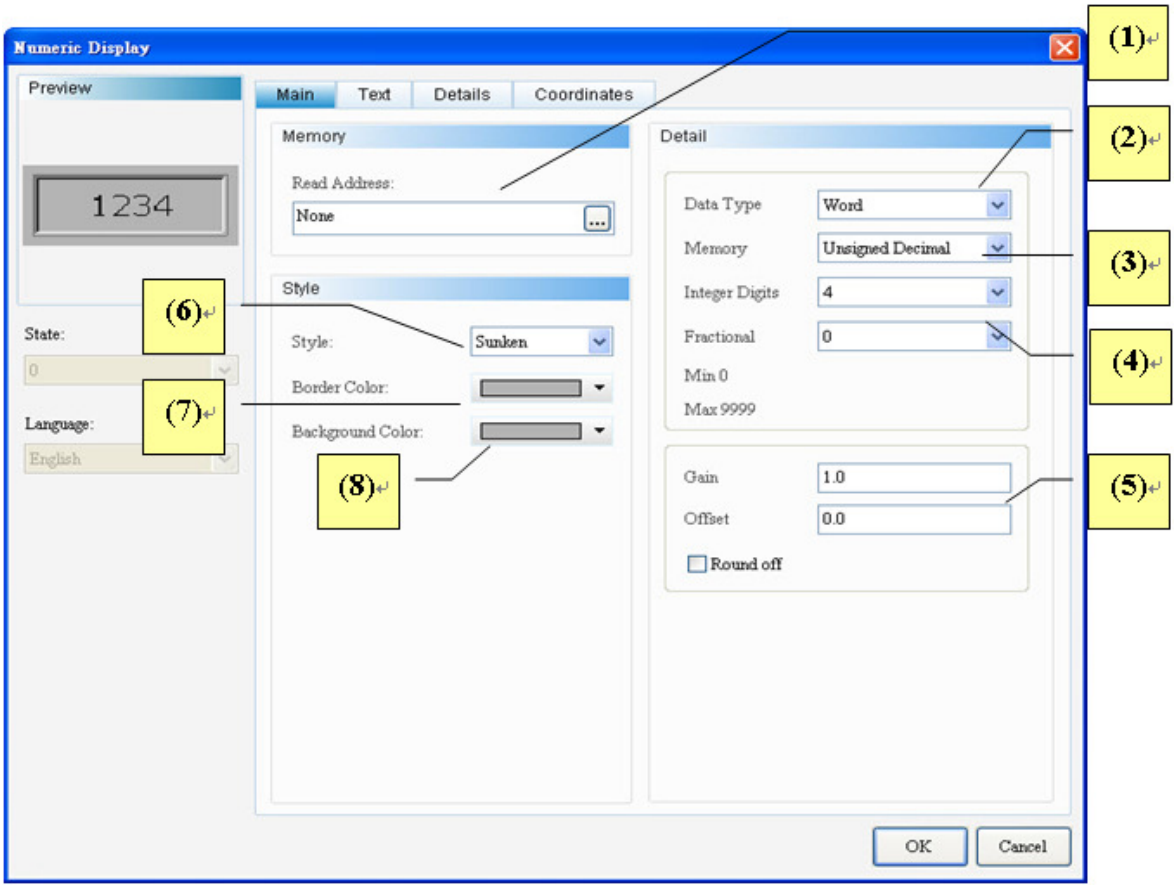
Double-click “Numeric Display” to call out the Numeric Display properties screen as shown below.



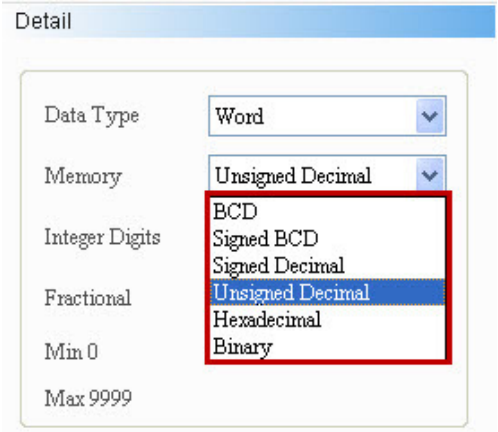
Numeric Display	
Function Page	**Content Description**
Preview	The numeric display element does not support multistate and multilingual data display.
General	Sets the read memory address, element type, element background color, and element border color Sets the data type, data format, integer digit, decimal place, gain, and offset
Text	Sets the font type, font size, font color, alignment, and content of the text to be displayed.
Advanced	Pads left zero
Position	Sets the X-Y coordinate, width, and height of elements

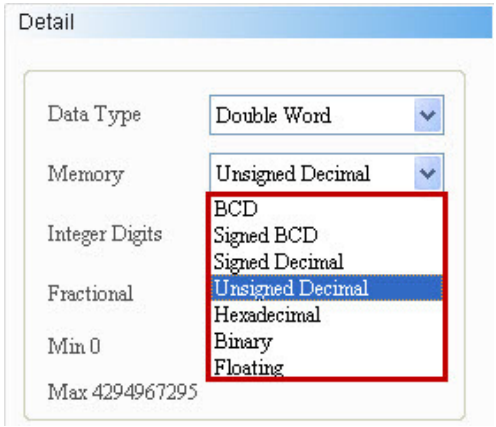
- General

  Numeric Display—Element general properties page

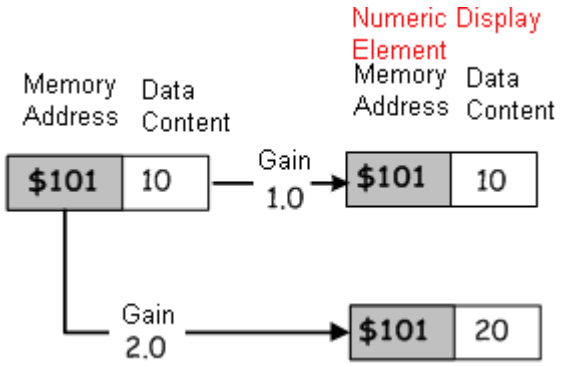
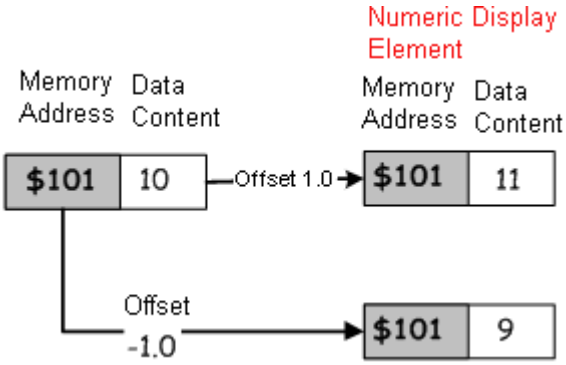
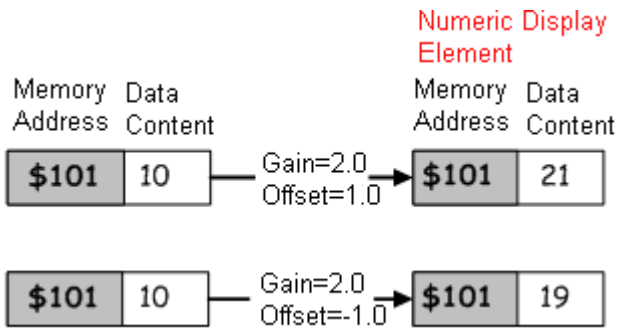


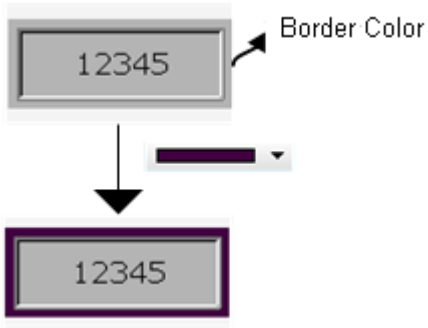
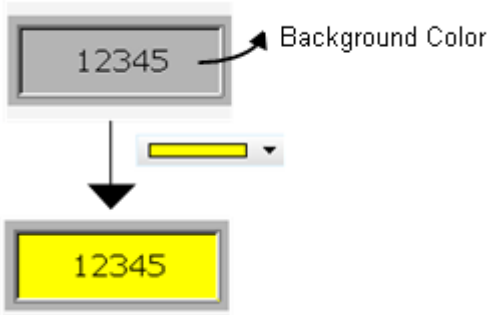
No.	Property	Function
(1)	Read memory address	➢ Selects the address of the internal memory or controller register ➢ The user can select a link name or element type. Please refer to section 5-1 in DOPSoft User Manual for more information.
(2)	Data type	➢ Two options: “Word” and “Double Word” Please refer to table 2.5.2 for more information.

<table>
<tr><th>No.</th><th>Property</th><th>Function</th></tr>
<tr><td>(3)</td><td>Data format</td><td>
➢ If the data type is “Word”, the data formats are as follows.


➢ If the data type is “Double Word”, the data formats are as follows.


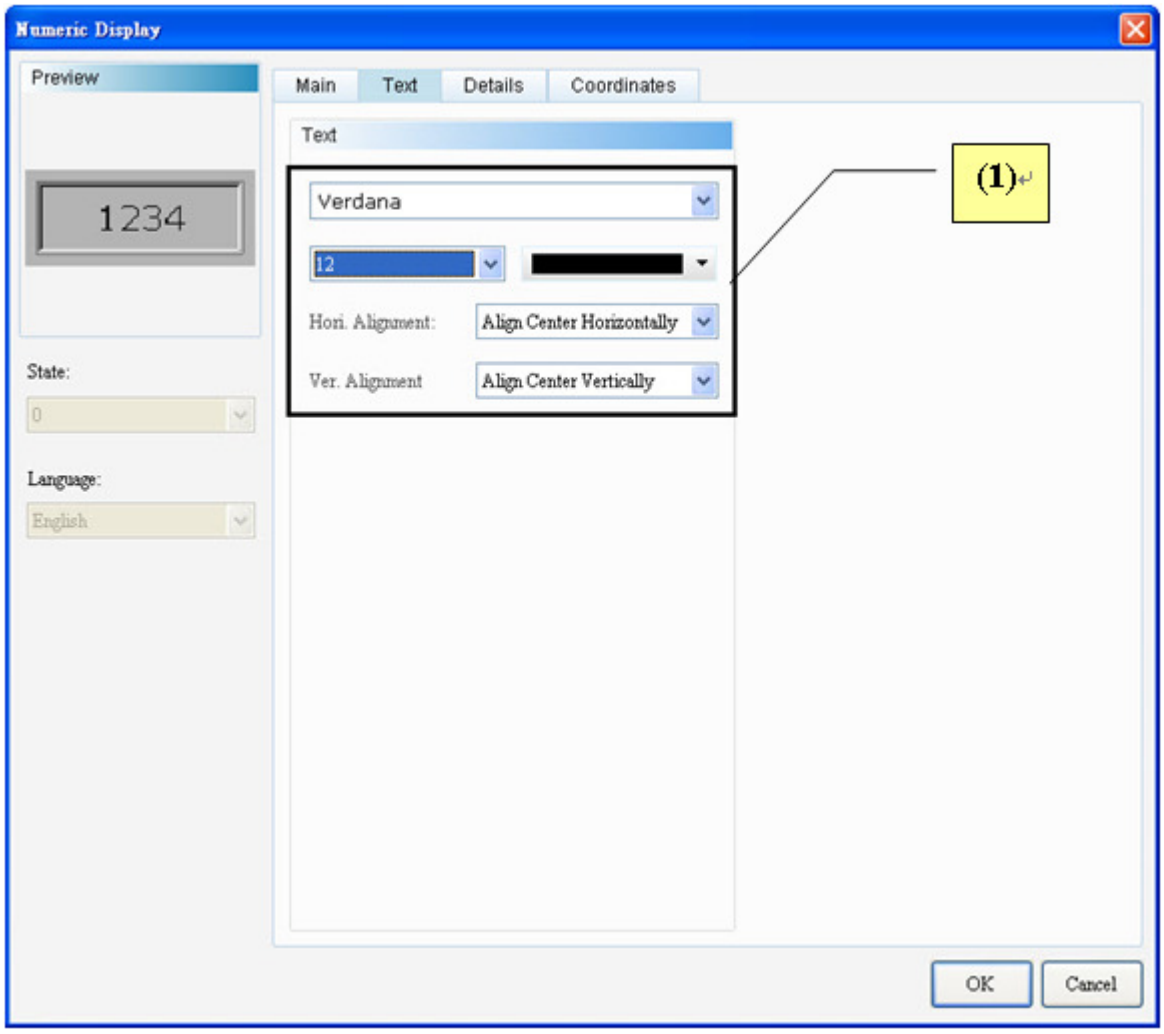
</td></tr>
<tr><td>(4)</td><td>Integer digit
Decimal place</td><td>
➢ Defines the digit of integers and the place of decimals
➢ Instead of true decimal places, the decimal place here means the display format. True decimal places can only be defined from this item after selecting “Floating” in the data format.
</td></tr>
<tr><td>(5)</td><td>Gain
Offset</td><td>
➢ Equation for calculating the gain and offset: y=(a) x+(b) ◦
<table>
<tr><th>y</th><th>a</th><th>x</th><th>b</th></tr>
<tr><td>Element numeric display</td><td>Gain value</td><td>Register actual value</td><td>Offset value</td></tr>
</table>
</td></tr>
</table>

No.	Property	Function
	Gain Offset	➢ The numeric display element will multiply the actual value in the register by the gain value before displaying the product on the HMI screen. The default gain is “1.0”. If the gain is “2.0”, the numeric displayed in the element is “20” when the register actual value is “10”.  ➢ The numeric display element will add the offset value to the register actual value before displaying the sum on the HMI screen. The default offset is “0.0”. If offset is “1.0”, the numeric displayed in the element is “11” when the register actual value is “10”. By contrast, if the offset is “-1.0” the numeric displayed in the element is “9”when the register actual value is “10”.  ➢ The following examples show 【Gain=2.0/Offset=1.0】 and 【Gain=2.0/Offset=-1.0】.  ➢ After selecting “Round off before Display”, values will be rounded off before displaying on the numeric display element.

<table>
<tr><th>No.</th><th>Property</th><th>Function</th></tr>
<tr><td>(6)</td><td>Element type</td><td>➢ There are four element types, including “Standard”, “Raised”, “Sunken”, and “Transparent”. Users can change the element appearance.
<table>
<tr><th>Standard</th><th>Raised</th><th>Sunken</th><th>Transparent</th></tr>
<tr><td>12345</td><td>12345</td><td>12345</td><td>12345</td></tr>
</table></td></tr>
<tr><td>(7)</td><td>Border color</td><td>➢ Sets element border color
➢ If the element type is “Transparent”, the border color is disabled.
 
</td></tr>
<tr><td>(8)</td><td>Element background color</td><td>➢ Sets element background color
➢ If the element type is “Transparent”, the background color is disabled.
 
</td></tr>
</table>

- Text

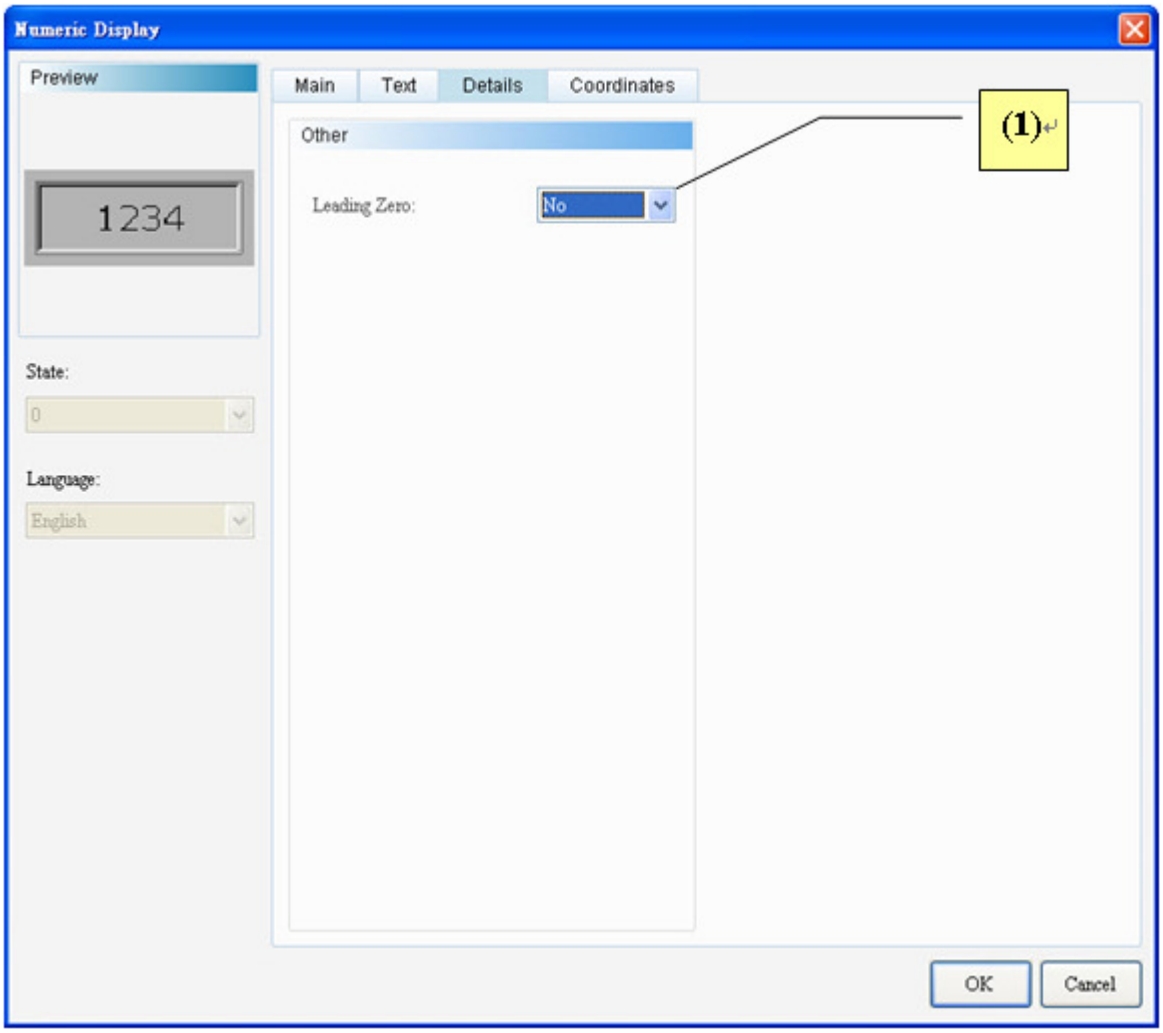
  Numeric Display–Element text properties page



No.	Property	Function
(1)	Text properties	➢ Sets text properties, including font type, font size, font color, and text alignment

- Advanced

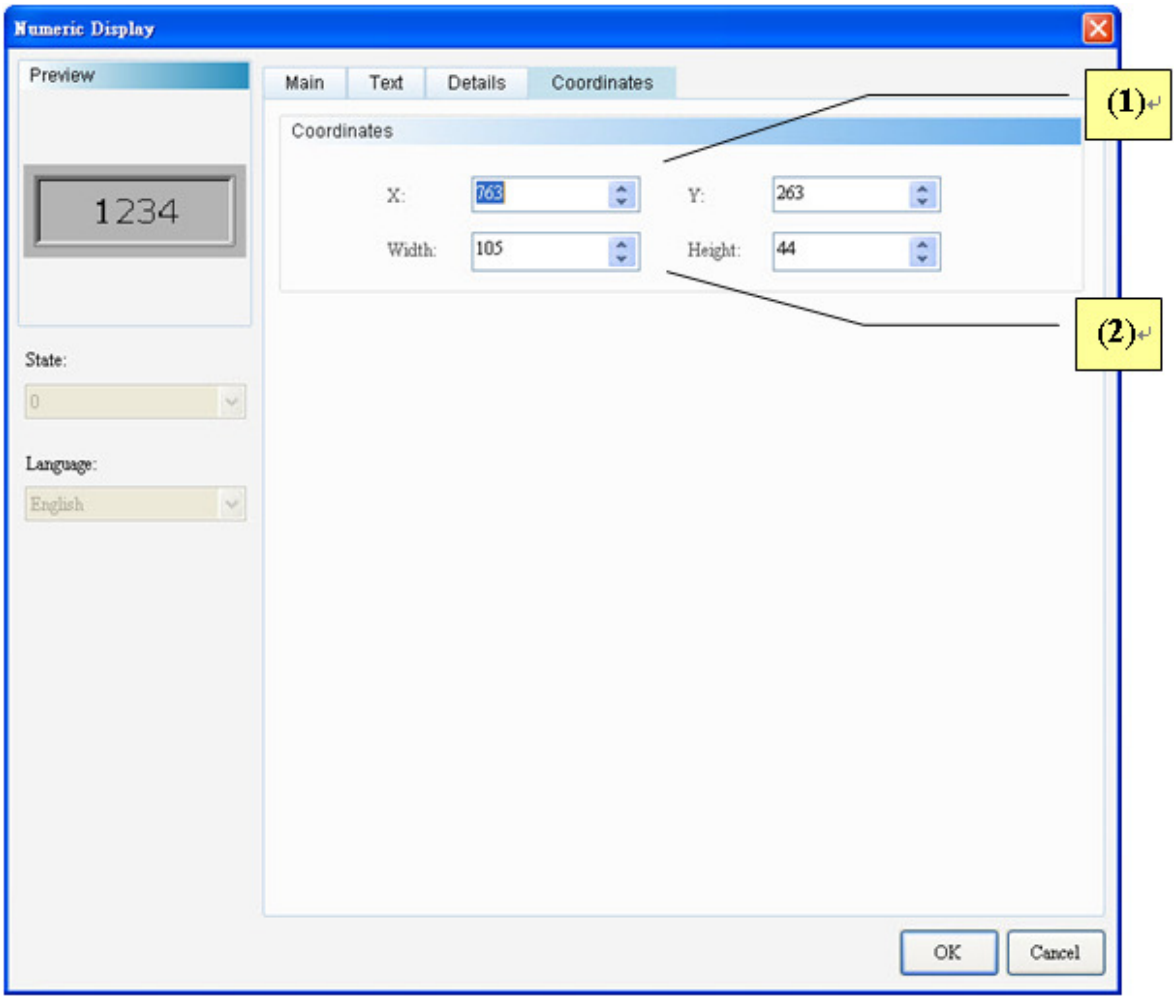
  Numeric Display–Element text properties page



No.	Property	Function
①	Leading zero	➢ Leading zero is determined according to the number of digits of an integer as shown in the example below. 5 integer digits ☑ Leading Zero ☐ Leading Zero 00050 50

- Position

  Numeric Display–Element position properties page



No.	Property	Function
(1)	X-value and Y-value	➢ Sets the upper left X-coordinate and Y-coordinate of elements
(2)	Width and height	➢ Sets the element width and height

2.2.6 State Graphic

	State graphic

Users can create various state pictures in the state graphic to read state data from the selected address, in order to display the selected state pictures on the HMI.
Examples of the three applications are described below. The table below shows “Auto Picture Change” is “No”.

Example of the State Graphic

《Table 2.5.3 Example of the State Graphic》

Read address

State Graphic Element		Numeric Entry Element	
Read address	$326	Write address	$326

Picture

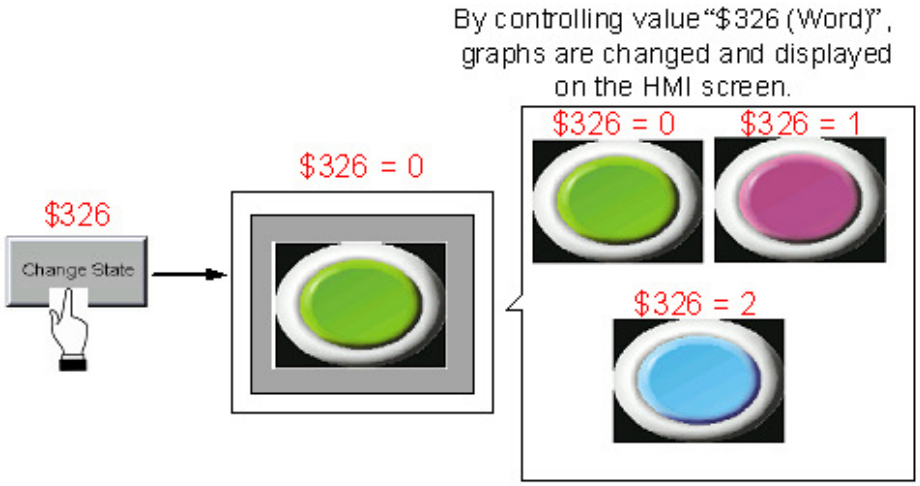
Set the State Graphic		
State 0	State 1	State 2

Properties

State Graphic Element			
Data Type	Data Format	State Counts	Auto Picture Change
Word	Unsigned decimal	3	No

Execution results

➢ After creating the element, run “Compile” and download it to the HMI. Next, input a value in the numeric entry element. Then, the state graphic will display the state pictures corresponding to the input value.



The table below shows “Auto Graph Change” is “Yes”.

Example of the State Graphic

《Table 2.5.4 Example of the State Graphic》

Read address

State Graphic Element		Numeric Entry Element	
Read address	$326	Write address	$326

Picture

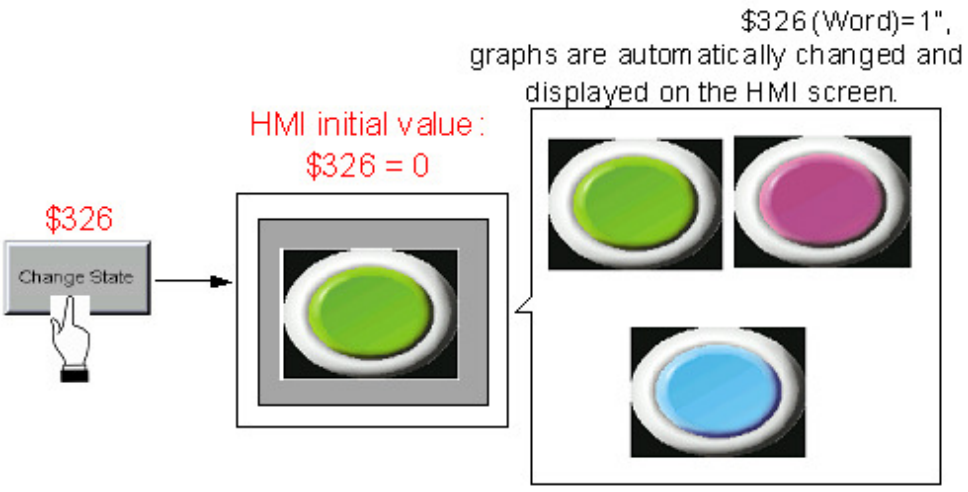
Set the State Graphic		
State 0	**State 1**	**State 2**

Properties

State Graphic Element			
Data Type	**Data Format**	**State Counts**	**Auto Picture Change**
Word	Unsigned decimal	3	Yes

Execution results

➢ After creating the element, run “Compile” and download it to the HMI. Next, input a non-zero value in the numeric entry element. Then, the state graphic will automatically change and display the selected pictures according to the defined picture change time. If the input value is “0”, the state graphic will reset to the initial state without executing any action.



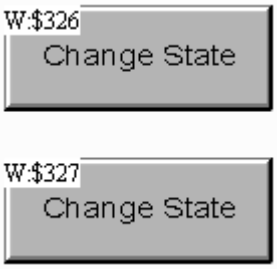
The table below shows “Auto Picture Change” is Variation.

Example of the State Graphic

《Table 2.5.5 Example of the State Graphic》

Read address

State Graphic Element		Numeric Entry Element		Numeric Entry Element	
Read address	$326	Write address	$326	Write address	$327



Picture

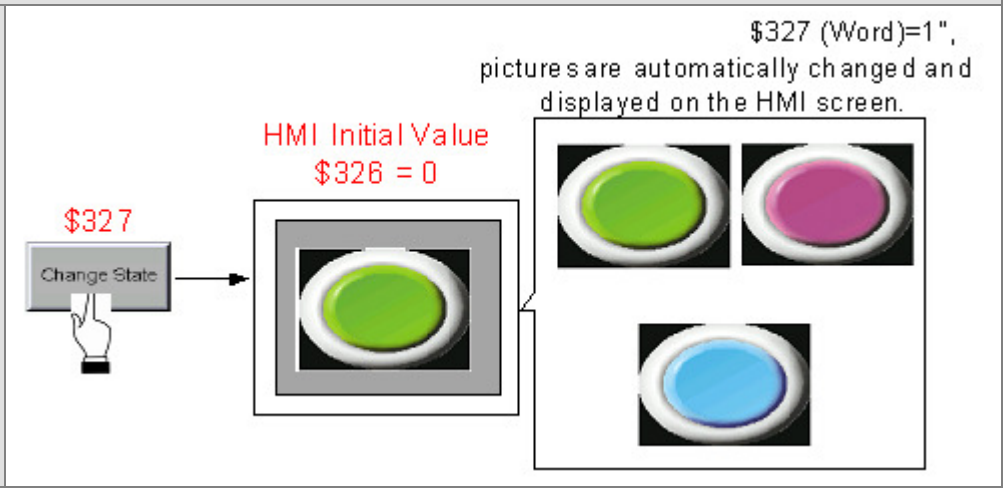
Set the State Graphic		
State 0	**State 1**	**State 2**

Properties

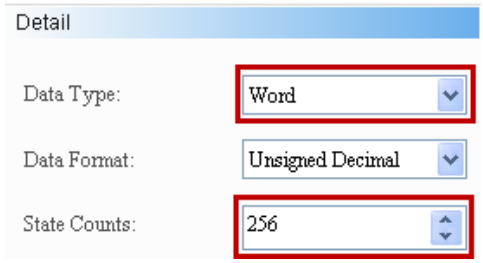
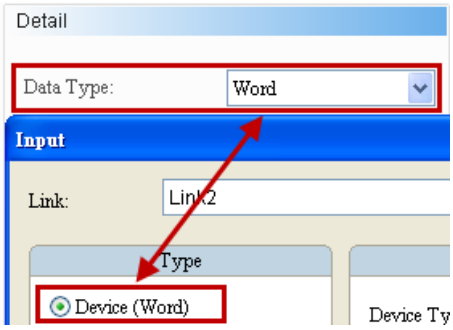
State Graphic Element			
Data Type	**Data Format**	**State Counts**	**Auto Picture Change**
Word	Unsigned decimal	3	Variation

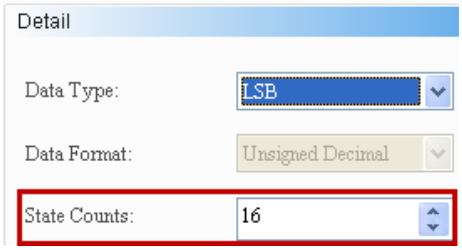
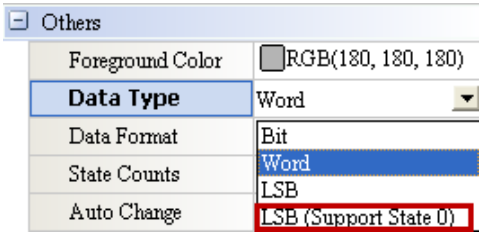
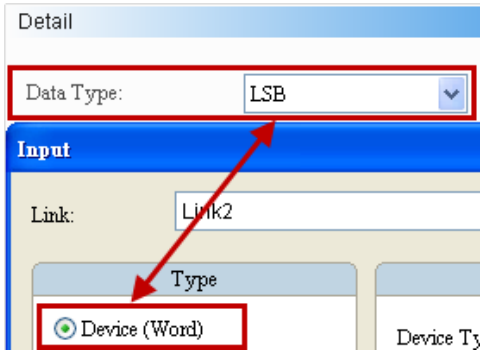
Execution results

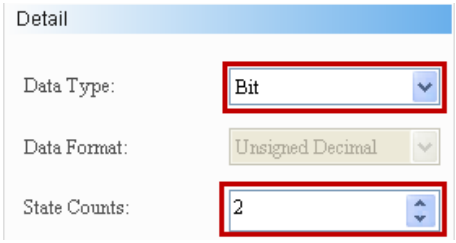
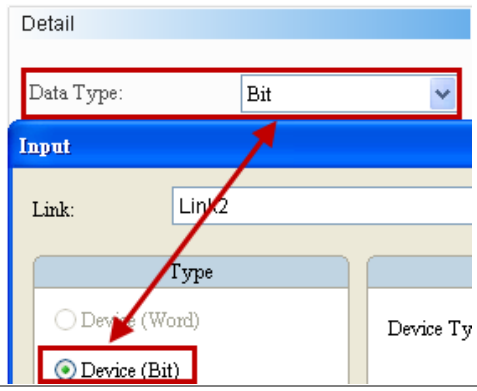
- The read address in the state graphic element represents the register for changing state pictures. The 【**Read Address+1**】 allows users to access to the register for setting the auto picture change as variation.
- After creating the element, run “Compile” and download it to the HMI. Next, select the numeric entry element {$327} and input a non-zero value in the element. Then, the state graphic will automatically change and display the selected pictures according to the defined picture change time. When selecting the numeric entry element {$326}, users can input the corresponding state graphic data in the element. If the numeric entry element {$327}is “0”, the state graphic will stop the auto picture change.

Example of the State Graphic 《Table 2.5.5 Example of the State Graphic》	
	

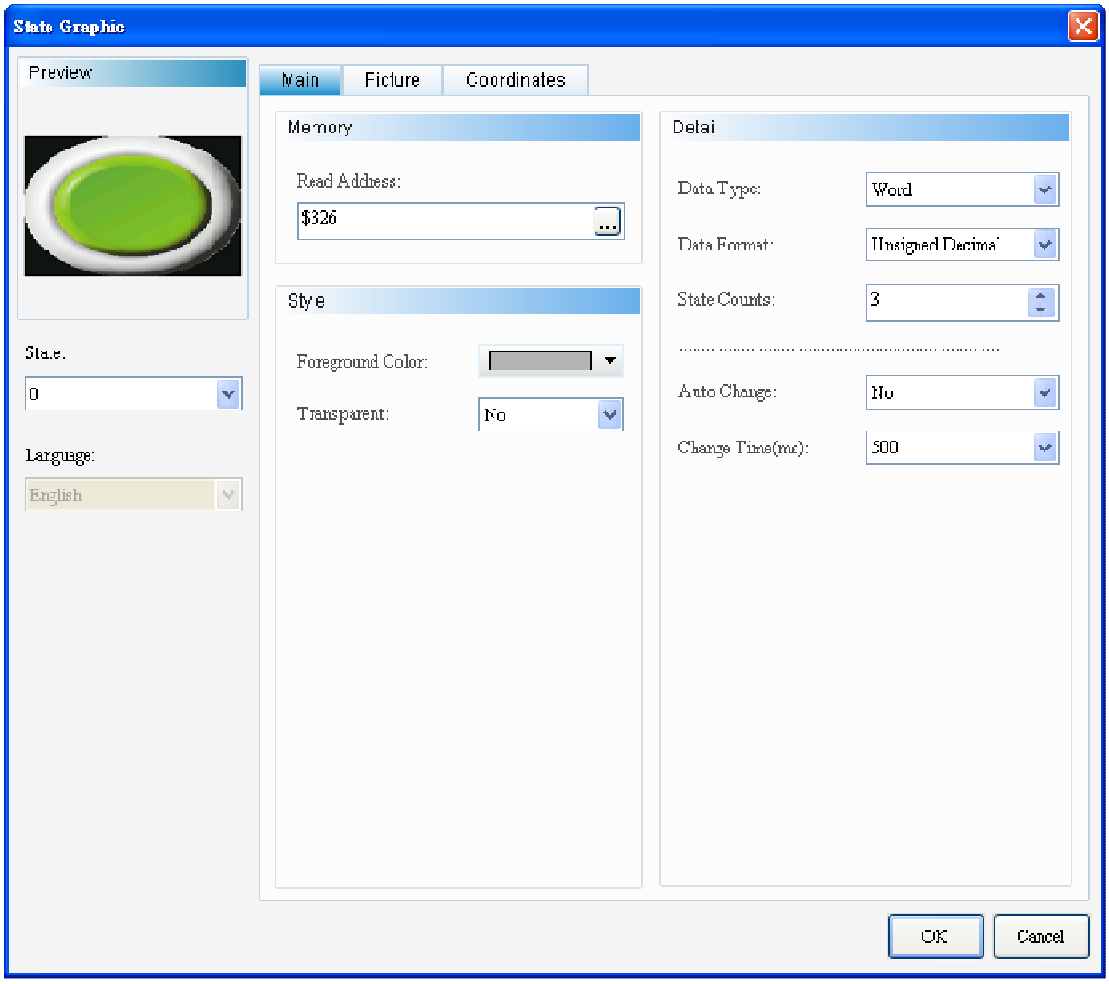
The state graphic supports four data types as shown in the table below. If users need to add or remove state counts, simply add or reduce state counts from State Counts in the properties.

Data Type	State Counts	Memory Address
Word	If the data type is "Word", users can select 1-256 states. 	If the data type is "Word", "Word" is the data type of the memory address. 

Data Type	State Counts	Memory Address
LSB/LSB (Support State 0)	If the data type is “LSB”, the data in the register is first converted into the binary data. Next, the present object state is determined according to the element with the lowest non-zero bit. If the data type is “LSB”, users can select 1-16 states, except “State 0”.  If users wish to display “State 0”, please select “LSB (Support State 0)”.  If users select “LSB”, the element will display “black” when State=0. 	If the data type is “LSB” or “LSB (Support State 0)”, “Word” is also the data type of the memory address. 

<table>
<tr><th>Data Type</th><th>State Counts</th><th>Memory Address</th></tr>
<tr><td>LSB/LSB (Support State 0)</td><td colspan="2">The examples in the following table show how the state value is determined with the lowest non-zero element after converting from a decimal value into a binary value. There are also examples demonstrating how DOPSoft determines the state value displayed with the lowest bit when the decimal values are 3 and 7.
<table>
<tr><th>Decimal</th><th>Binary</th><th>Sate Value</th></tr>
<tr><td><u>0</u></td><td><u>0000000000000000</u></td><td><u>State=0 when all bits are 0
【LSB (Support State 0) must be selected】</u></td></tr>
<tr><td>1</td><td>0000000000000001</td><td>The lowest non-zero bit is bit 0, State=1.</td></tr>
<tr><td>2</td><td>0000000000000010</td><td>The lowest non-zero bit is 1, State=2.</td></tr>
<tr><td><u>3</u></td><td><u>0000000000000011</u></td><td><u>The lowest non-zero bit is bit 0, State=1.</u></td></tr>
<tr><td>4</td><td>0000000000000100</td><td>The lowest non-zero bit is bit 2, State 3.</td></tr>
<tr><td><u>7</u></td><td><u>0000000000000111</u></td><td><u>The lowest non-zero bit is bit 0, State=1.</u></td></tr>
<tr><td>8</td><td>0000000000001000</td><td>The lowest non-zero bit is bit 3, State=4.</td></tr>
<tr><td>16</td><td>0000000000010000</td><td>The lowest non-zero bit is bit 4, State=5.</td></tr>
<tr><td>32</td><td>0000000000100000</td><td>The lowest non-zero bit is bit 5, State=6.</td></tr>
<tr><td>64</td><td>0000000001000000</td><td>The lowest non-zero bit is bit 6, State=7.</td></tr>
<tr><td>128</td><td>0000000010000000</td><td>The lowest non-zero bit is bit 7, State=8.</td></tr>
<tr><td>256</td><td>0000000100000000</td><td>The lowest non-zero bit is bit 8, State=9.</td></tr>
<tr><td>512</td><td>0000001000000000</td><td>The lowest non-zero bit is bit 9, State=10.</td></tr>
<tr><td>1024</td><td>0000010000000000</td><td>The lowest non-zero bit is bit 10, State=11.</td></tr>
<tr><td>2048</td><td>0000100000000000</td><td>The lowest non-zero bit is bit 11, State=12.</td></tr>
<tr><td>4096</td><td>0001000000000000</td><td>The lowest non-zero bit is bit 12, State=13.</td></tr>
<tr><td>8192</td><td>0010000000000000</td><td>The lowest non-zero bit is bit 13, State=14.</td></tr>
<tr><td>16384</td><td>0100000000000000</td><td>The lowest non-zero bit is bit 14, Statep15.</td></tr>
<tr><td>32768</td><td>1000000000000000</td><td>The lowest non-zero bit is bit 15, State=16.</td></tr>
</table></td></tr>
<tr><td>Bit</td><td>If the data type is “Bit”, only 2 states are available.
 
</td><td>If the data type is “Bit”, “Bit” is the data type of the memory address.
 
</td></tr>
</table>

Double-click “State Graphic” to call out the State Graphic properties screen as shown below.

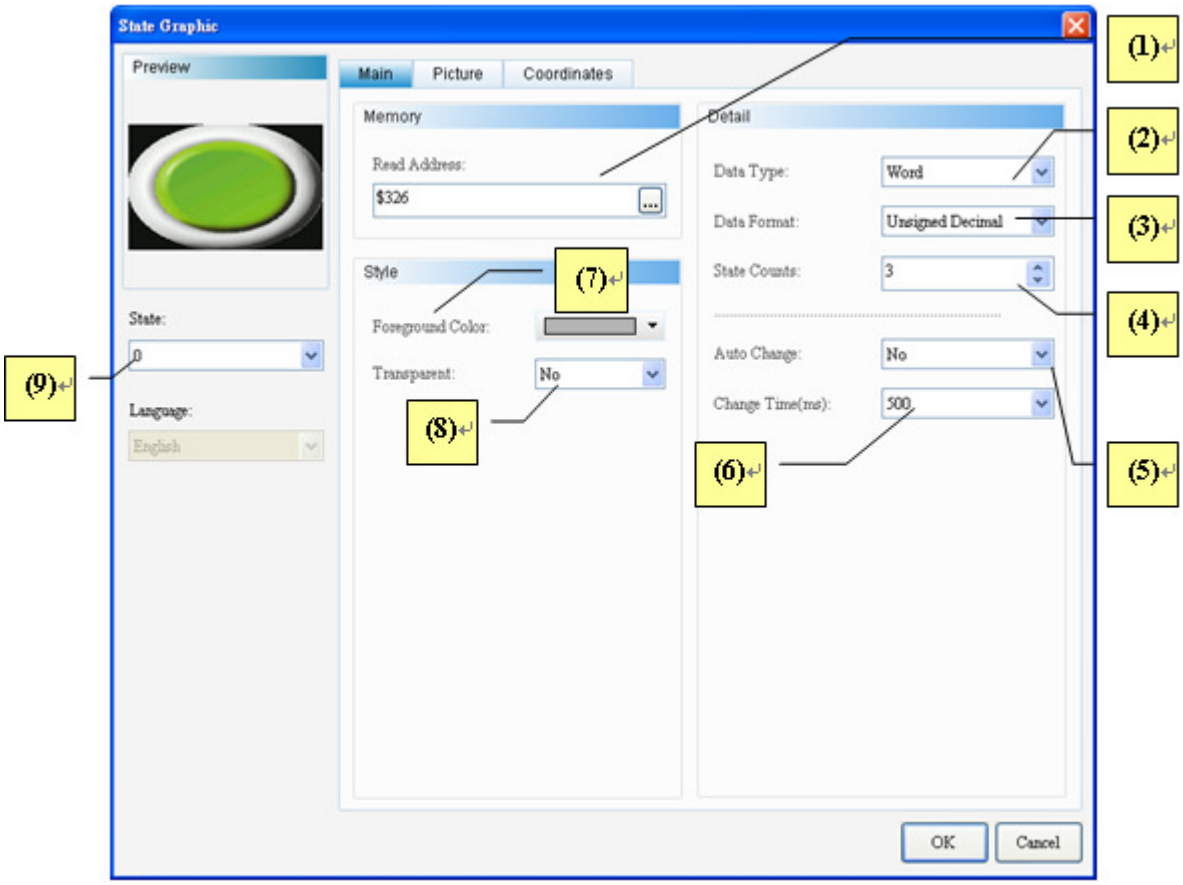


The State Graphic function pages are described below.

State Graphic	
Function Page	**Content Description**
Preview	Views the multistate data, but does not support multilingual data display
General	Sets the read address, foreground color, and transparent color Sets the data type, data format, state counts, auto picture change, and picture change time
Picture	Sets the picture bank name, the alignment, the stretch mode, and the picture transparent color
Position	Sets the X-Y coordinate, width, and height of the element

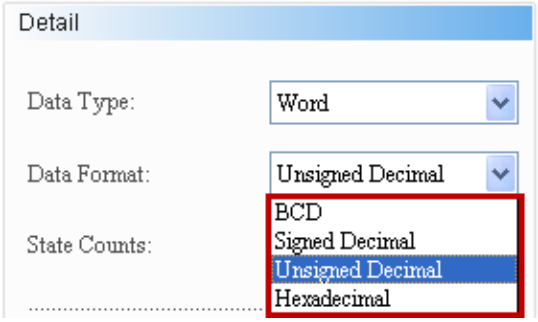
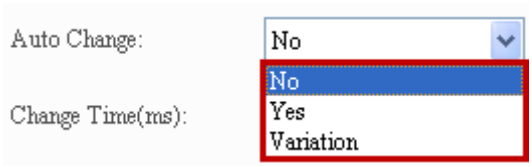
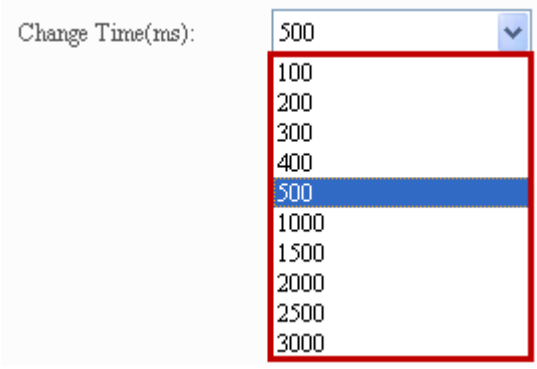
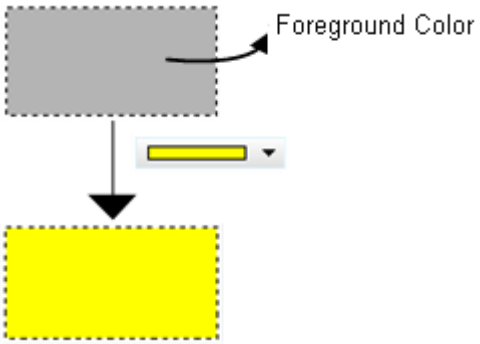
- General

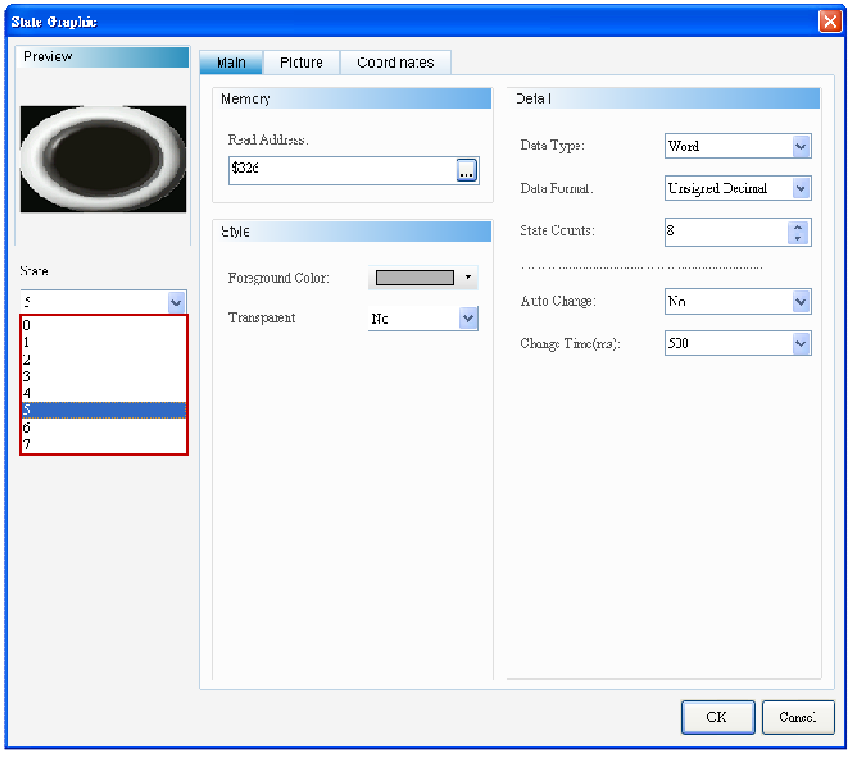
  State Graphic–Element general properties page



The functions are described below.

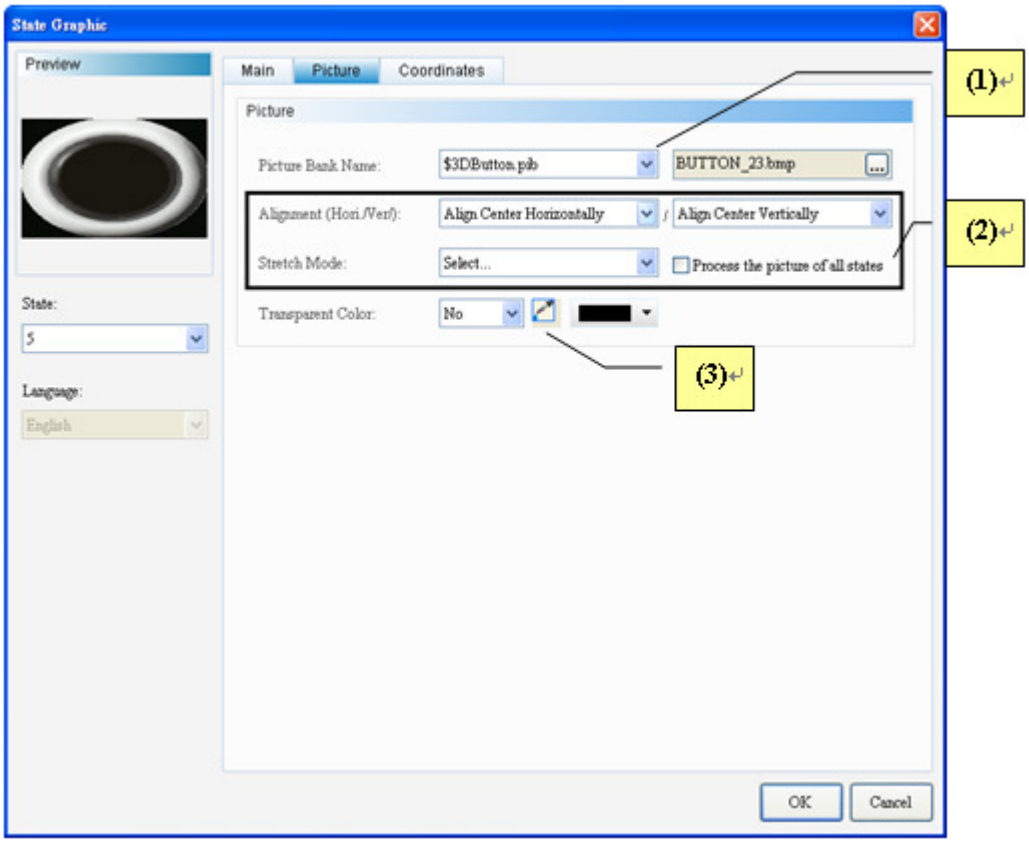
No.	Property	Function
(1)	Read address	➢ Selects the address of the internal memory or controller register. The memory type changes based on the selected data type, including “Word”, “LSB”, and “Bit”, as shown in table 2.5.6. ➢ Selects the link name or element type Please refer to section 5-1 in DOPSoft User Manual for more information.
(2)	Data type	➢ Four options: “Bit”, “Word”, “LSB”, and “LSB (Support State 0)” Please refer to table 2.5.6 for more information.
(3)	Data format	➢ The data format can only be selected when the data type is “Word”. ➢ These formats include “BCD”, Signed Decimal”, “Unsigned Decimal”, and “Hexadecimal”.

No.	Property	Function
		
(4)	State counts	➢ Sets the total state count of the state graphic elements If the data type is “Word”, users can select 1-256 states; if the data type is “LSB”, users can select 16 states; if the data type is “LSB (Support State 0)”, users can select 17 states; if the data type is “Bit”, users can select 2 states. Please refer to table 2.5.6 for more information.
(5)	Auto picture change	➢ There are 3 options for the auto picture change: “Yes”, “No”, and “Variation”  ➢ Please refer to the examples in table 2.5.3~table 2.5.5 for more information about the application of the auto picture change.
(6)	Picture change time	➢ The picture change time ranges from 100-3000 ms. 
(7)	Foreground color	➢ Sets the foreground color ➢ If the transparent color is “Yes”, the foreground color is disabled. 

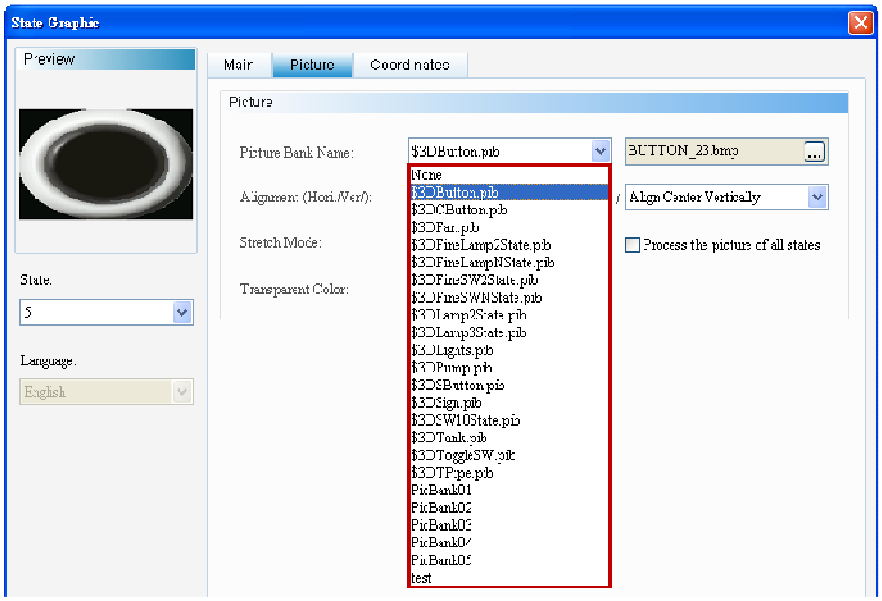
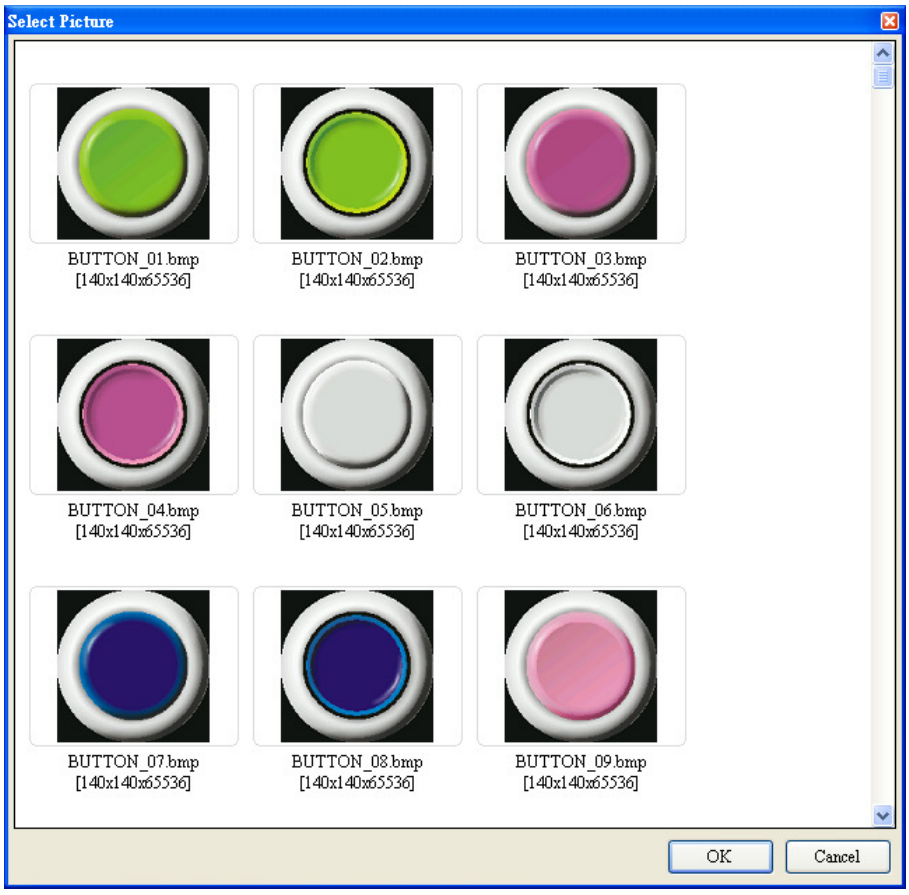
No.	Property	Function
(8)	Transparent color	➢ After selecting “Yes” for the transparent color, the result is as shown below.  ➢ Users can select any color in the picture to become transparent with the transparent color. By clicking the Transparent Color icon  and then the black button section, DOPSoft will omit coloring the black section in the picture to make it transparent.  ➢ By selecting the transparent color for both the element and the picture, the result is as shown below. 
(9)	State	➢ Users can preview or change the parameter of all button element states by changing the state. 

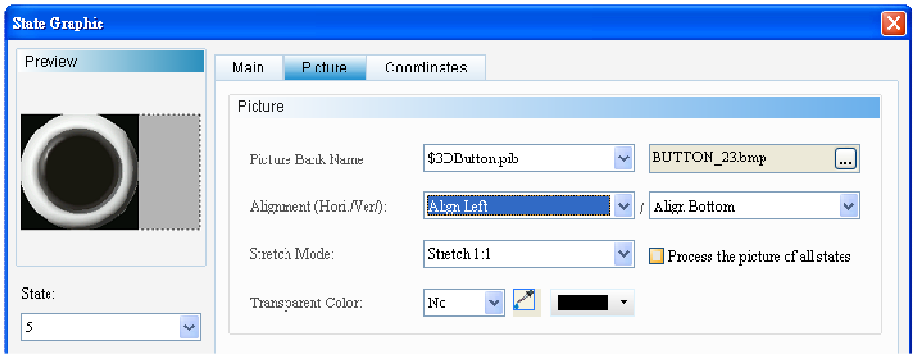
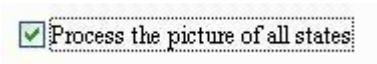
- Graph

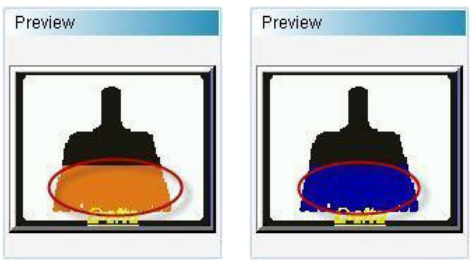
  State Graphic—Element graph properties page



The functions are described below.

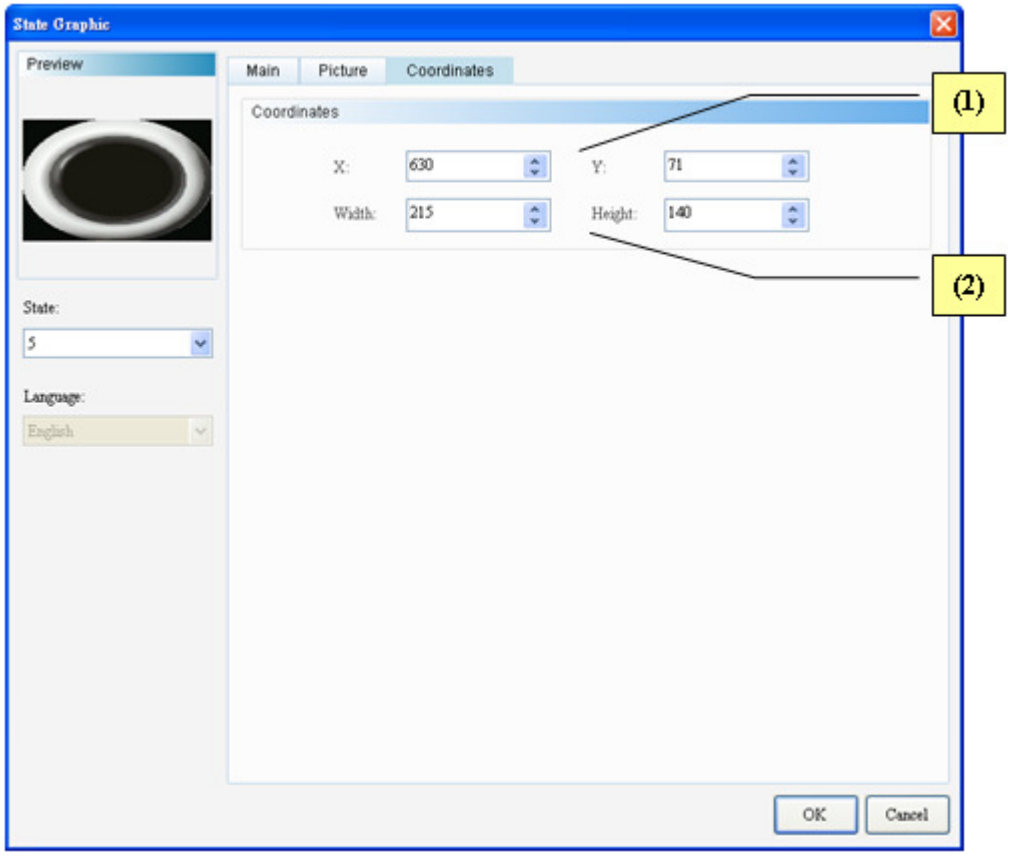
No.	Property	Function
(1)	Picture bank name	➢ The default picture bank name is “None”. Users can select in the built-in bank the picture to be displayed from the pull-down.  

<table>
<tr><th>No.</th><th>Property</th><th>Function</th></tr>
<tr><td rowspan="2">(2)</td><td>Alignment</td><td>➢ Sets the picture alignment with the alignment options.
 
</td></tr>
<tr><td>Stretch mode</td><td>➢ The stretch modes include “Fill”, “Keep Aspect Ratio”, and “Actual Size”.
<table>
<tr><th>Fill</th><th>Keep Aspect Ratio</th><th>Actual Size</th></tr>
<tr><td>In the “Fill” mode, the selected picture will fill up the entire display area.</td><td>In the “Keep Aspect Ratio” mode, the selected picture will fit in the display area proportionally according to the picture ratio.</td><td>In the “Actual Size” mode, the picture will be displayed in its original size in the display area.</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
</table>
➢ If “Process all state pictures” is selected, the system assumes that each element has multiple entries of state data, and some pictures may be unable to fill the entire display area. By selecting this item, users will not need to set individual pictures to save time from editing.
 
</td></tr>
<tr><td>(3)</td><td>Selecting the transparent color</td><td>➢ Sets a color in the picture to transparent
In this case, by clicking the Transparent Color icon  and then the orange part of the loom, DOPSoft will omit all orange parts in the picture and turn them into transparent.
 

 
</td></tr>
</table>

- Position

  State Graphic—Element position properties page



The functions are described below.

No.	Property	Function
(1)	X-value and Y-value	➢ Sets the upper left X-coordinate and Y-coordinate of elements
(2)	Width and height	➢ Sets the element width and height

2.2.7 Numeric Entry

N	Numeric entry

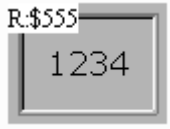
With the numeric keypad provided by the numeric entry element, users can input a value to the selected write memory address. Next, after reading this value with the element read memory, such as the data display element, this value is displayed on the HMI. Please refer to table 2.6.1 below.

Example of the Numeric Entry

《Table 2.6.1 Example of the Numeric Entry》

Read memory address

Numeric Entry Element		Data Display Element	
Write memory address	$555	Read memory address	$555

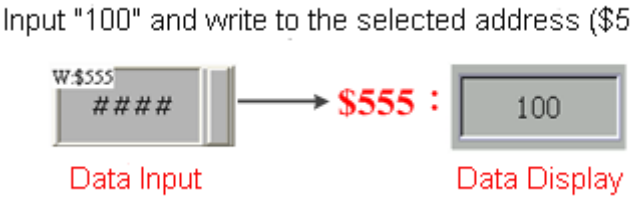


Properties

Numeric Entry Element			
Data Type	**Data Format**	**Integer Digit**	**Decimal Place**
Word	Unsigned decimal	4	0

Execution results

- After creating the element, compile and download it to the HMI. Next, input "100"with the numeric entry element, the data display element will display this value.



The numeric entry supports two data types, "Word" and "Double Word". The valid range of the numeric entry data is described in table 2.6.2 below.

Numeric Entry

《Table 2.6.2 Numeric Entry Valid Range》

Word

Data Format	Data Valid Range
BCD	0~9999
Signed BCD	-999~9999
Signed decimal	-32768~32767
Unsigned decimal	0~65535
Hex	0~0xFFFF
Binary	0~0xFFFF

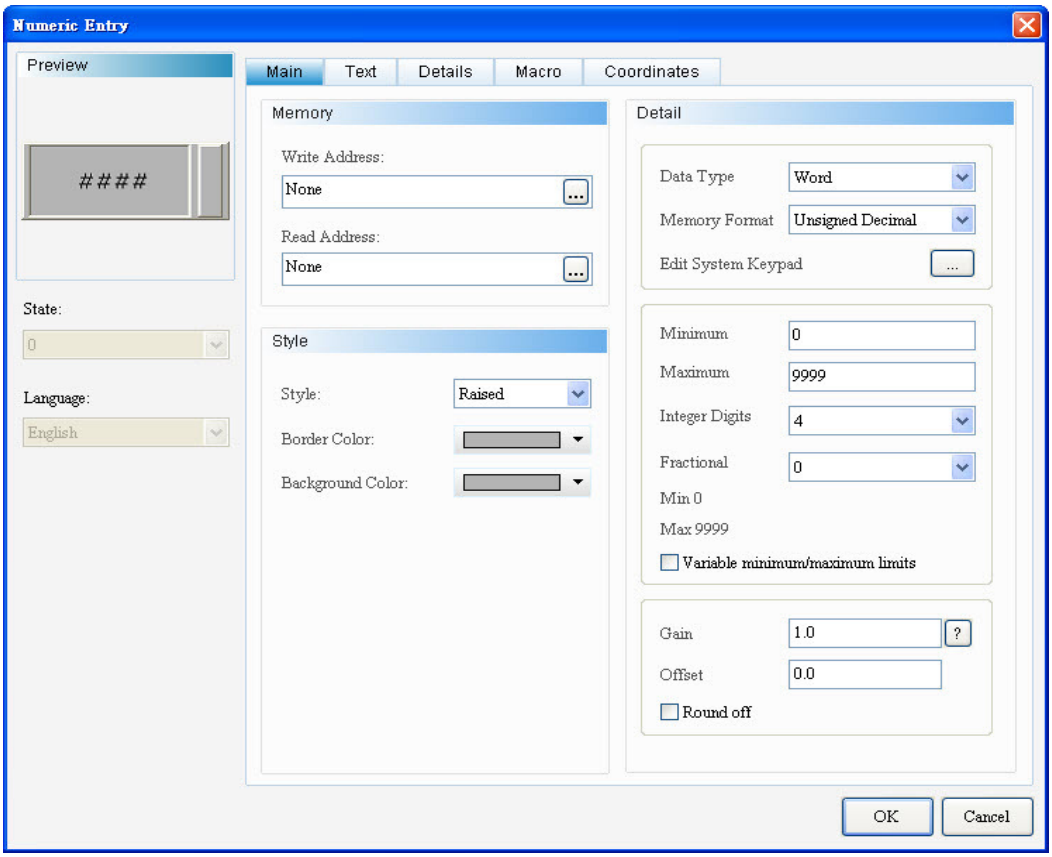
Numeric Entry

《Table 2.6.2 Numeric Entry Valid Range》

Double Word

Data Format	Data Valid Range
BCD	0~99999999
Signed BCD	-9999999~99999999
Signed decimal	-2147483648~2147483647
Unsigned decimal	0~4294697295
Hex	0~0xFFFFFFFF
Binary	0~0xFFFFFFFF
Floating	0~9999999

Double-click “Numeric Entry” to call out the Numeric Entry properties screen as shown below.

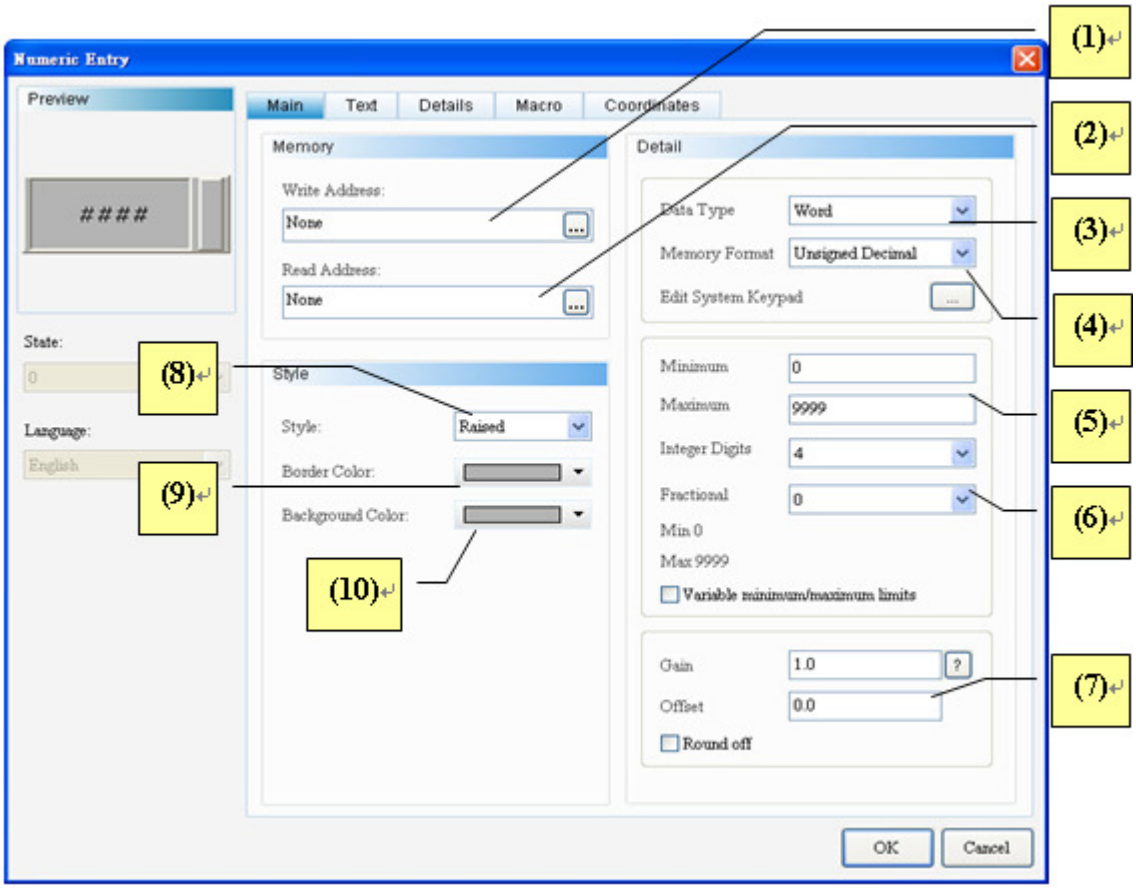


The Numeric Entry function pages are described below.

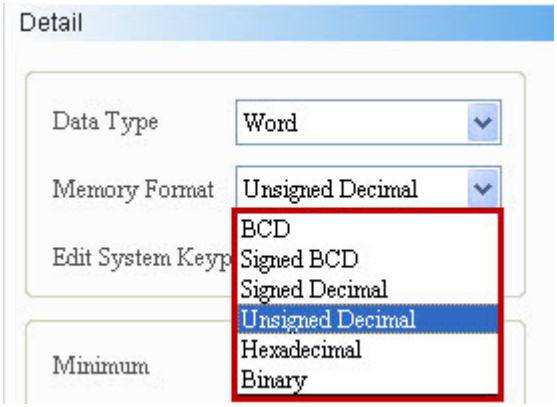
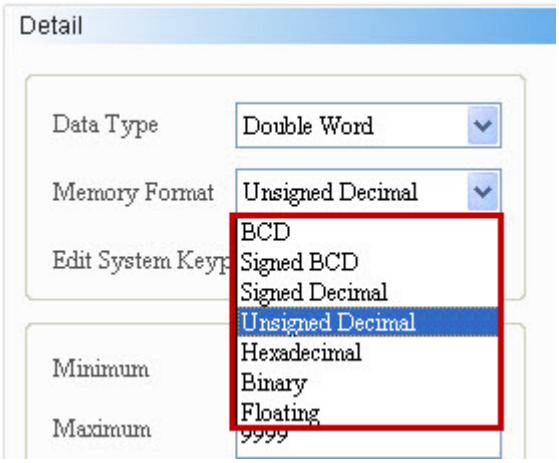
Numeric Entry	
Function Page	**Content Description**
Preview	Supports neither multistate nor multilingual data display
General	Sets the read memory address, write memory address, style, background color, and border color Sets the data type, data format, integer digit, decimal place, minimum value, maximum value, and gain/offset
Text	Sets the font type, font size, font color, and alignment of the text to be displayed
Advanced	Sets the method of enabling input, sets the interlock state, sets the interlock address, sets the activation method, sets the activation address, sets the invisible address, pads the left zero, sets the exceeding limit reminder, sets the user security level, sets the low security, and hides characters
Position	Sets the X-Y coordinate, width, and height of elements

- General

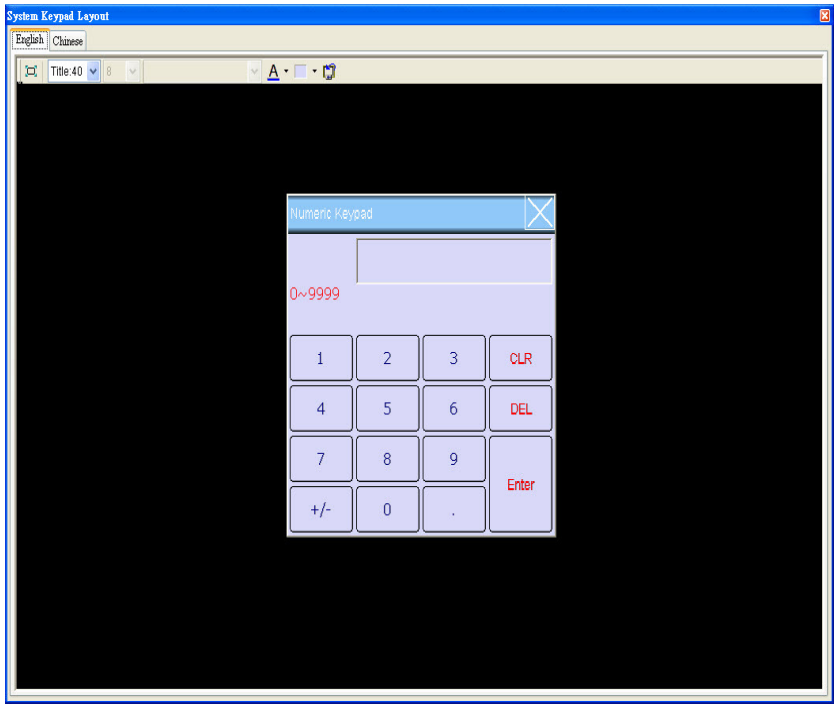
  Numeric Entry—Element general properties page



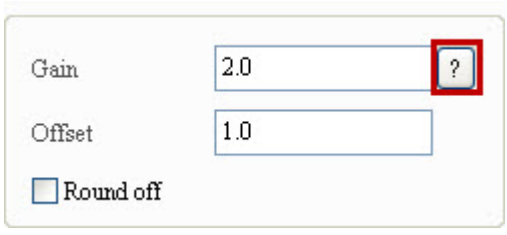
The functions are described below.

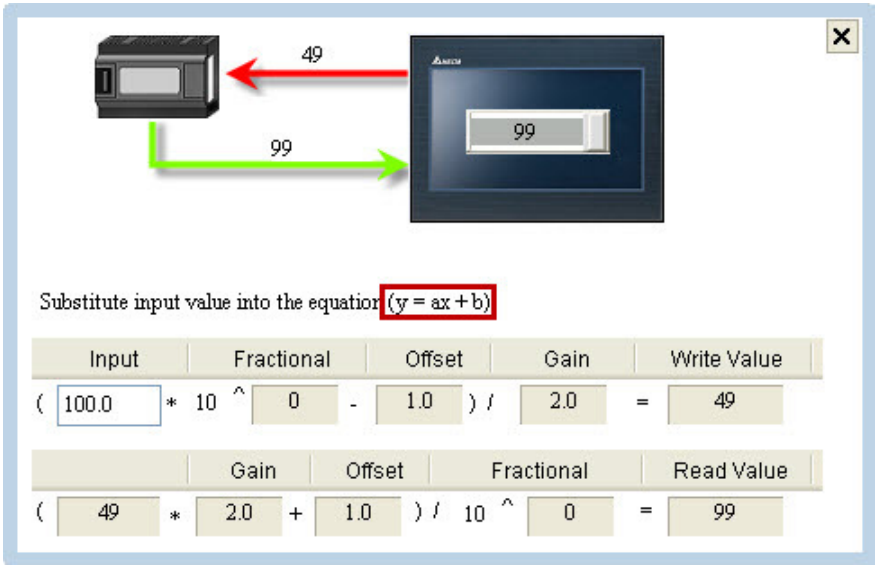
No.	Property	Function
(1)	Write memory address	➢ Selects the address of the internal memory or controller register ➢ Selects the link name or style Please refer to section 5-1 in DOPSoft User Manual for more information.
(2)	Read memory address	➢ Selects the address of the internal memory or controller register ➢ Selects the link name or stype Please refer to section 5-1 in DOPSoft User Manual for more information.
(3)	Data type	➢ Two options: “Word” and “Double Word” Please refer to table 2.6.2 for more information
(4)	Data format	➢ If the data type is “Word”, the data formats are as follows.  ➢ If the data type is “Double Word”, the data formats are as follows. 

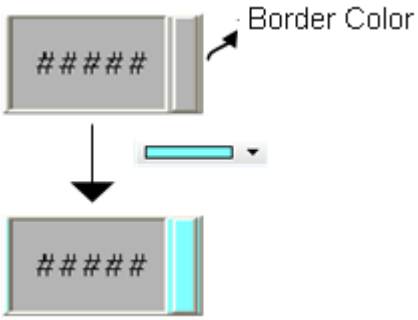
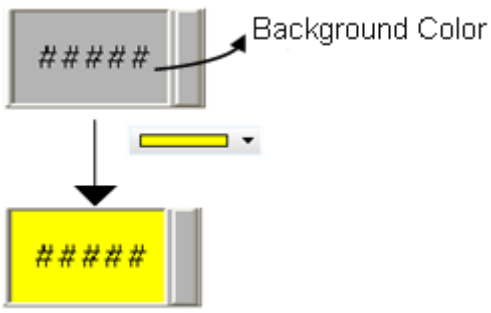
No.	Property	Function
(4)	Editing numeric keypad	➢ The editing numeric keypad allows users to adjust the numeric keypad size, title size, font size, font type, font color or the data display, and background color of the numeric keypad window.



	Selects the system numeric keypad size
Title:40	Sets the title height
10	Sets the font size
Arial	Sets the font type
A	Sets the font color
	Selects the background color
	Default size

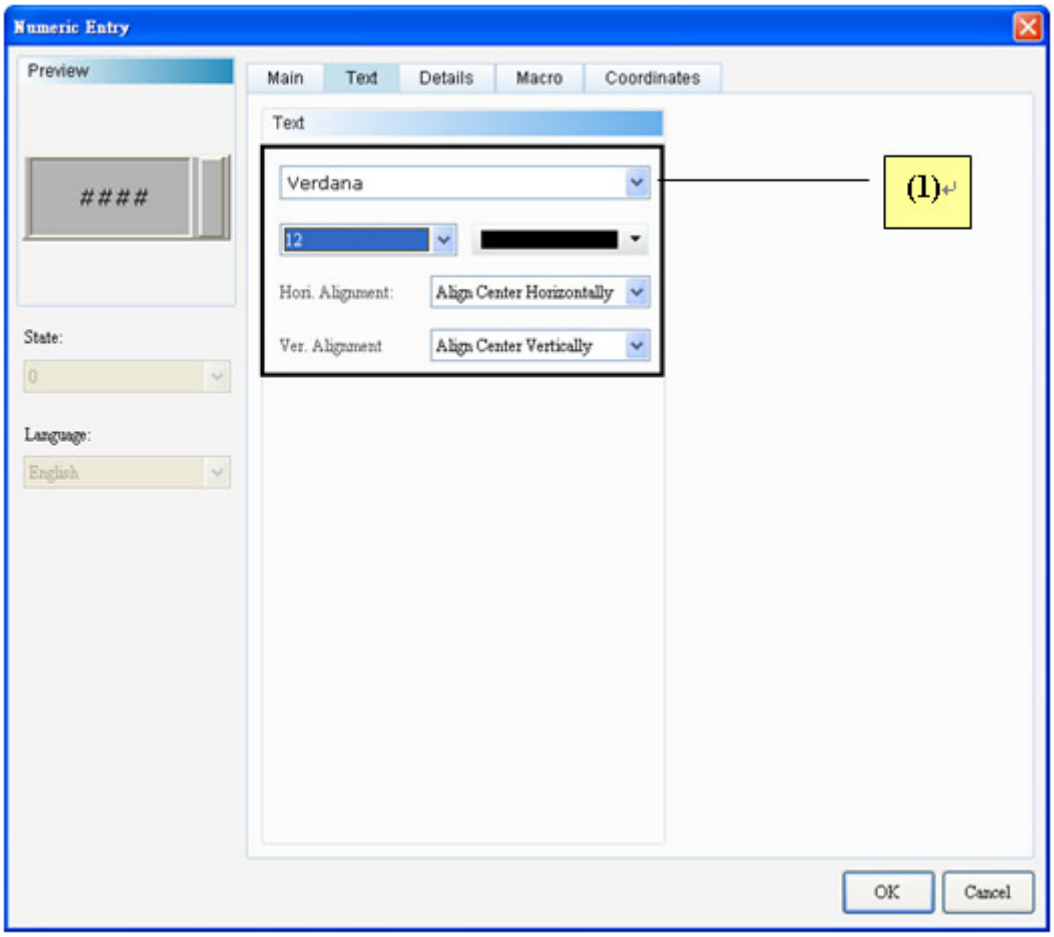
<table>
<tr><th>No.</th><th>Property</th><th>Function</th></tr>
<tr><td>(5)</td><td>Minimum value/ Maximum value</td><td>➢ The data valid range of the minimum value and the maximum value is subject to the data type and the data format.
<table>
<tr><th>Data Type</th><th>Data Format</th><th>Data Valid Range</th></tr>
<tr><td rowspan="6">Word</td><td>BCD</td><td>0~9999</td></tr>
<tr><td>Signed BCD</td><td>-999~9999</td></tr>
<tr><td>Signed decimal</td><td>-32768~32767</td></tr>
<tr><td>Unsigned decimal</td><td>0~65535</td></tr>
<tr><td>Hex</td><td>0~0xFFFF</td></tr>
<tr><td>Binary</td><td>0~0xFFFF</td></tr>
<tr><td rowspan="7">Double word</td><td>BCD</td><td>0~99999999</td></tr>
<tr><td>Signed BCD</td><td>-9999999~99999999</td></tr>
<tr><td>Signed decimal</td><td>-2147483648~2147483647</td></tr>
<tr><td>Unsigned decimal</td><td>0~4294967295</td></tr>
<tr><td>Hex</td><td>0~0xFFFFFFFF</td></tr>
<tr><td>Binary</td><td>0~0xFFFFFFFF</td></tr>
<tr><td>Floating</td><td>0~9999999</td></tr>
</table></td></tr>
<tr><td>(6)</td><td>Integer digit Decimal place</td><td>➢ Users can define the integer digits and decimal places to be displayed.
➢ Instead of true decimal places, the decimal place here means the display format. True decimal places can only be defined form this item after selecting “Floating” in the data format.</td></tr>
<tr><td>(7)</td><td>Gain Offset</td><td>➢ Equation for calculating the gain and offset: y=(a) x+(b)
<table>
<tr><th>y</th><th>a</th><th>x</th><th>b</th></tr>
<tr><td>Calculation results</td><td>Gain value</td><td>Input value</td><td>Offset/Gain values</td></tr>
</table>
➢ If the gain or offset defined is a decimal, please select “Floating” in the data format.
➢ The numeric entry provides the estimation button for users to understand the gain and offset calculations more simply and clearly as shown below.

</td></tr>
</table>

<table>
<tr><th>No.</th><th>Property</th><th>Function</th></tr>
<tr><td></td><td></td><td> 

➢ After selecting “Round off”, values will be rounded off before displaying on the numeric display element.</td></tr>
<tr><td>(8)</td><td>Style</td><td>➢ There are four styles, including “Standard”, “Raised”, “Sunken”, and “Transparent”. Users can change the element appearance.
<table>
<tr><th>Standard</th><th>Raised</th><th>Sunken</th><th>Transparent</th></tr>
<tr><td>#####</td><td>#####</td><td>#####</td><td>#####</td></tr>
</table></td></tr>
<tr><td>(9)</td><td>Border color</td><td>➢ Sets the border color of elements.
➢ When the style is “Transparent”, the border color is disabled.
 
</td></tr>
<tr><td>(10)</td><td>Background color</td><td>➢ Sets the background color of elements
➢ When the style is “Transparent”, the background color is disabled.
 
</td></tr>
</table>

- Text

  Numeric Entry–Element text properties page

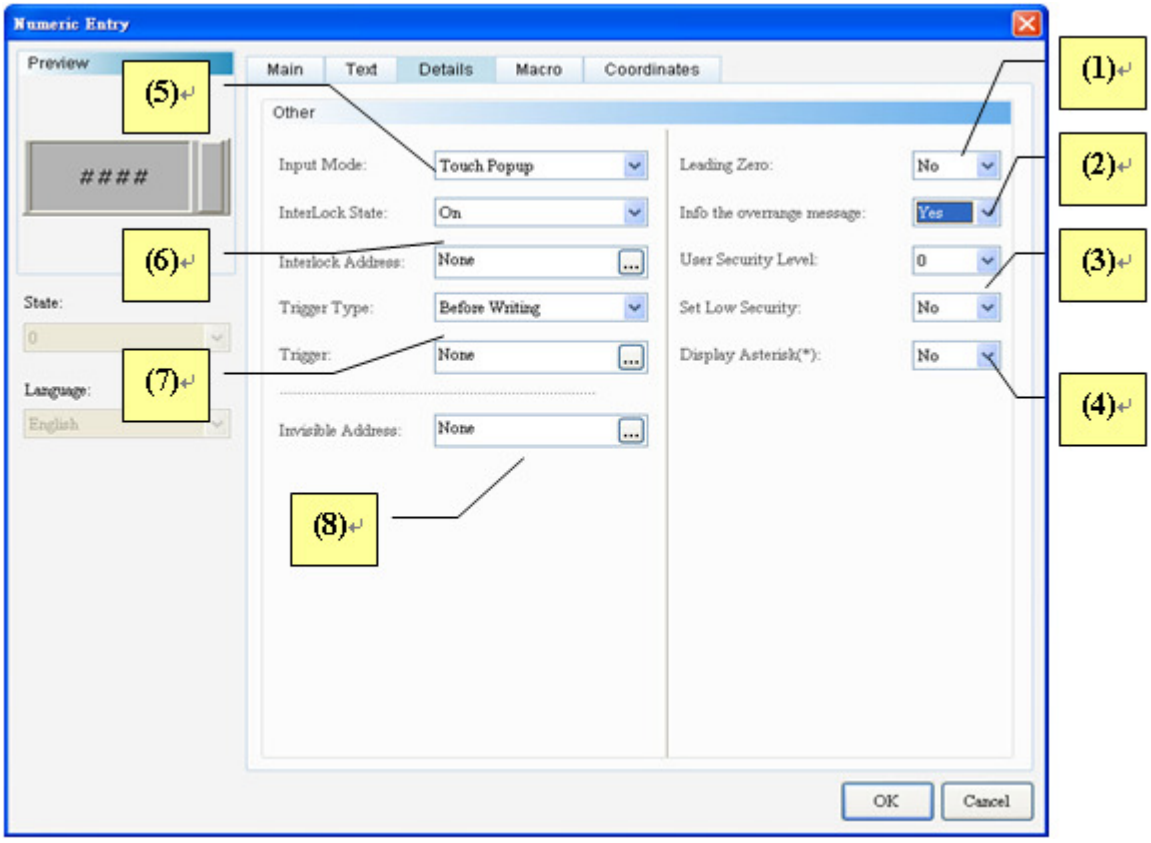


The functions are described below.

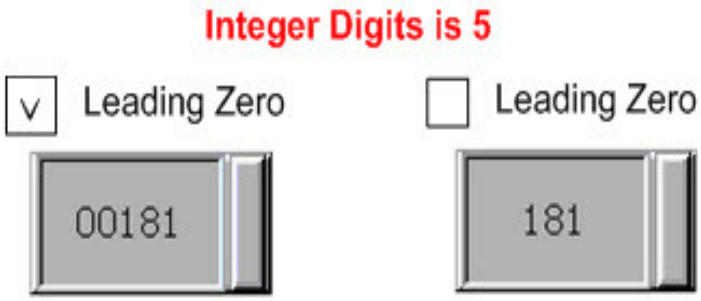
No.	Property	Function
(1)	Text properties	➢ Sets text properties, including the font type, font size, font color, and text alignment

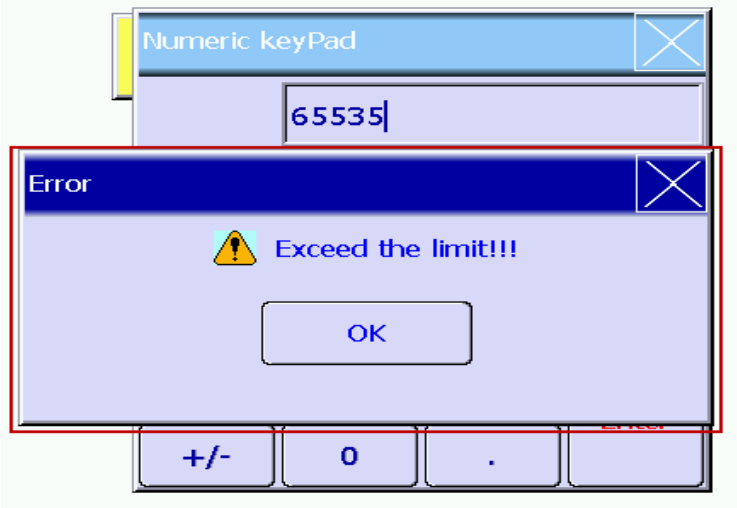
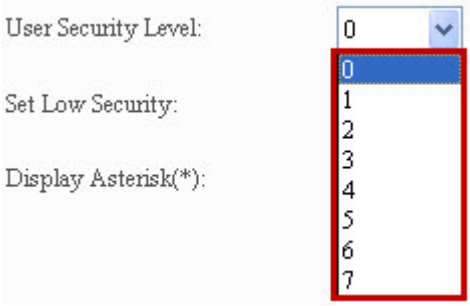
- Advanced

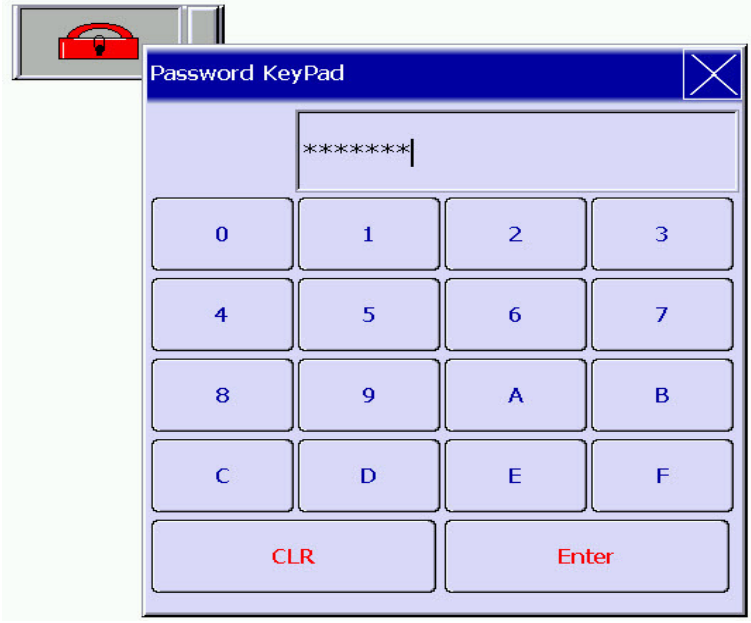
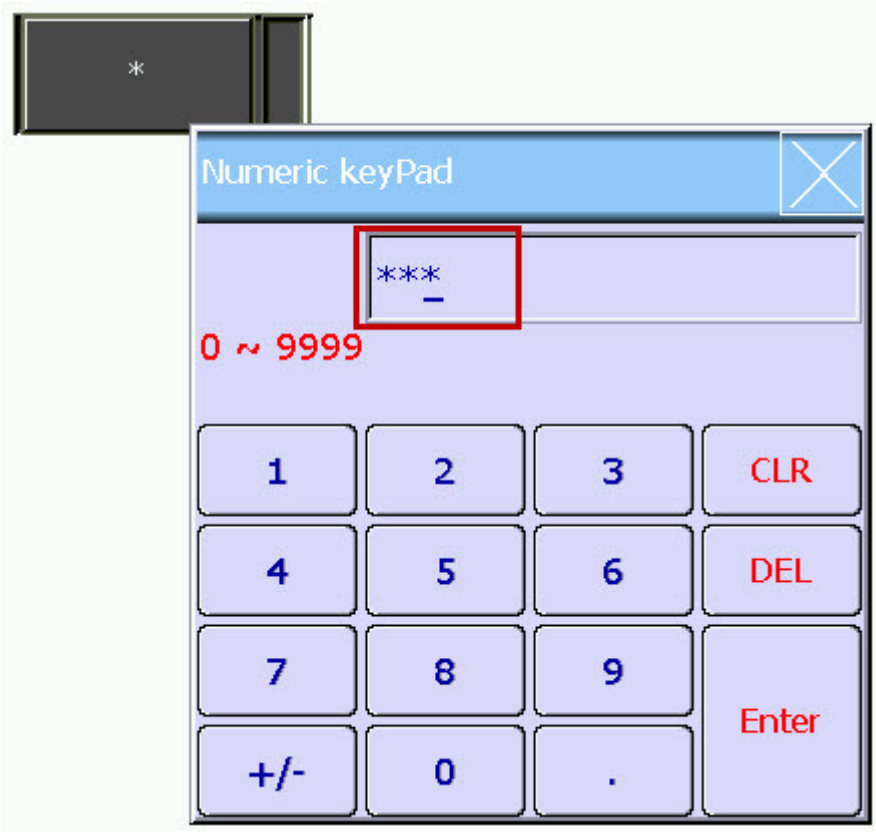
  Numeric Entry–Element advanced properties page

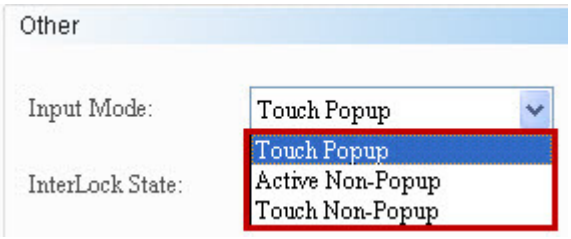
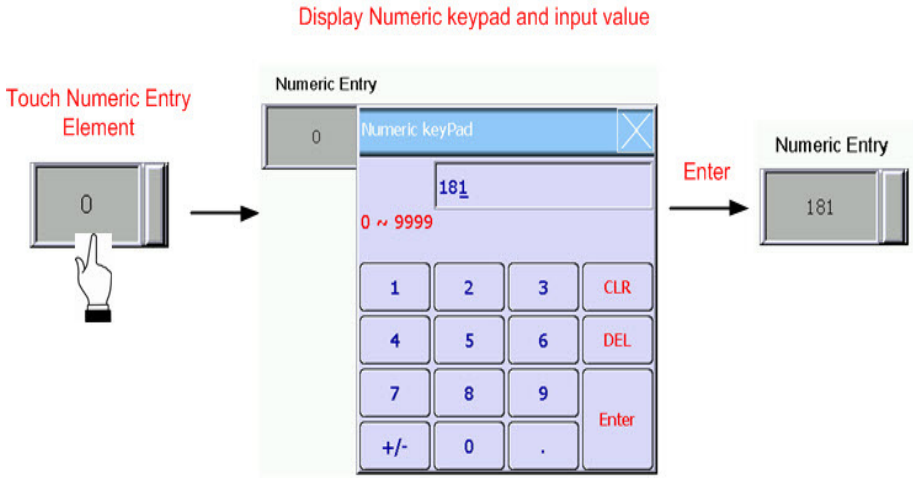
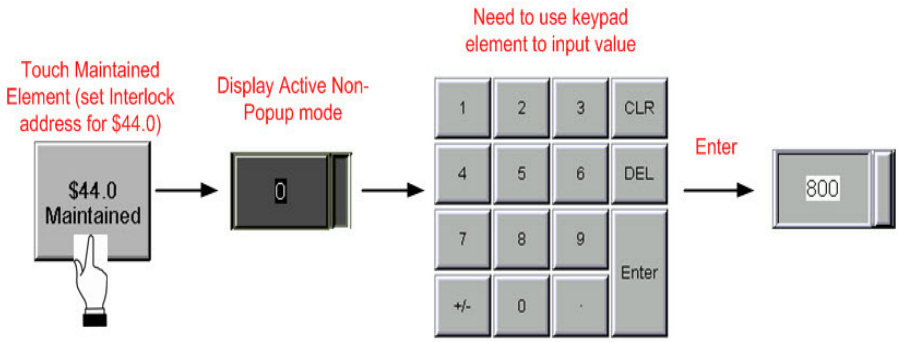


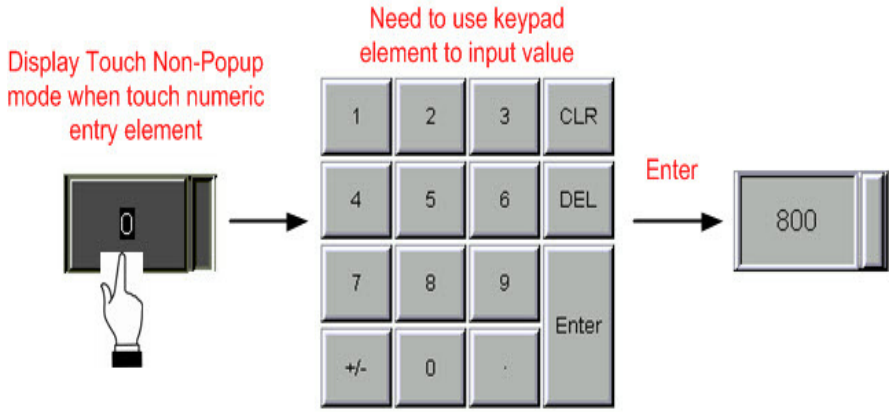
The functions are described below.

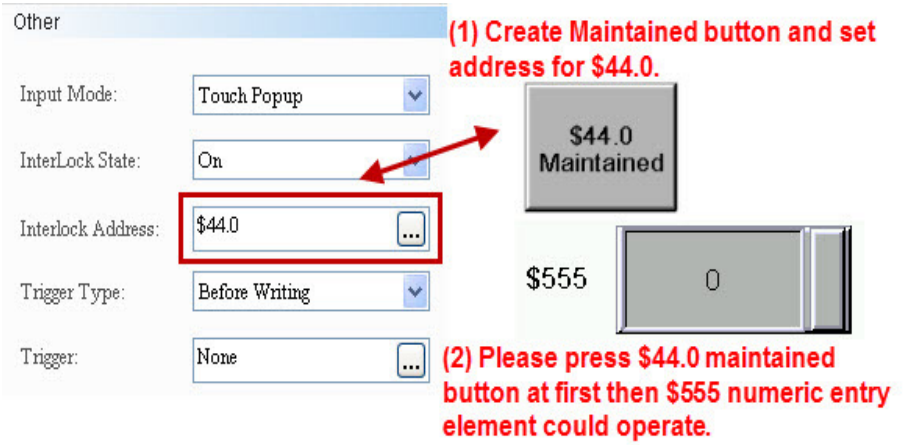
No.	Property	Function
(1)	Padding the left zero	➢ Padding the left zero is determined according to the number of digits of an integer as shown in the example below. 

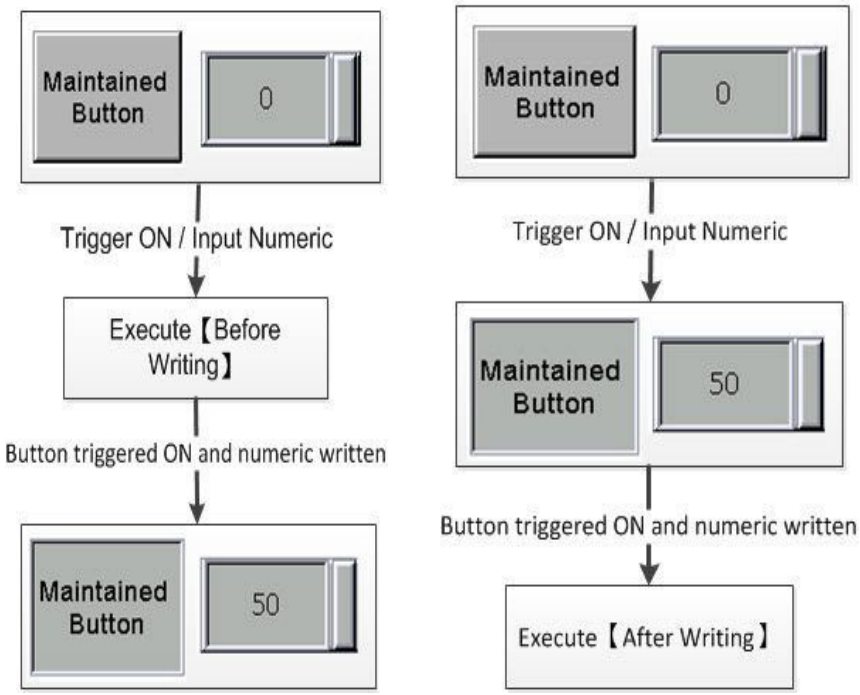
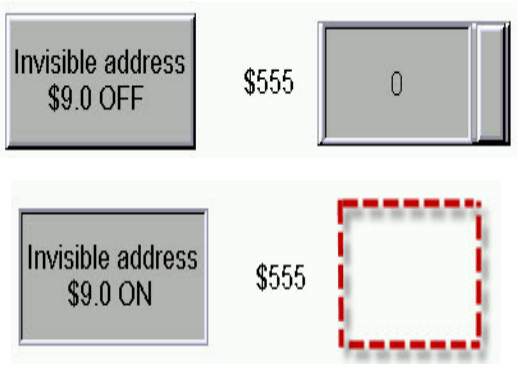
No.	Property	Function
(2)	Info the over range message	➢ If “Yes” is selected for “Info the over range message”, when the input value exceeds this range defined, an error message will pop up to remind users as shown below. 
(3)	User security level	 ➢ Sets the users security level of element activities Only users with equal or higher security level corresponding to the element can activate the element. ➢ After setting the users security level, when users activate the element, the password box will pop up and request users to input the password. (The password can be changed form the password setup element. Please refer to section 5-7 in DOPSoft User Manual for more information.)

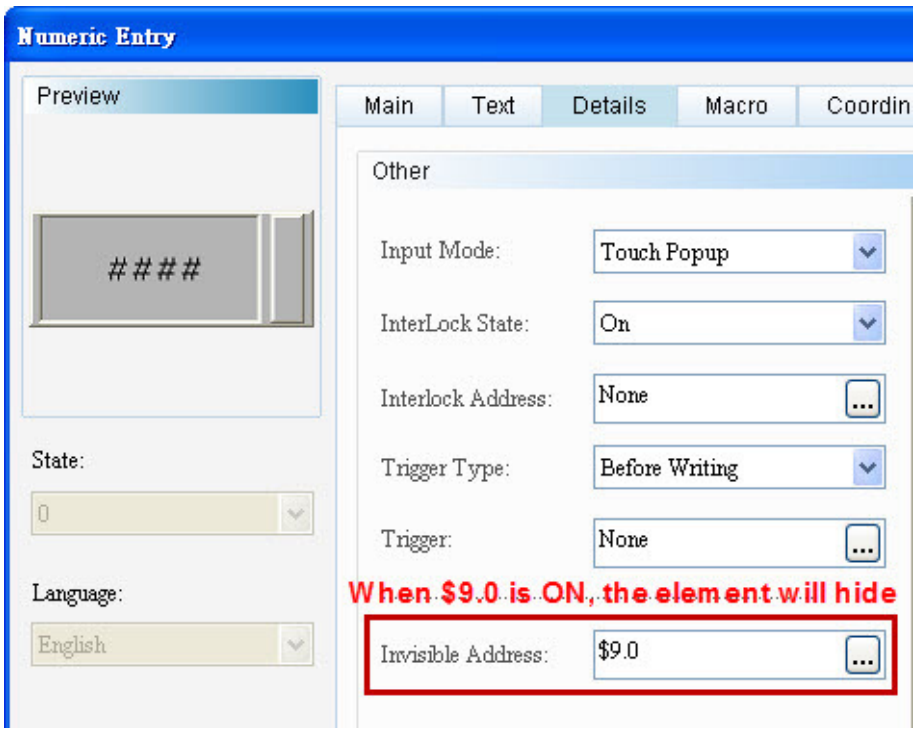
No.	Property	Function
(3)	Setting the low security	 ➢ If “Yes” is selected for “Set Low Security”, the HMI automatically sets the security to the lowest level every time users input the password. When users activate the element again, they will be requested to input again the password corresponding to the element.
(4)	Displaying the asterisk	➢ If “Yes” is selected for “Hide Character”, all numbers input from the numeric keypad will be displayed as “***”, i.e. characters are hidden, as shown below. 

No.	Property	Function
(5)	Input mode	➢ The input modes include “Touch Popup”, “Active Non-Popup”, and “Touch Non-Popup”. “Touch Popup” is the default input method for the numeric entry elements.  ➢ “Touch Popup” means after touching a numeric element, the numeric keypad will pop up.  ➢ No numeric keypad will pop up for both “Active Non-Popup” and “Touch Non-Popup”. Users must create an additional keypad element to operate the HMI. ➢ “Active Non-Popup” must be used along with the interlock address. Set the interlock address of the numeric entry element as $44.0, create a maintained element, and set its write memory address as $44.0.  Like the case of “Active Non-Popup”, no keypad will pop up in “Touch Non-Popup”. Therefore, an additional keypad is needed to input numeric data.

No.	Property	Function
		

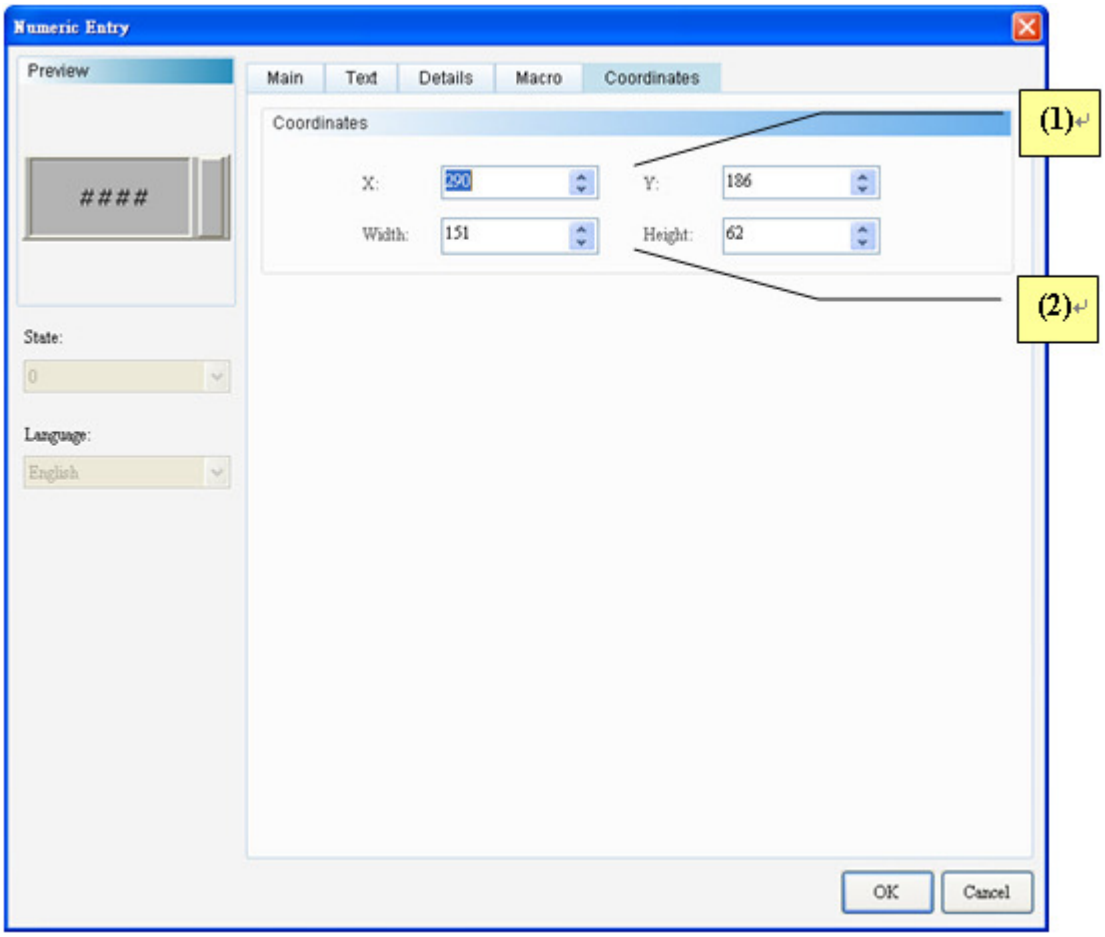
<table>
<tr><th>No.</th><th>Property</th><th>Function</th></tr>
<tr><td rowspan="2">(6)</td><td>Interlock state</td><td>➢ The interlock address allows users to operate an element form this particular address. It must be used along with the interlock state. If the interlock state is “OFF”, this means the interlock address is operable when the interlock state is “OFF”. In contrast, when the interlock state is “ON”, this means the interlock address is operable when the interlock state is “ON”.</td></tr>
<tr><td>Interlock address</td><td>➢ The operations are as follows.
I First, create a maintained button and set its write memory address as $44.0. Next, set its write memory as $555 from the numeric entry element and the interlock address of the character entry element as $44.0.
II To make the numeric entry element $555 operable, press the maintained button $44.0 to enable $555.
 
</td></tr>
<tr><td rowspan="2">(7)</td><td>Trigger type</td><td>➢ The trigger types include “Before Writing” and “After Writing”.
<table>
<tr><td rowspan="2">Trigger type</td><th>Before Writing</th><th>After Writing</th></tr>
<tr><td>The activation bit is ON before changing values.</td><td>Values are changed before the activation bit is ON.</td></tr>
</table>
➢ As the activation function only sets the trigger address to ON, users must set the trigger address to OFF before re-activation.
➢ Before writing: After writing:</td></tr>
<tr><td>Trigger</td><td></td></tr>
</table>

No.	Property	Function
		
(8)	Invisible address	➢ When the invisible address is “ON”, the button element is hidden, and the corresponding function is disabled. 

No.	Property	Function
		

- Position

  Numeric Entry—Element position properties page

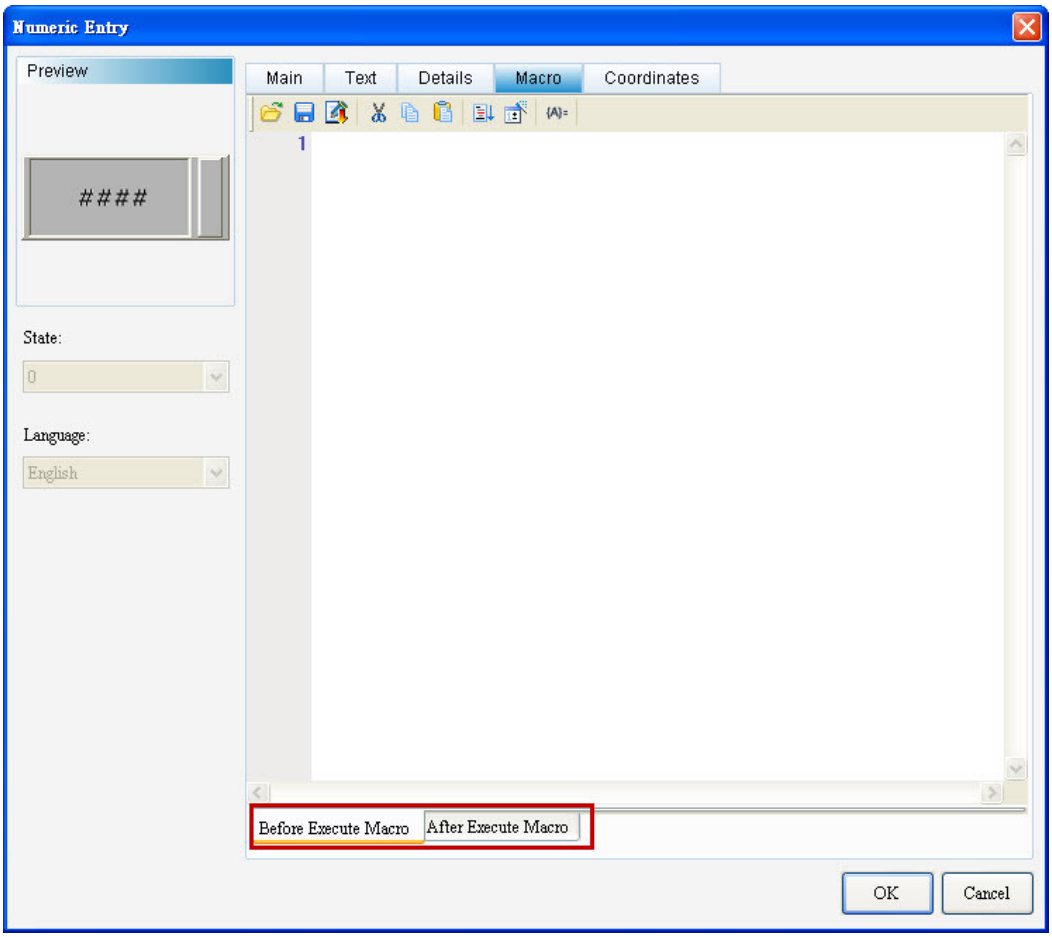


The functions are described below.

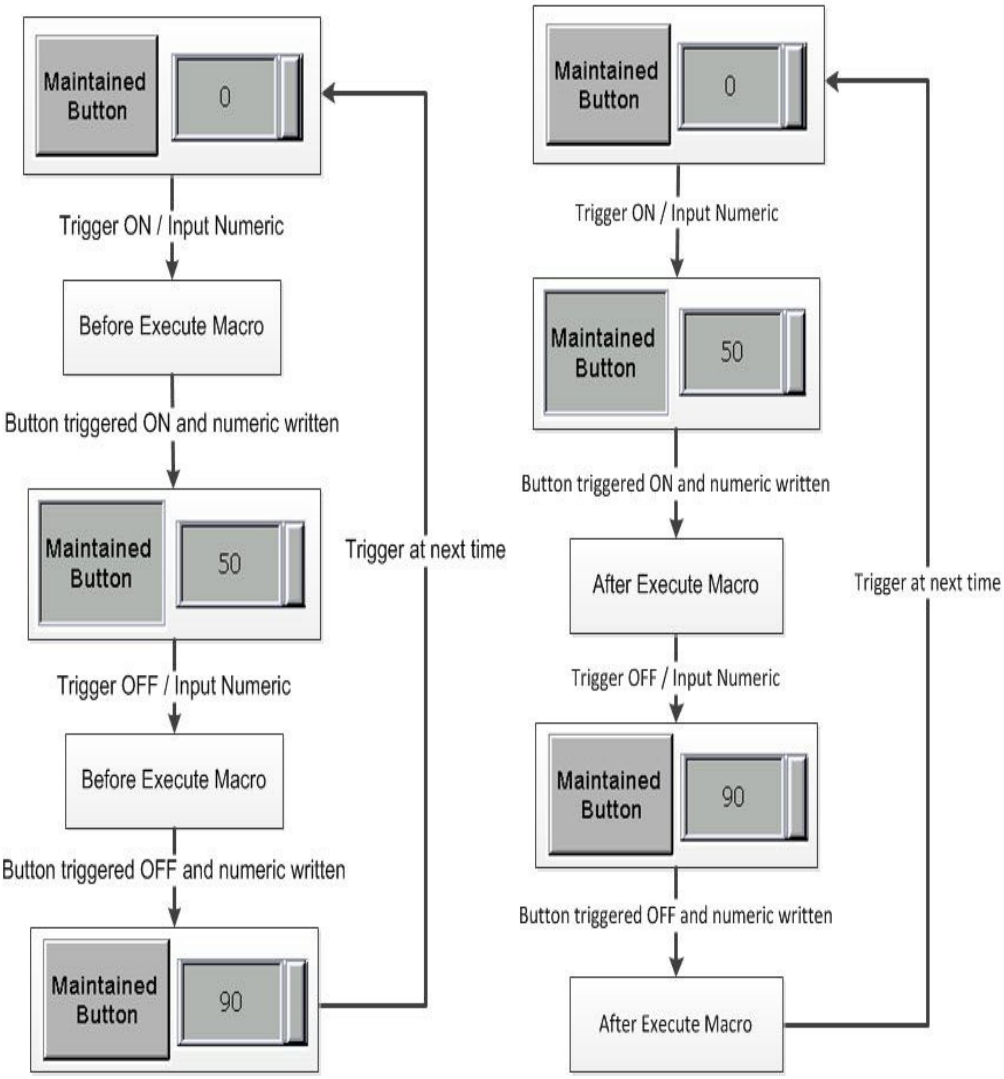
No.	Property	Function
(1)	X-value and Y-value	➢ Sets the upper left X-coordinate and Y-coordinate of elements
(2)	Width and height	➢ Sets the element width and height

- Macro

  Numeric Entry–Element macro properties page



The functions are described below.

No.	Property	Function
(1)		➢ The Before Execute Macro process and the After Execute Macro process are diagrammed below. 
	Before executing the macro	➢ When users touch the button element, the HMI will first run the commands in the corresponding macro before running the button action. If the button state is not changed by means of touching the button (using external controller commands or other macros), the HMI will not run the corresponding macro commands.
	After executing the macro	➢ After users touch the button element, the HMI will first run the button action before running the commands in the corresponding macro. If the button state is not changed by means of touching the button (using external controller commands or other macros), the HMI will not run the corresponding macro commands.

Chapter 3 Communication and Program

The methods of connecting a PLC are described in this chapter. Users can upload/download a program through different communication types.

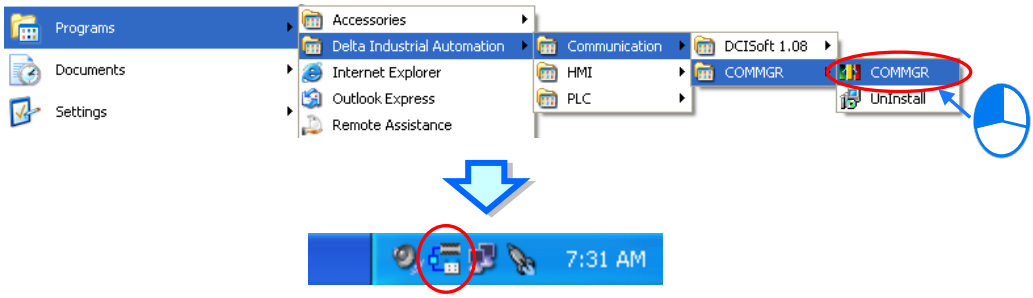
Table of Contents

3.1 Setting Communication

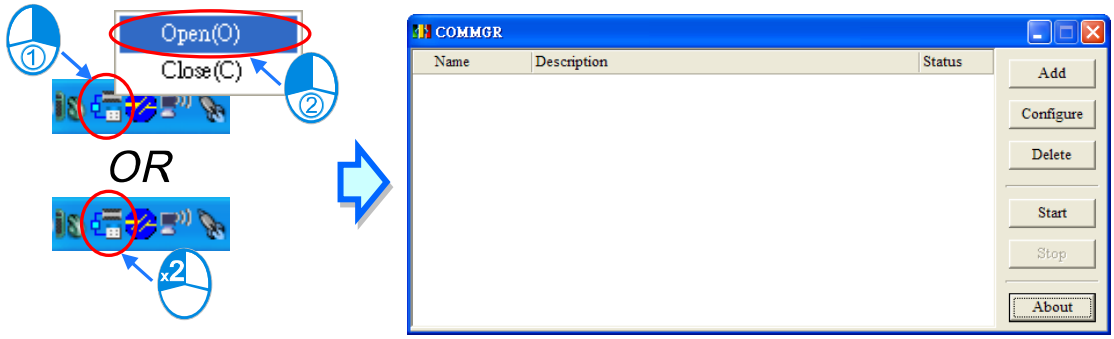
A PLC can communicate with ISPSoft through Ethernet, RS-232, RS-485, or USB.

3.1.1 Ethernet Communication

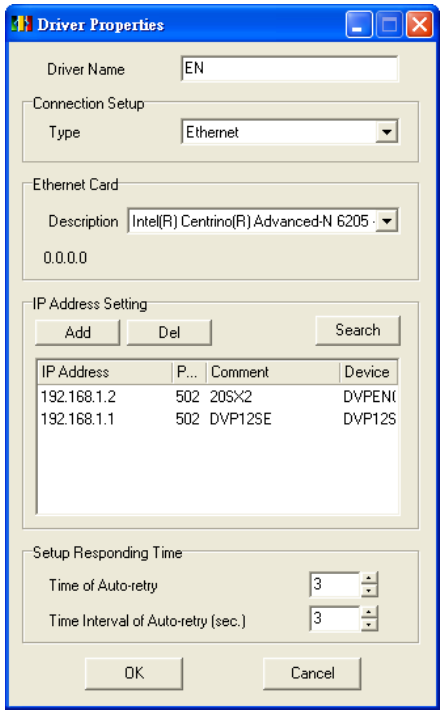
ISPSoft can be connected to DVP12SE through Ethernet.
Step 1: Start COMMGR.



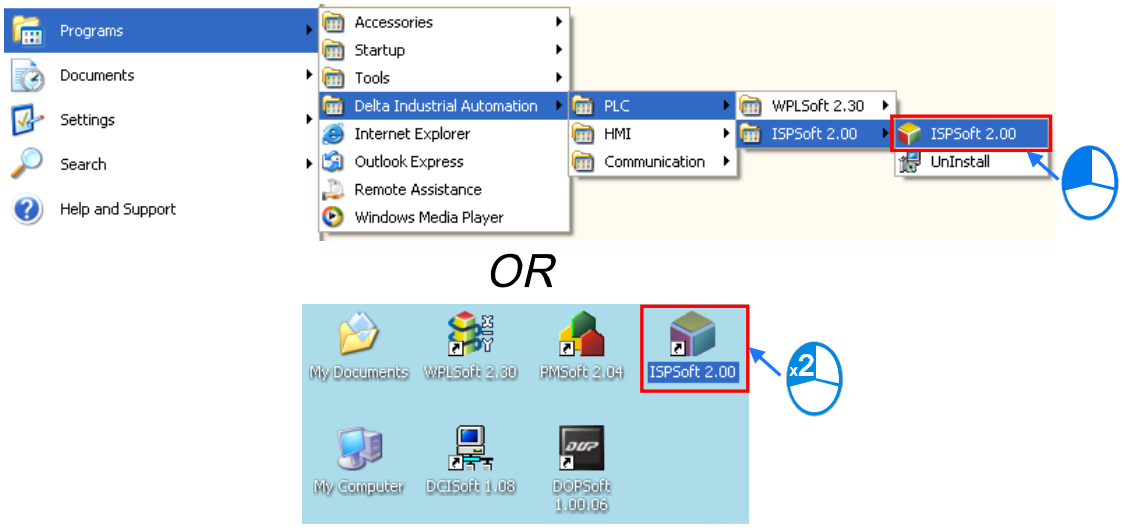
Step 2: Open the **COMMGR** window.



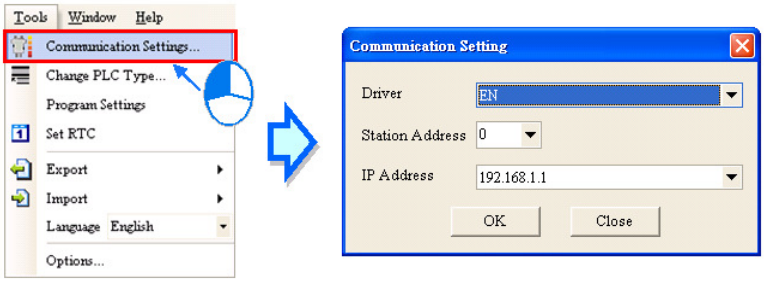
Step 3: Type “EN” in the **Drive Name** box, and select **Ethernet** in the **Type** drop-down list box in the **Connection Setup** section.



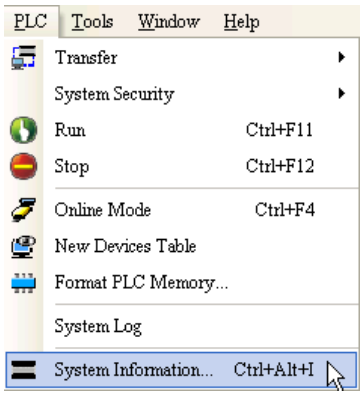
Step 4: Start ISPSoft.



Step 5: Click **Communication Settings…** on the **Tools** menu. Select **EN** in the **Driver** drop-down list box, and select the IP address of DVP12SE in the **IP Address** drop-down list box in the **Communication Setting** window.

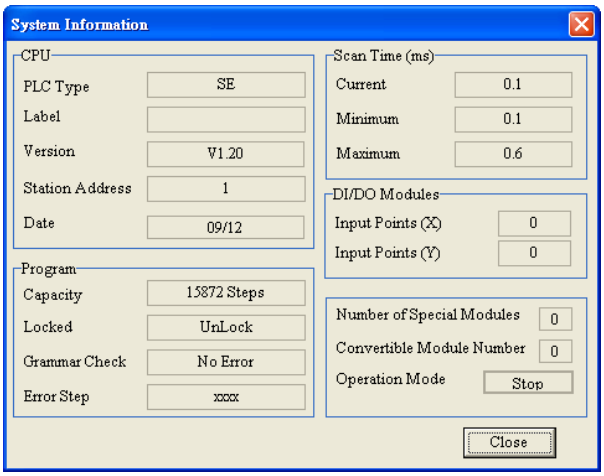


Step 6: Click **System Information**... on the **PLC** menu.



3

Situation 1: DVP12SE is connected to ISPSoft successfully.

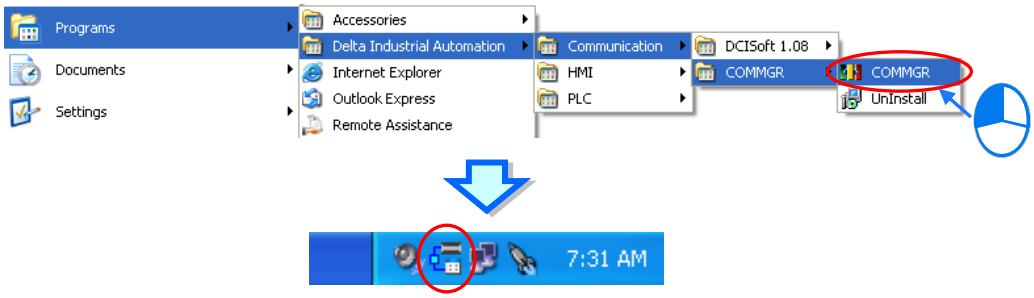


Situation 2: DVP12SE fails to connect to ISPSoft.

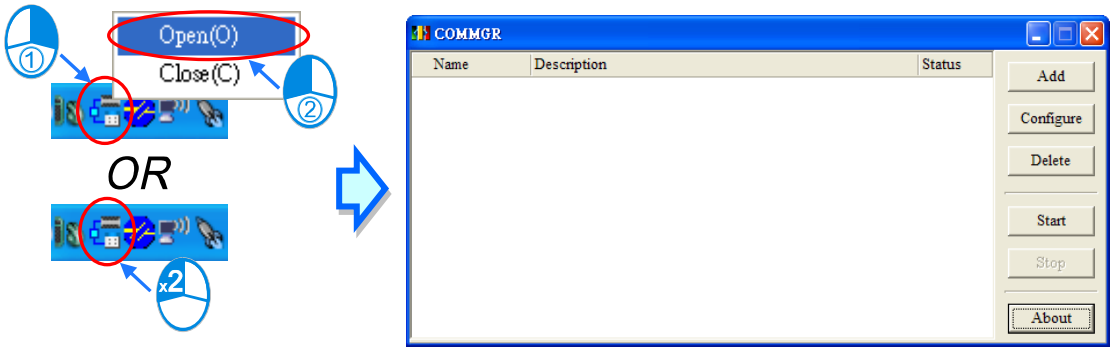
If the communication between ISPSoft and DVP12SE fails, please check whther the commnucation cable comes off, and the setting is incorrect.

3.1.2 RS-232 Communication

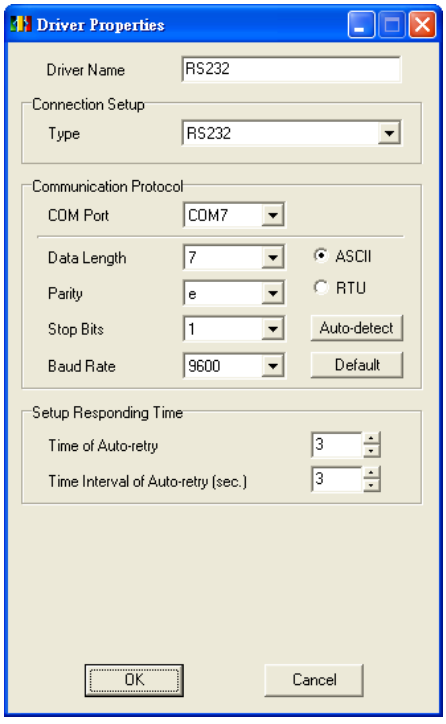
ISPSoft can be connected to DVP28SV2 through RS-232.
Step 1: Start COMMGR.



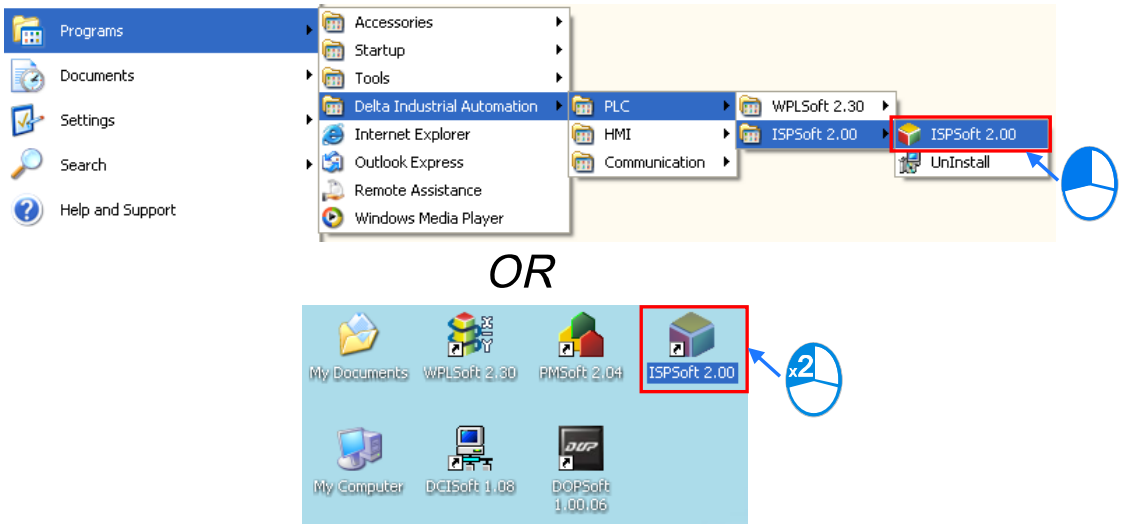
Step 2: Open the **COMMGR** window.



Step 3: Type “RS232” in the **Drive Name** box, select **RS232** in the **Type** drop-down list box in the **Connection Setup** section, and select the corresponding communication port in the **COM Port** drop-down list box in the **Communication Protocol** section.

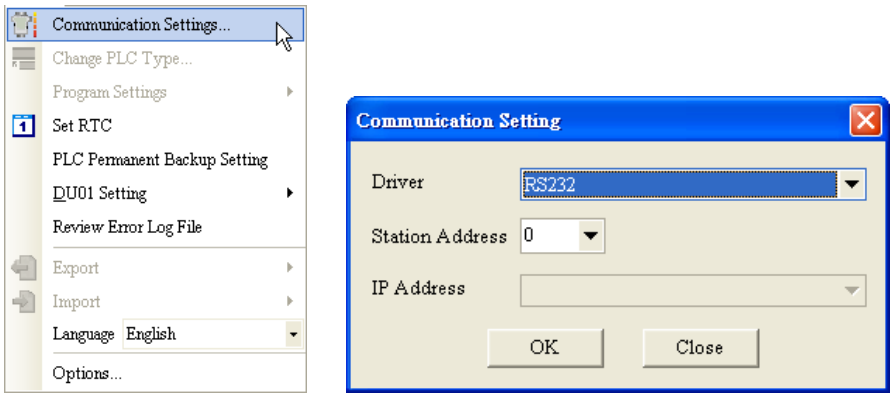


Step 4: Start ISPSoft.

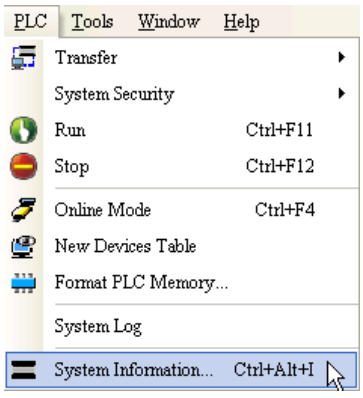


3

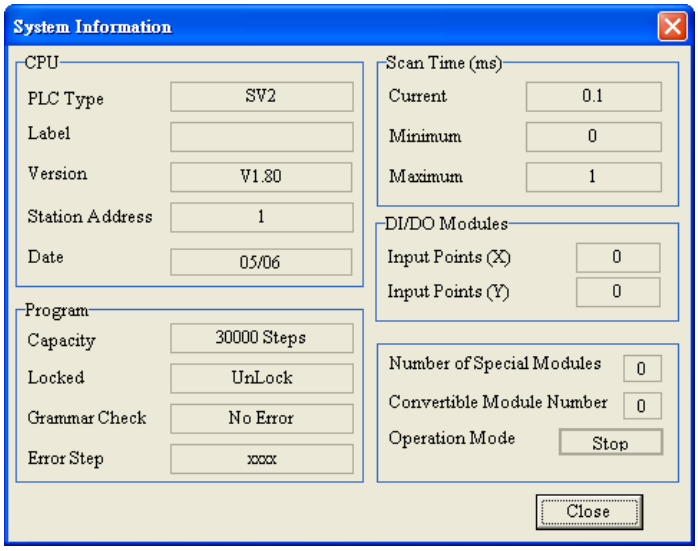
Step 5: Click **Communication Settings…** on the **Tools** menu. Select **RS232** in the **Driver** drop-down list box in the **Communication Setting** window.



Step 6: Click **System Information**... on the **PLC** menu.



Situation 1: DVP28SV2 is connected to ISPSoft successfully.



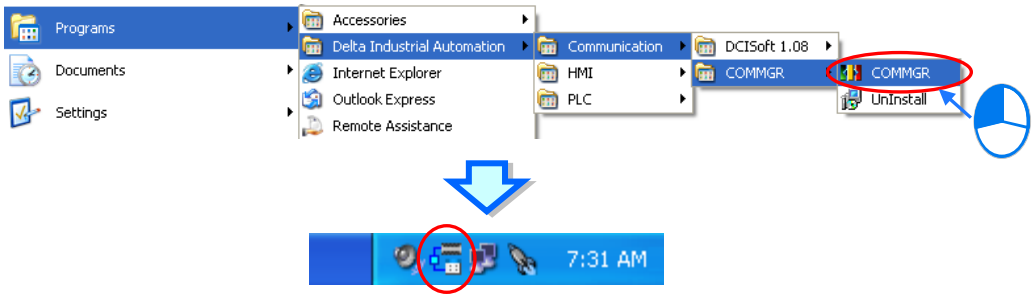
Situation 2: DVP28SV2 fails to connect to ISPSoft.

If the communication between ISPSoft and DVP28SV2 fails, please check whther the commnucation cable comes off, and the setting is incorrect.

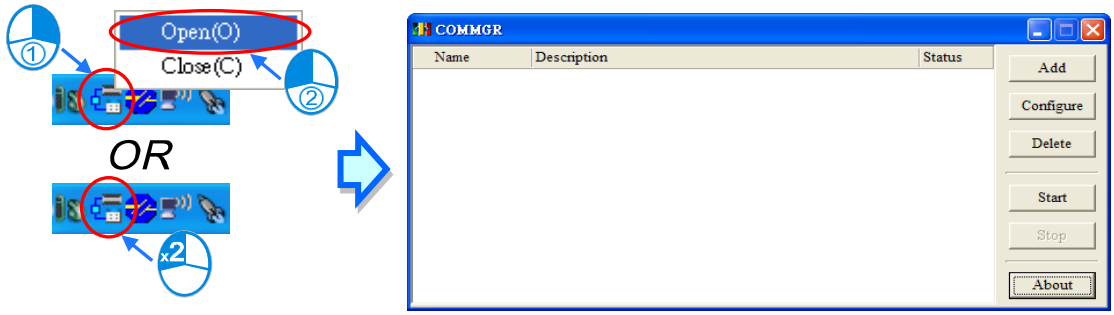
3.1.3 RS-485 Communication

ISPSoft can be connected to DVP28SV2 through RS-485.

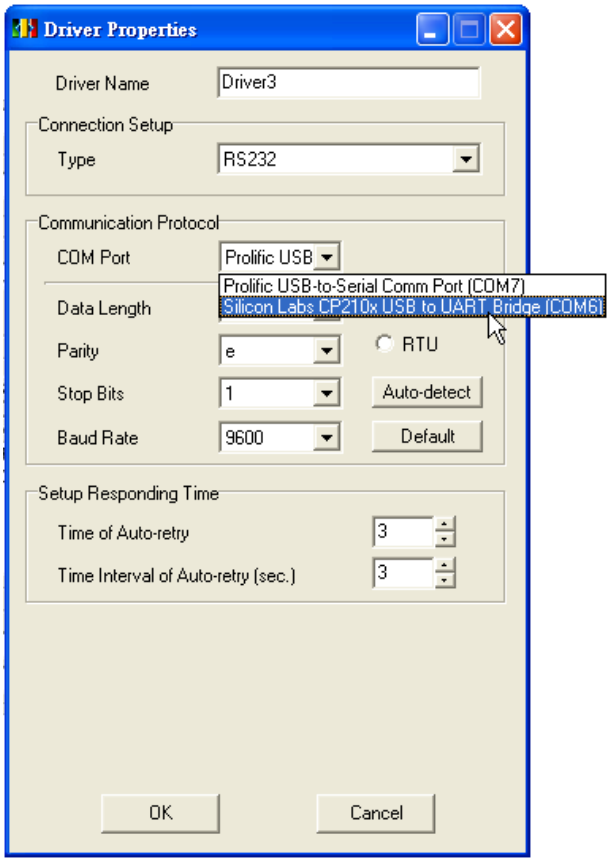
Step 1: Start COMMGR.



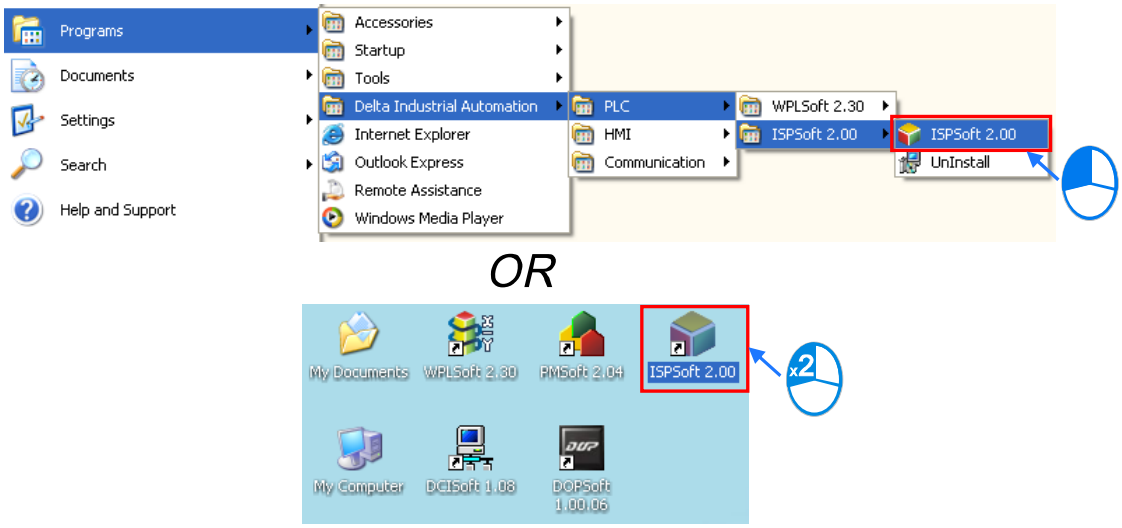
Step 2: Open the **COMMGR** window.



Step 3: Type “Driver3” in the **Drive Name** box, and select **RS232** in the **Type** drop-down list box in the **Connection Setup** section. Connect IFD6500 to DVP28SV2 so that DVP28SV2 can communicate with ISPSoft through RS-485. After the IFD6500 driver is installed, the communication port which will be used is called Silicon Labs CP210x USB to UART Bridge (COM6). Please select **Silicon Labs CP210x USB to UART Bridge (COM6)** in the **COM Port** drop-down list box in the **Communication Protocol** section.

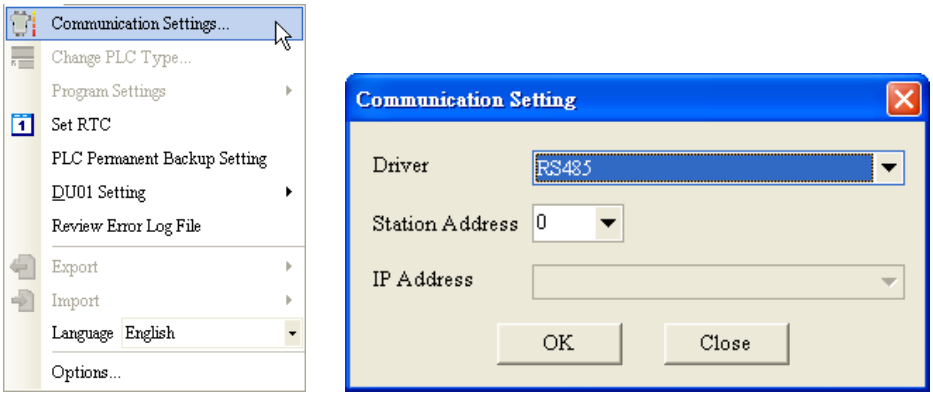


Step 4: Start ISPSoft.

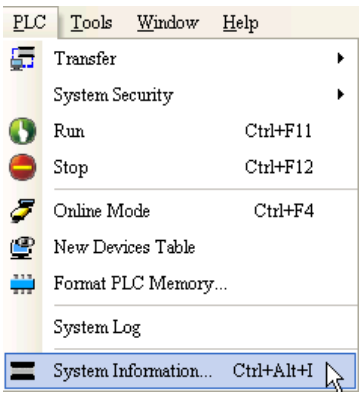


3

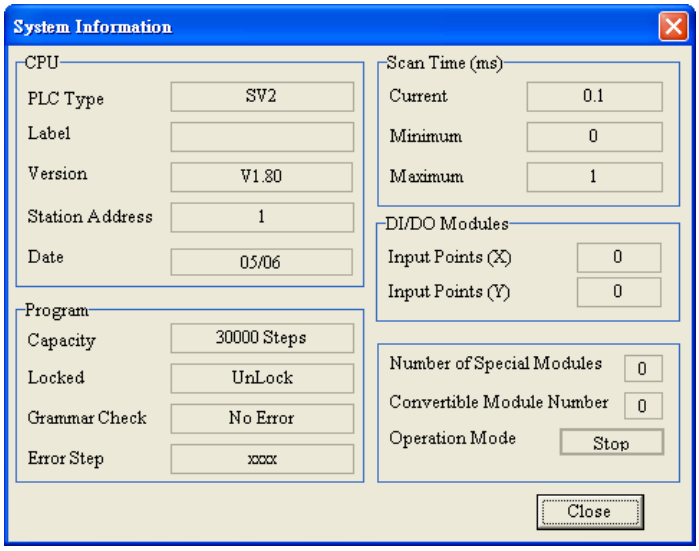
Step 5: Click **Communication Settings…** on the **Tools** menu. Select **RS485** in the **Driver** drop-down list box, and select 1 in the **Station Address** drop-down list box in the **Communication Setting** window.



Step 6: Click **System Information**... on the **PLC** menu.



Situation 1: DVP28SV2 is connected to ISPSoft successfully.

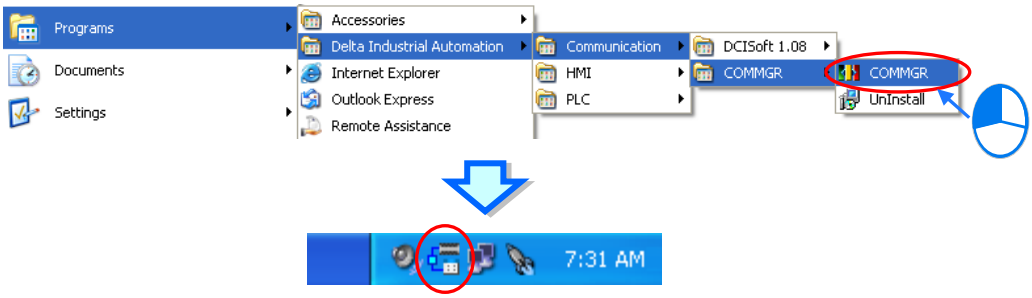


Situation 2: DVP28SV2 fails to connect to ISPSoft.

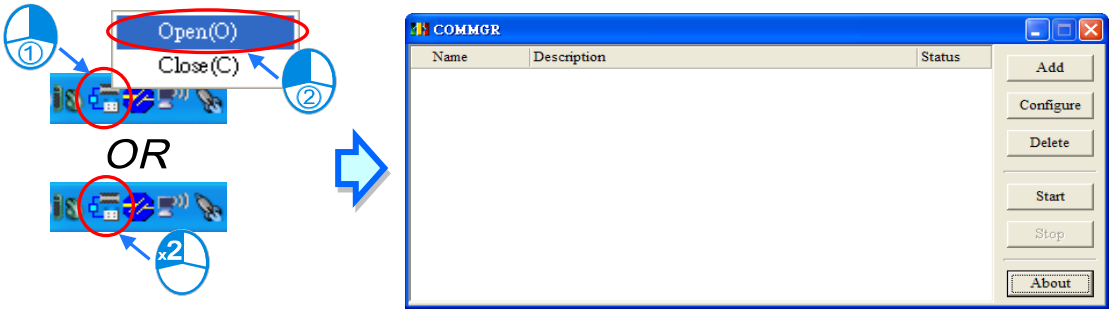
If the communication between ISPSoft and DVP28SV2 fails, please check whther the commnucation cable comes off, and the setting is incorrect.

3.1.4 USB Communication

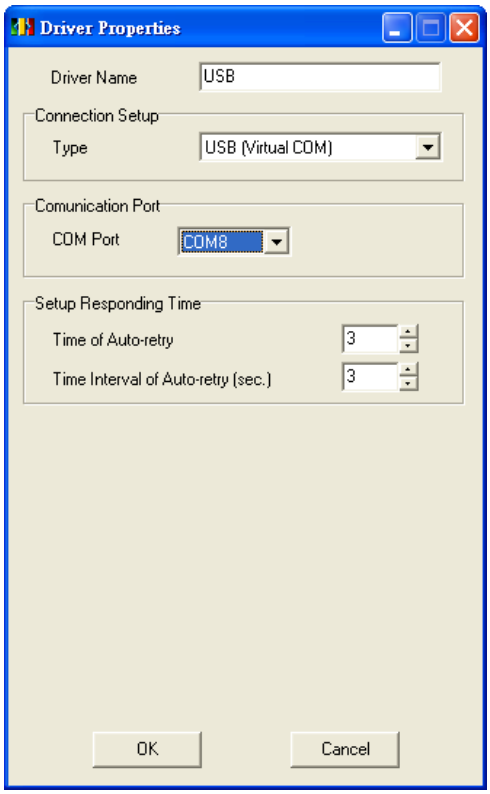
ISPSoft can be connected to DVP12SE through USB.
Step 1: Start COMMGR.



Step 2: Open the **COMMGR** window.

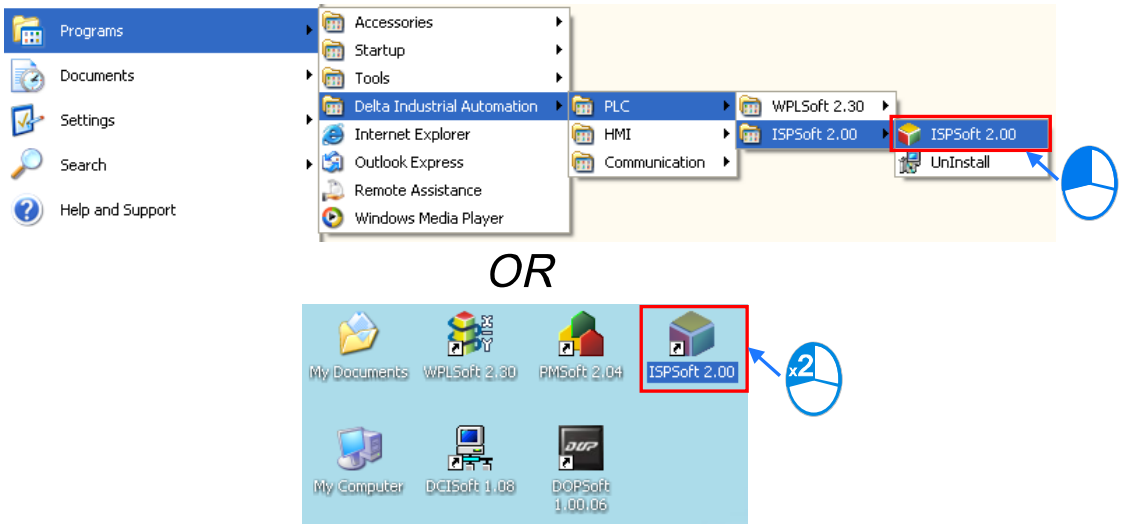


Step 3: Type “USV” in the **Drive Name** box, select **USB (Virtual COM)** in the **Type** drop-down list box in the **Connection Setup** section, and select the corresponding communication port in the **COM Port** drop-down list box in the **Communication Port** section.

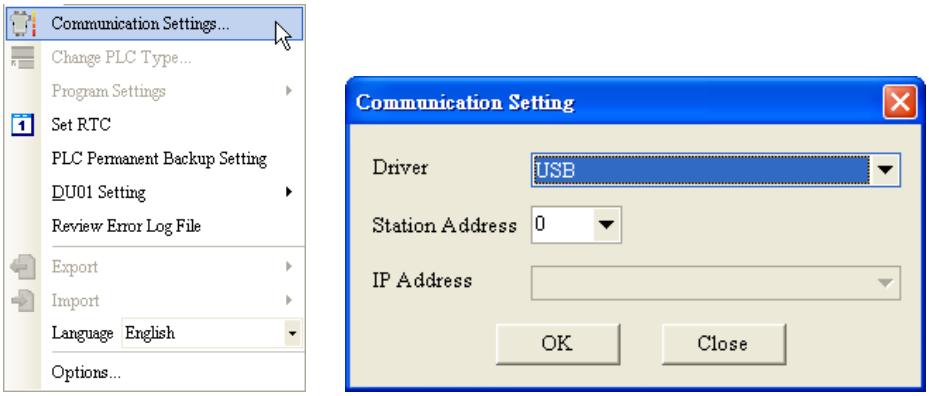


Step 4: Start ISPSoft.

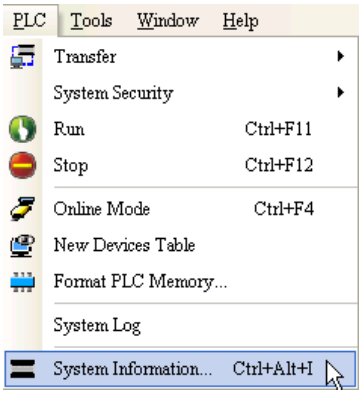
3


Programs
Documents
Settings
Search
Help and Support
Accessories
Startup
Tools
Delta Industrial Automation
Internet Explorer
Outlook Express
Remote Assistance
Windows Media Player
PLC
HMI
Communication
WPLSoft 2.30
ISPSoft 2.00
ISPSoft 2.00
UnInstall
OR
My Documents
WPLSoft 2.30
PMSoft 2.04
ISPSoft 2.00
x2
My Computer
DCISoft 1.08
DOPSoft 1.00.06

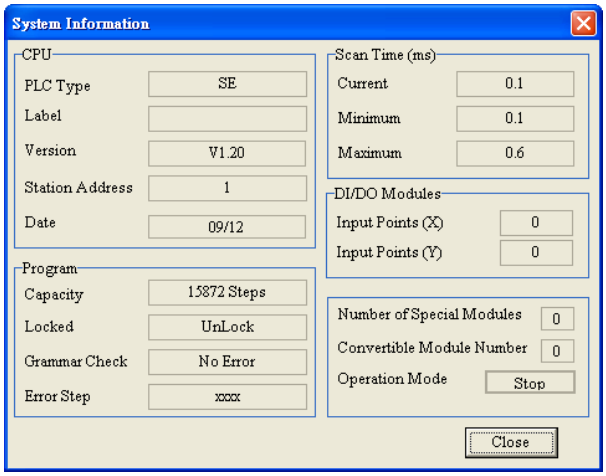
Step 5: Click **Communication Settings…** on the **Tools** menu. Select **USB** in the **Driver** drop-down list box in the **Communication Setting** window.



Step 6: Click **System Information**... on the **PLC** menu.



Situation 1: DVP12SE is connected to ISPSoft successfully.



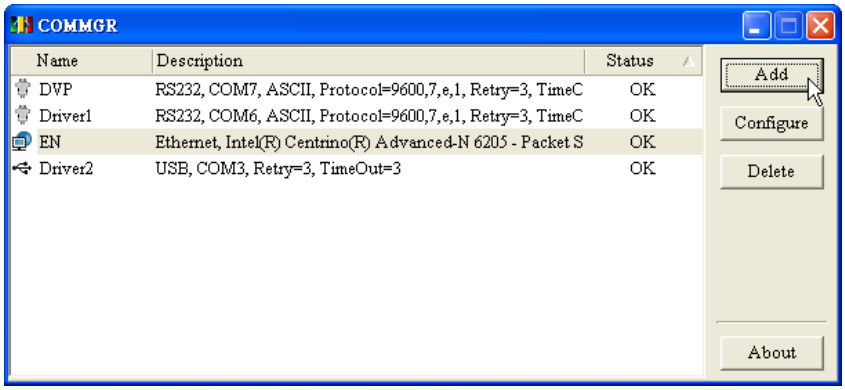
Situation 2: DVP28SV2 fails to connect to ISPSoft.

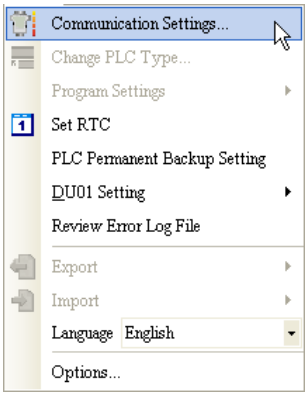
If the communication between ISPSoft and DVP28SV2 fails, please check whther the commnucation cable comes off, and the setting is incorrect.
Please refer to appendix A for more information aout setting USB communication.

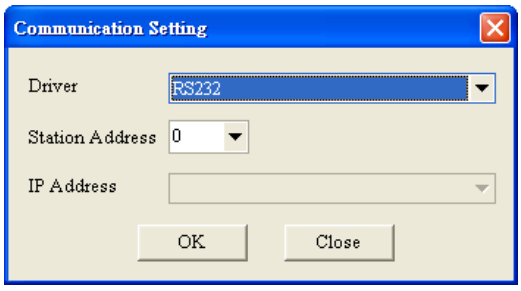
3.2 Uploading/Downloading a Program

3.2.1 Uploading a Program

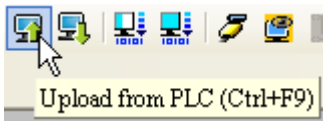
If users want to know the program stored in a PLC, they can connect the PLC to a PC, and upload the program through ISPSoft.
Step 1: Select a communication type.



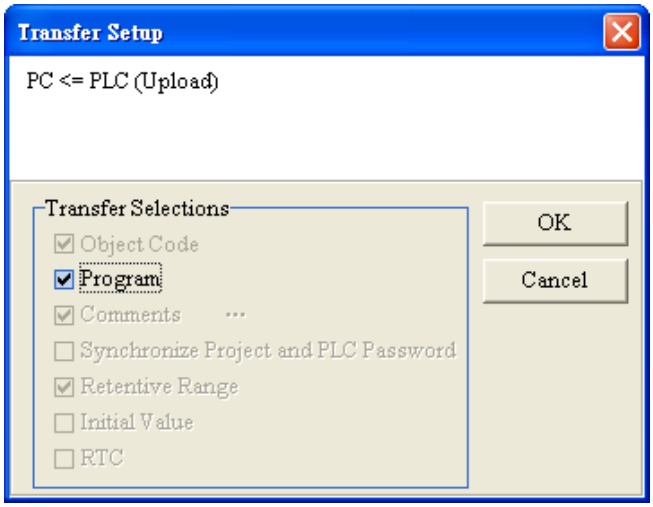




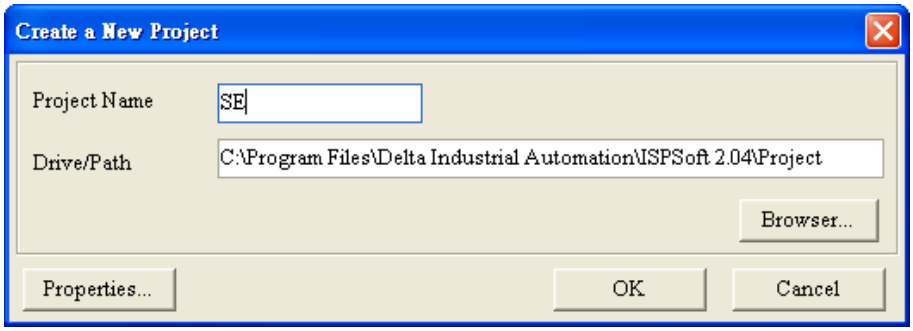
Step 2: After **Upload from PLC** on the toolbar is clicked, the program will be uploaded to the PC.



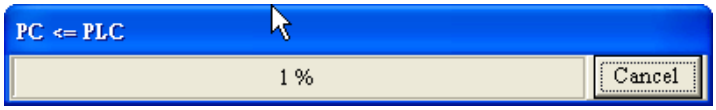
Click **OK**.



Type a project name in the **Project Name** box, and type a path in the **Drive/Path** box.



Percentage of progress



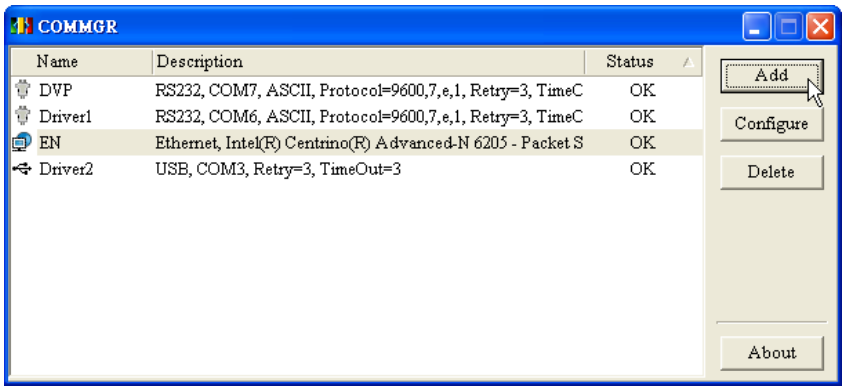
The uploading of the program is complete.

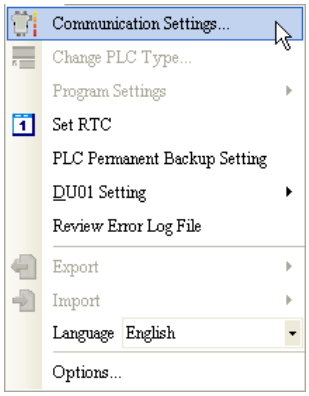
3

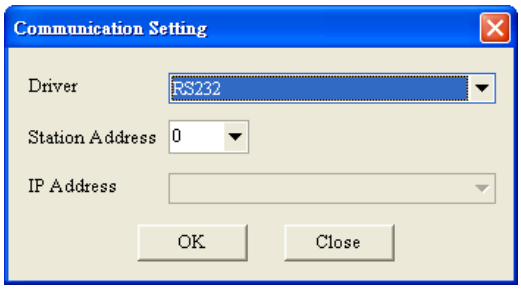
3.2.2 Downloading a Porgram

After users write a program, they can connect the PC to a PLC, and download the program to the PLC.

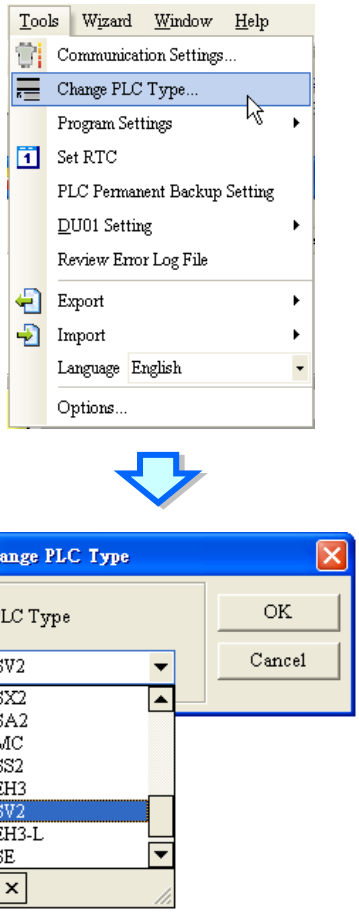
Step 1: Select a communication type.



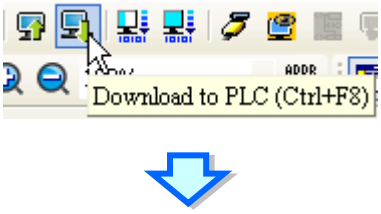




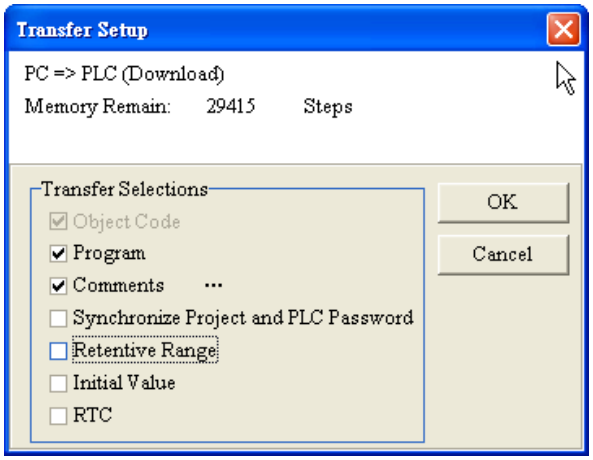
Step 2: Click **Change PLC Type**... on the **Tools** menu, and select a PLC in the **PLC Type** drop-down list box in the **Change PLC Type** window.



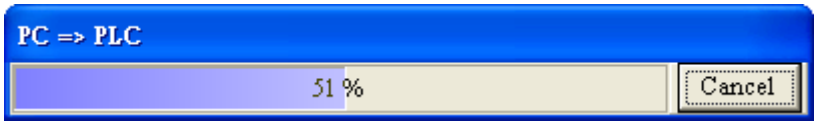
Step 3: After **Download to PLC** on the toolbar is clicked, the program will be downloaded to the PLC.



Users have to select checkboxes according to their needs.



Percentage of progress

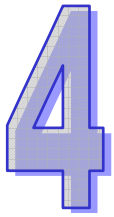


The downlading of the program is complete.

Note: If users want to download a program, the PLC selected in the **PLC Type** drop-down list box in the **Change PLC Type** window must be correct. Otherwise the program can not be downloaded.

MEMO

Chapter 4 Operating a Training Kit



Delta slim types of PLCs can exchange data with a master station through Ethernet, CANopen, or RS-485. The slave stations are used with a temperature measurement module, a digital input/output module, an analog input/output module, a high-speed output function, and a high-speed count function.

Table of Contents

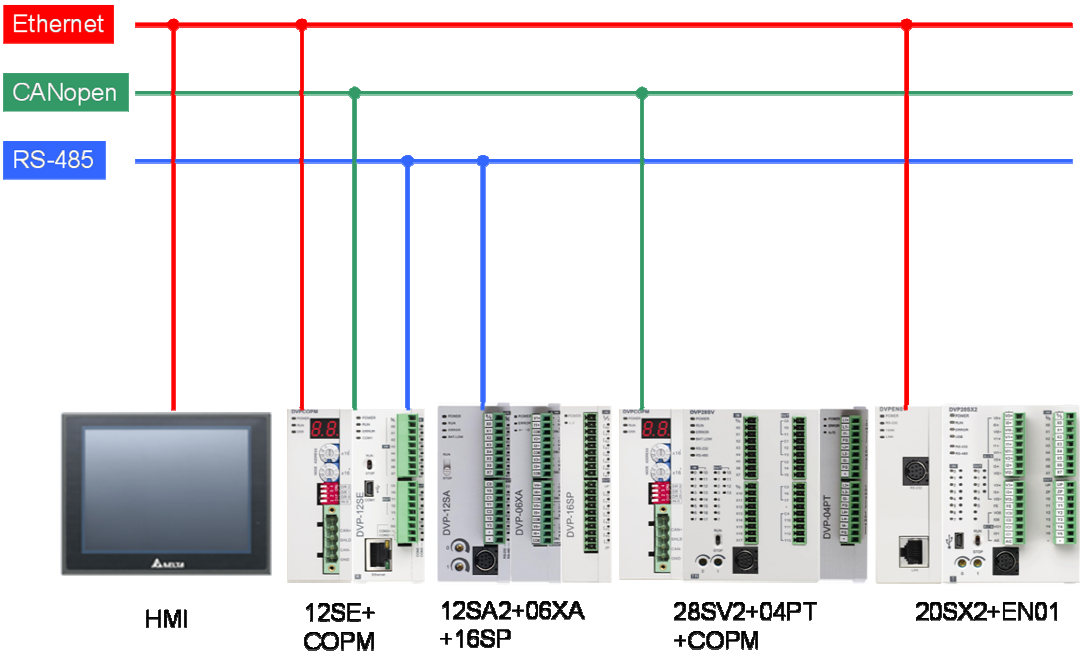
4.1 Introduction of a Training Kit

Delta slim types of PLCs can exchange data with a master station through Ethernet, CANopen, or RS-485.

The HMI can exchange data with the master station DVP12SE through Ethernet, and exchange data with slave station through DVP12SE. The master station DVP12SE functions as a data collection center. It communicates with the slave station DVP20SX2 through Ethernet, with the slave station DVP28SV2 through CANopen, with the slave station DVP12SA2 through RS-485. The slave stations are used with a temperature measurement module, a digital input/output module, an analog input/output module, a high-speed output function, and a high-speed count function. Please refer to the following sections for more information.

An equivalent communication structure is shown below.

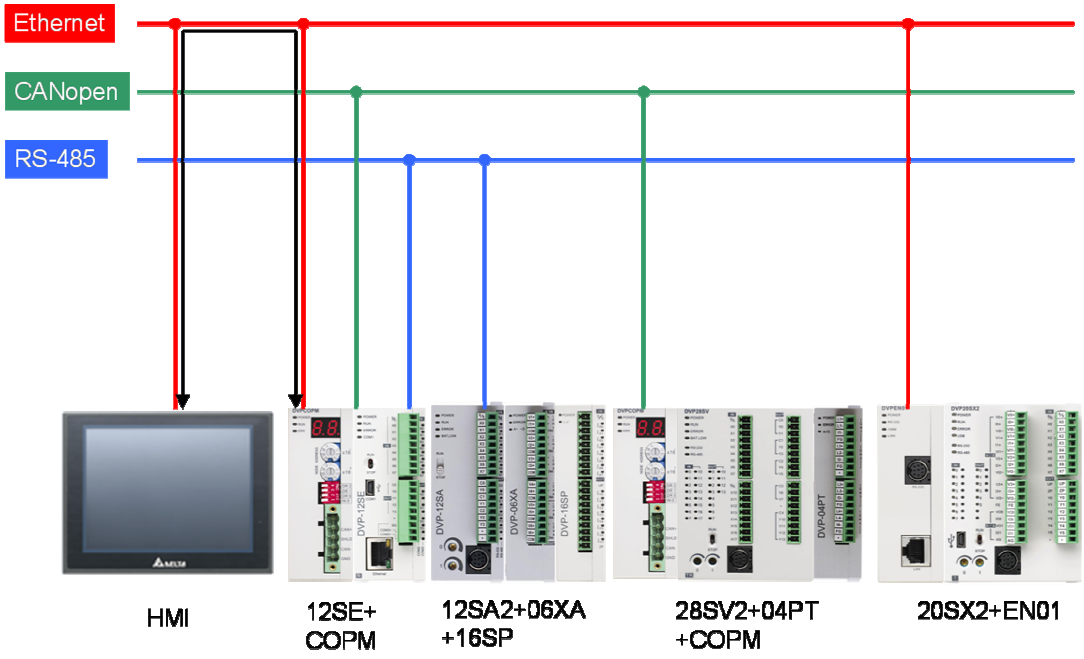
1. Equivalent communication structure



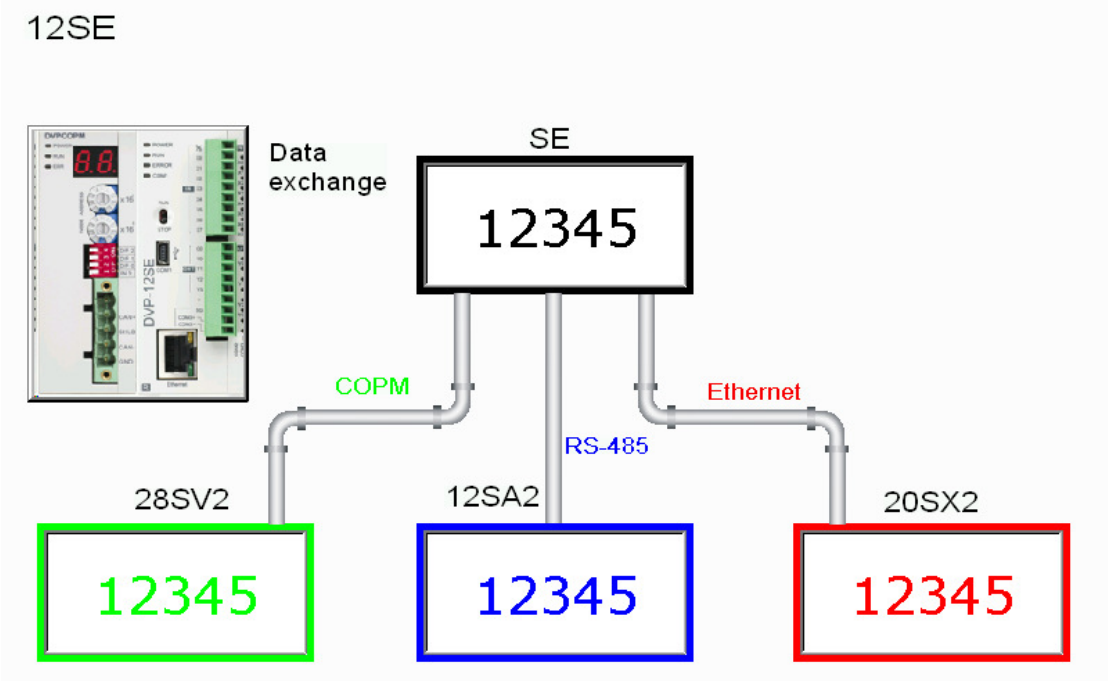
2. The devices on the panel of the training kit are shown below.

4.2 Functions of DVP12SE

- The HMI is connected to DVP12SE through Ethernet. It can exchange data with the master station DVP12SE through Ethernet, and exchange data with slave station through DVP12SE. An equivalent Ethernet network is shown below.



- The value in C0 is written into DVP28SV2, DVP12SA2, and DVP20SX2, and then the values written into DVP28SV2, DVP12SA2, and DVP20SX2 are read. The page displayed on the HMI is shown below.



- The HMI displays the devices which are involved in data exchange.

	HMI
Data source	C0
Device in which data read from DVP28SV2 is stored	D6039
Device in which data read from DVP12SA2 is stored	D1484
Device in which data read from DVP20SX2 is stored	D104

1. Data exchange table
   - The master station DVP12SE exchanges data with DVP28SV2 through CANopen.

Master station/Slave station	Master	Direction	Slave
PLC	**DVP12SE**		**DVP28SV2**
Writing data into DVP28SV2	D6289	→	D6039
Reading data from DVP28SV2	D6039	←	D6289

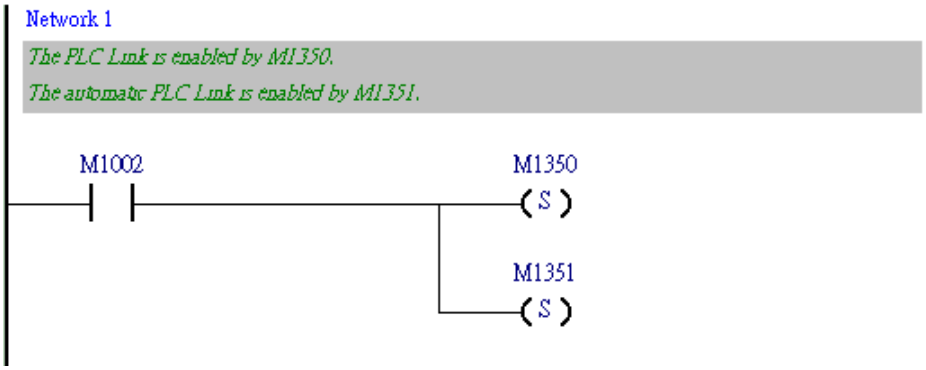
   - The master station DVP12SE exchanges data with DVP12SA2 through RS-485.

Master station/Slave station	Master	Direction	Slave
PLC	**DVP12SE**		**DVP12SA2**
Writing data into DVP12SA2	D1498	→	D202
Reading data from 12SA2	D1484	←	D104

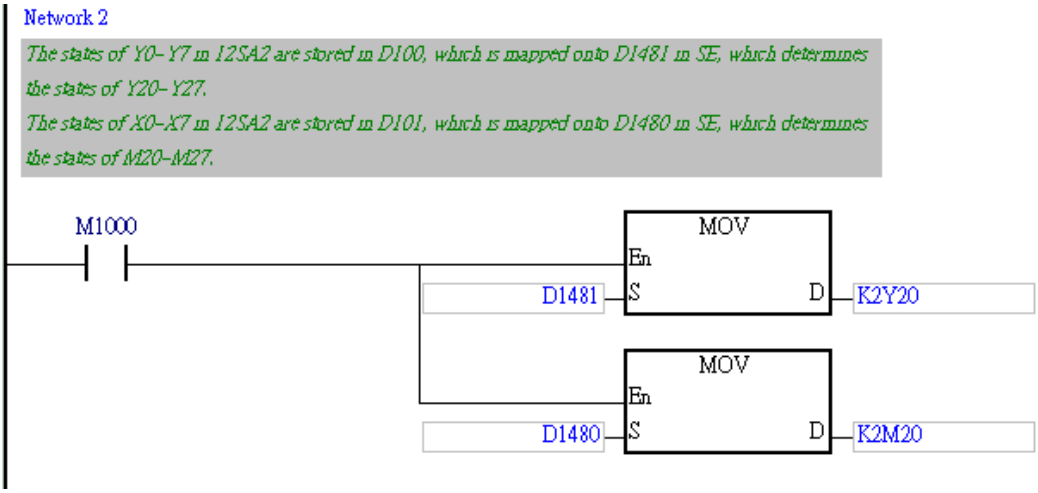
   - The master station DVP12SE exchanges data with DVP20SX2 through Ethernet.

Master station/Slave station	Master	Direction	Slave
PLC	**DVP12SE**		**DVP20SX2**
Writing data into DVP20SX2	D202	→	D102
Reading data from DVP20SX2	D104	←	D204

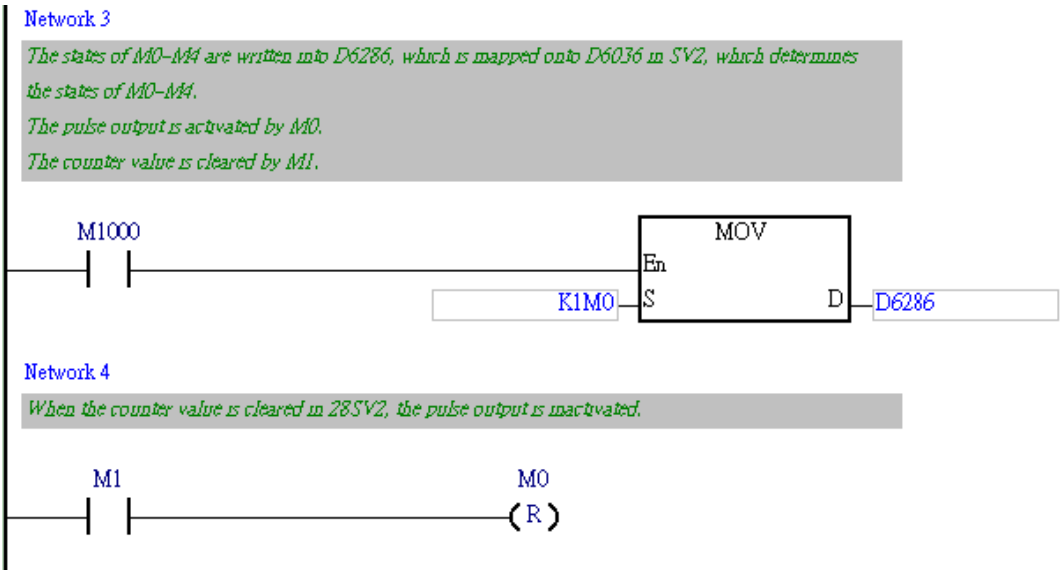
2. Control program
   - The RS-485 communication setting of the master station DVP12SE is shown below.



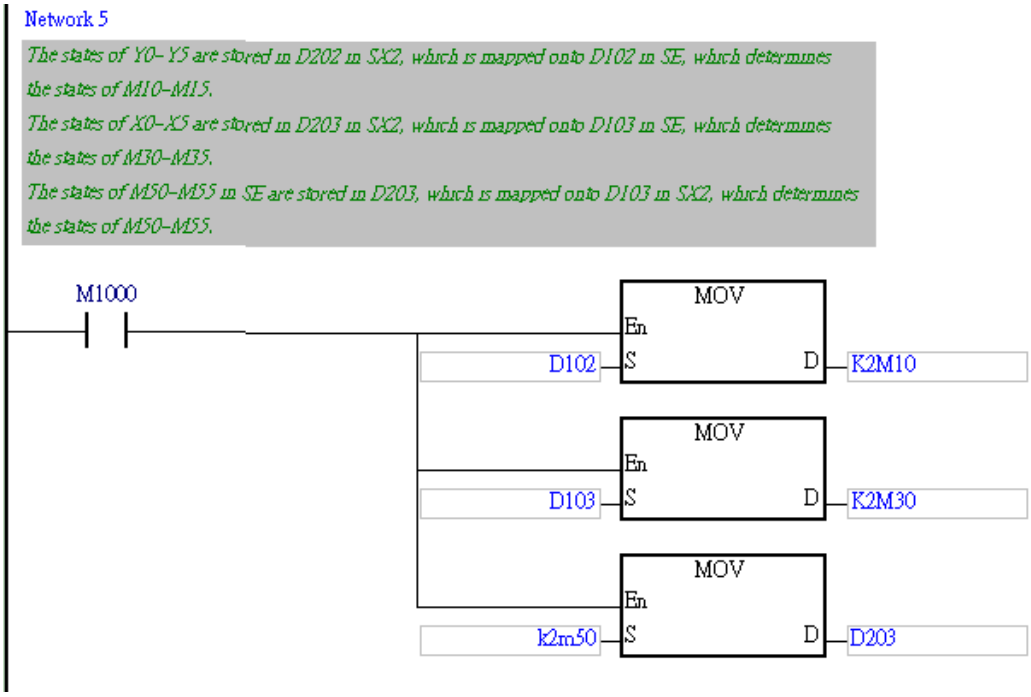
- DVP12SA2 is mapped onto DVP12SE. The program is shown below.



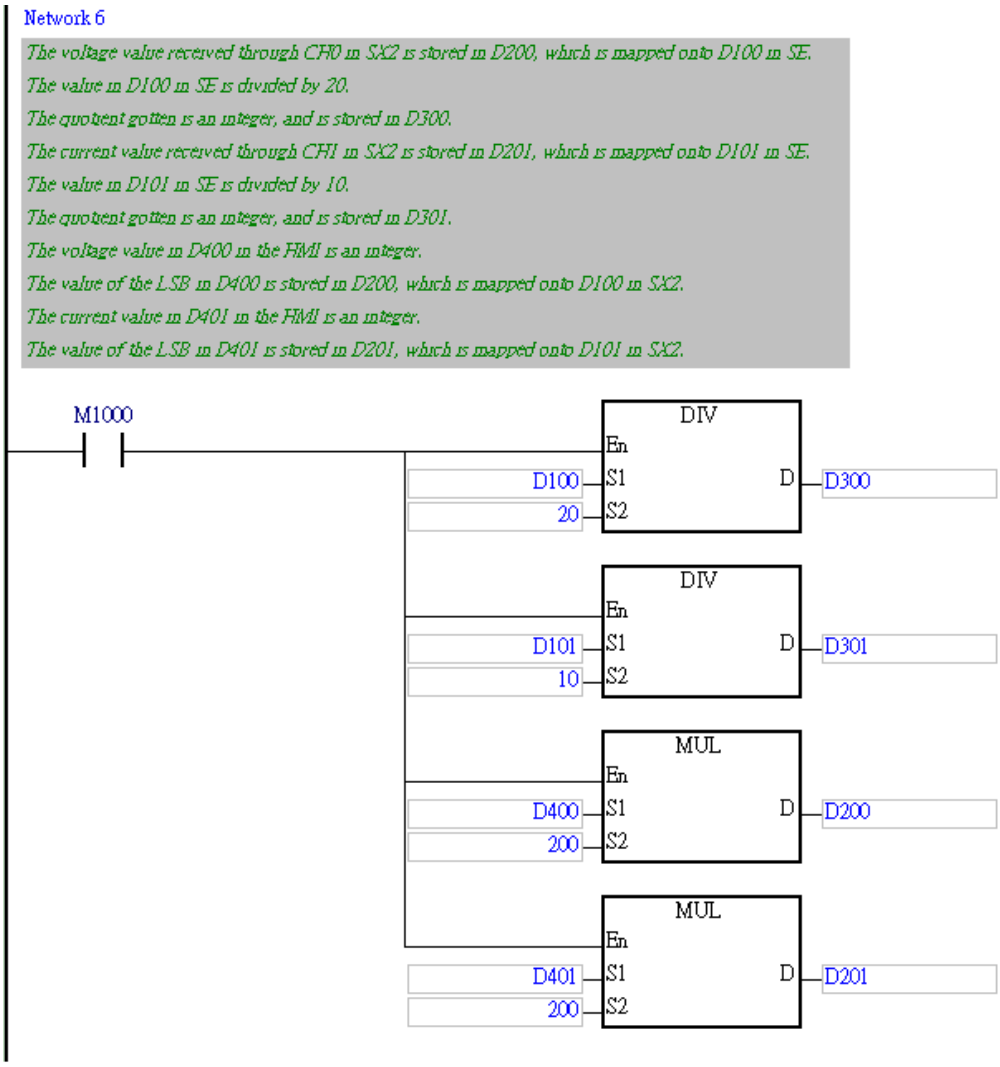
- The master station DVP12SE communicates with DVP28SV2 through CANopen. The setting of a high-speed pulse output flag and the setting of a pulse clearing flag are shown below.



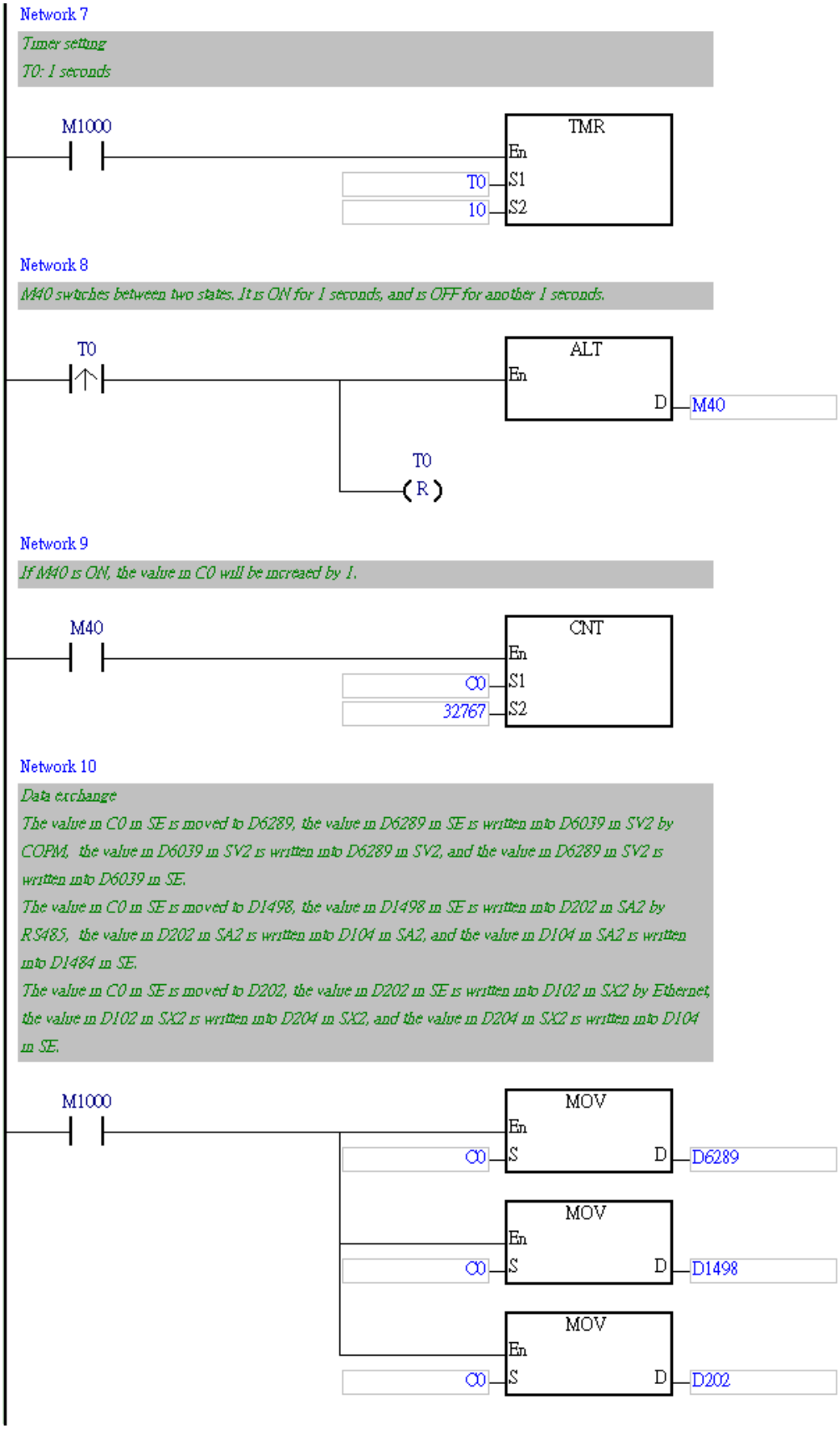
- The master station DVP12SE communicates DVP20SX2 through Ethernet. The setting of digital inputs and the setting of digital outputs are shown below.



- The master station DVP12SE communicates with DVP20SX2 through Ethernet. The setting of analog inputs and the setting of analog outputs are shown below.

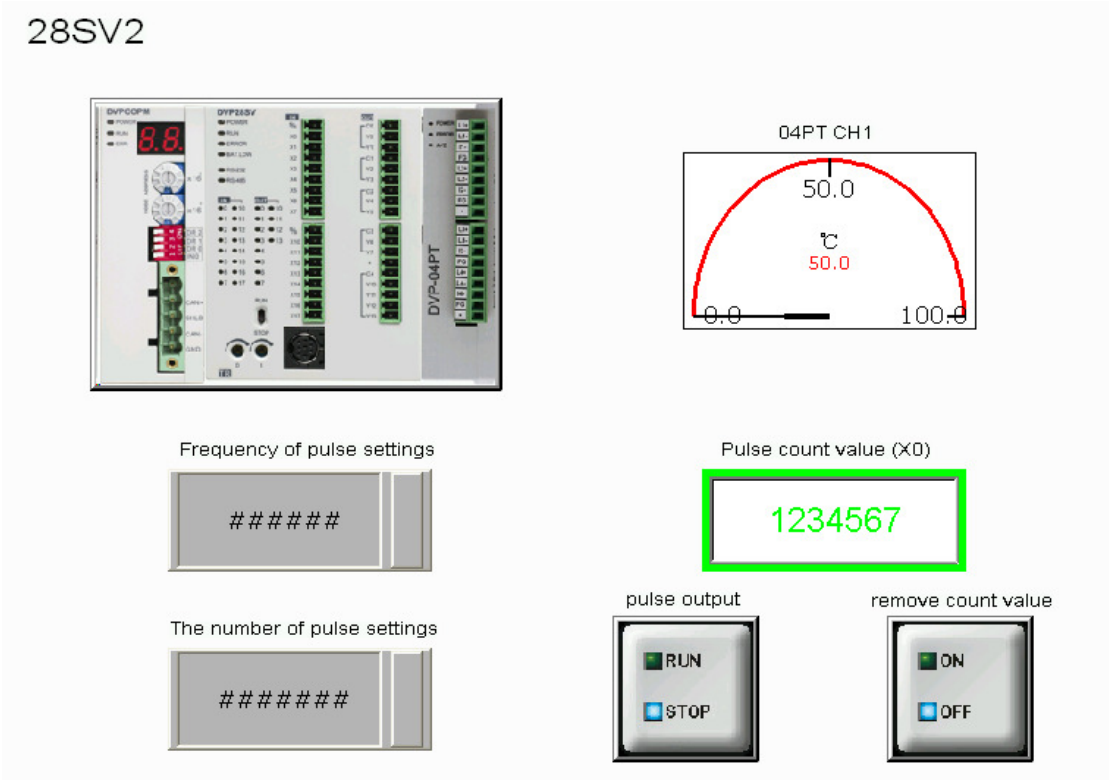


- The master station DVP12SE communicates with DVP12SA2 through RS-485, and with DVP28SV2 through DVPCOPM-SL, and with DVP20SX2 through Ethernet. The program is shown below.

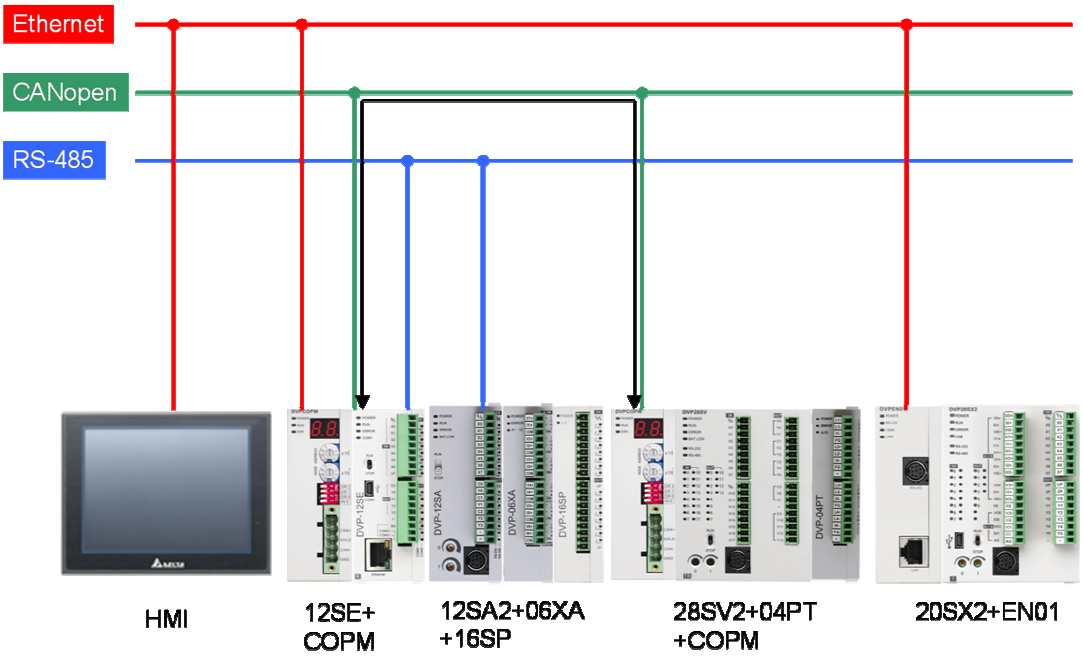


4.3 Functions of DVP28SV2

1. Page on the HMI
   - DVPCOPM-SL is connected to the left side of DVP28SV2. The master station DVP12SE exchanges data with DVP28SV2 through CANopen. The temperature measurement module DVP04PT-S is connected to the right side of DVP28SV2. It is used to measure room temperature.
   - Users can set the frequency of pulses sent by DVP28SV2, and the number of pulses sent by DVP28SV2. They can use DVP28SV2 to count pulses/
   - DVP04PT-S measure room temperature through a temperature sensor, and the room temperature measures is displayed on the HMI.
   - The page which displays the use of DVP28SV2 to send high-speed pulses and the room temperature measured is shown below.



- An equivalent CANopen network is shown below.



- The HMI displays the devices which are involved in data exchange.

	HMI
Reading the temperature sent by channels 1 in DVP04PT-S	D6032
Setting the frequency of pulses sent by DVP28SV2	D6282
Setting the number of pulses sent by DVP28SV2	D6284
High-speed count	D6033
Pulse output flag	M0
Count clearing flag	M1

2. The steps of setting the HMI are as follows.

   Step 1: Set the frequency of pulses sent by DVP28SV2, and the number of pulses sent by DVP28SV2

   Step 2: Press the Pulse output button so that the state of the button is RUN.

   Step 3: Press the Remove count value button so that the state of the button is ON. The state of the Pulse output button becomes STOP. If users want to resume the output of pulses, they have to set the Remove count value button to OFF, otherwise the Pulse output button can not be set to RUN.

   Note: When pulses are sent, users can set the frequency of pulses sent by DVP28SV2, but they can not change the number of pulses sent by DVP28SV2.

3. Setting DVPCOPM-SL

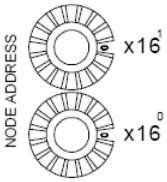
The master station DVP12SE communicates with DVP28SV2 through DVPCOPM-SL,

	DVP28SV2			DVP12SE	HMI
Reading the temperature sent by channels 1 in DVP04PT-S	D6282		→	D6032	D6032
Frequency of pulses	D6032		←	D6282	D6282
Number of pulses	D6034		←	D6284	D6284
High-speed count	D6283		→	D6033	D6033
Pulse output flag	M0	D6036	←	D6286	M0
Count clearing flag	M1		←		M1
Writing data into DVP28SV2	D6039		←	D6289	
Reading data from DVP28SV2	D6289		→	D6039	D6039

4. Setting hardware

Step 1: Setting a station address

It is used to set the node address of DVPCOPM-SL on a CANopen network. The node addresses which can be used range from 1 to 7F. (0 and 80~FF can not be used.)

Setting	Description	
1~7F	Available nodes on a CANopen network	
0, 80~FF	Unavailable nodes on a CANopen network	

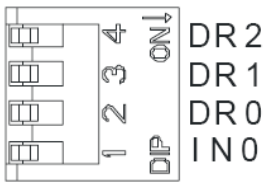
Note:

- Please use a slotted screwdriver to turn the knobs with care, and do not scrape them.
- When the power supply is cut off, a node address can be set. After the setting of a node address is complete, DVPCOPM-SL can be supplied with power.

Step 2: Setting the same baud rate

It is used to set the transmission rate of DVPCOPM-SL on a CANopen network. The relation between transmission rates and maximum communication distances are shown below.

DR 2	DR 1	DR0	Transmission rate	Maximum communication distance
OFF	OFF	OFF	10 kbps	5000 m
OFF	OFF	ON	20 kbps	2500 m
OFF	ON	OFF	50 kbps	1000 m
OFF	ON	ON	125 kbps	500 m
ON	OFF	OFF	250 kbps	250 m
ON	OFF	ON	500 kbps	100 m
ON	ON	OFF	800 kbps	50 m
ON	ON	ON	1 Mbps	25 m
IN 0				Reserved



Note:

- Please use a slotted screwdriver to turn the knobs with care, and do not scrape them.
- When the power supply is cut off, a node address can be set. After the setting of a node address is complete, DVPCOPM-SL can be supplied with power.

Step 3: Supplying the power again

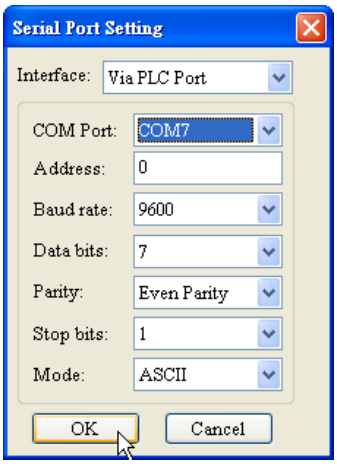
5. Setting the software

CANopen Builder is used to set the work mode of the module and the devices which can be

involved in data exchange.

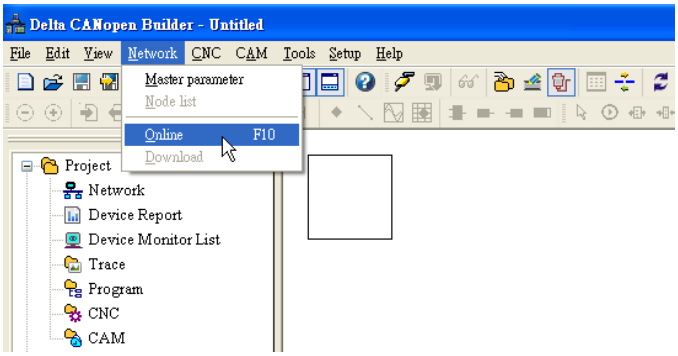
- Setting the work mode of the module

  Step 1: Set the communication between the software and the module.

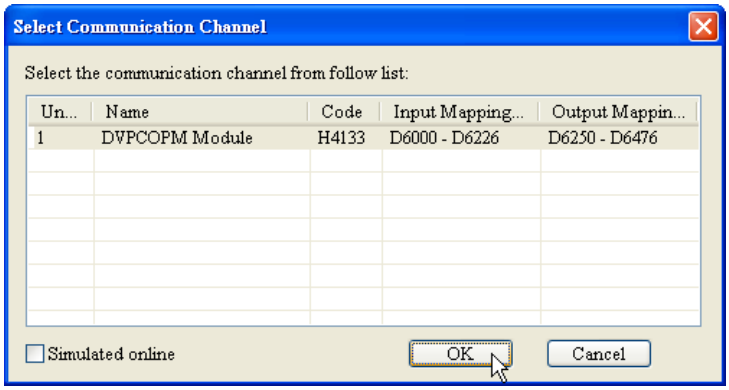


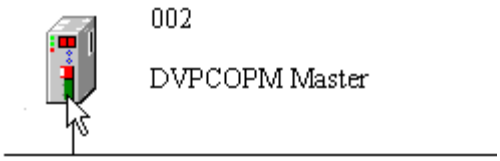
4

Step 2: Click **Online** on the **Network** menu.

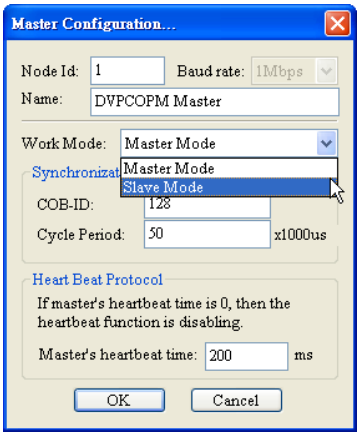


Step 3: Select a communication channel.

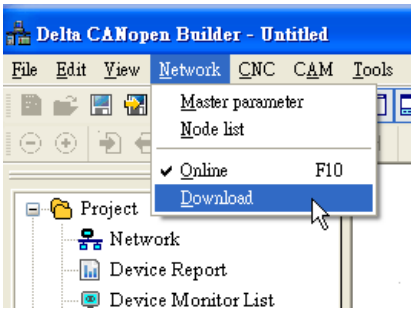


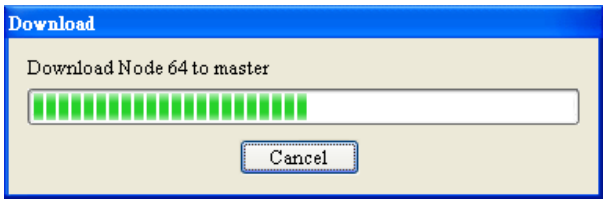


Step 4: Set the work mode of the module.



Click **Download** on the **Network** menu.

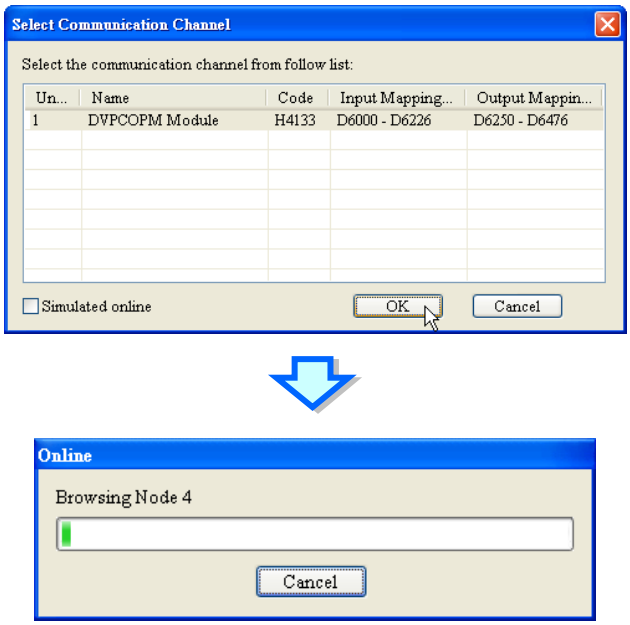




Step 5: Supply the power to the module again.

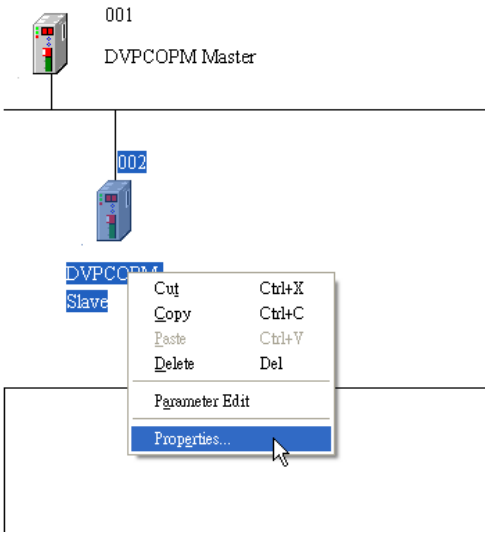
- Setting the devices which can be involved in data exchange

  Step 1: After the work mode of the module is set, users have to connect the software to the master station. After the users click **Online** on the **Network** menu, the node which is connected to the master station will be scanned

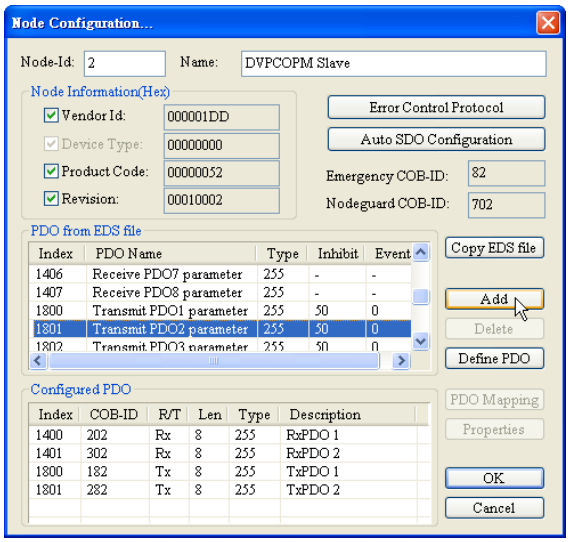


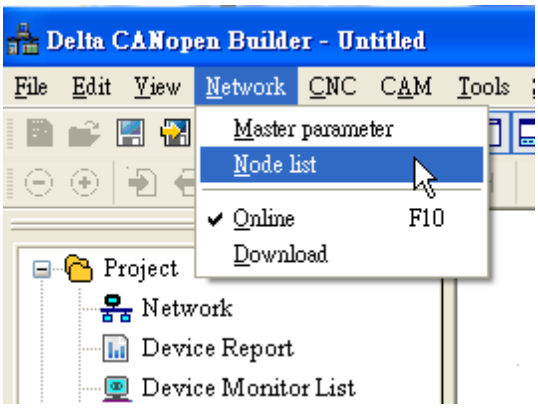
4

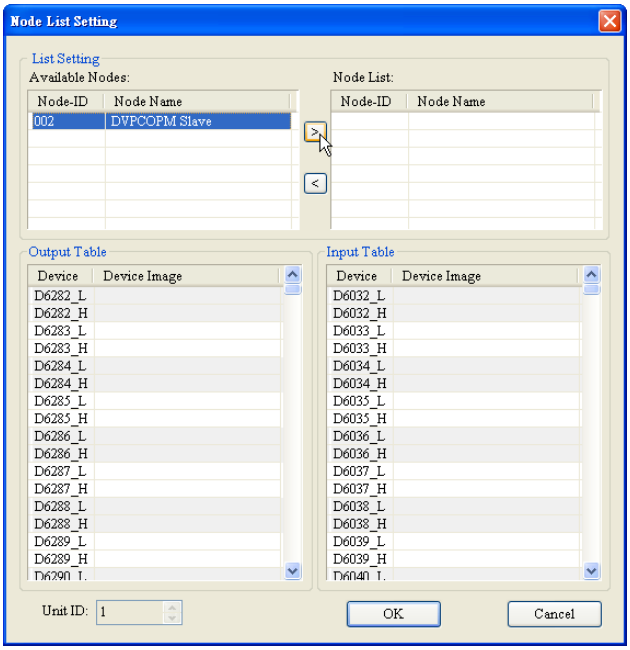
Step 2: Set the devices which can be involved in data exchange.

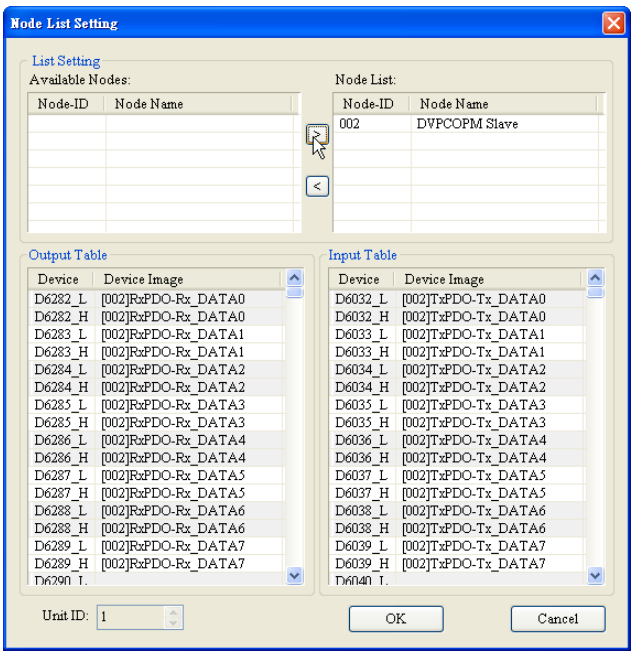


Increase devices which can be involved in data exchange.

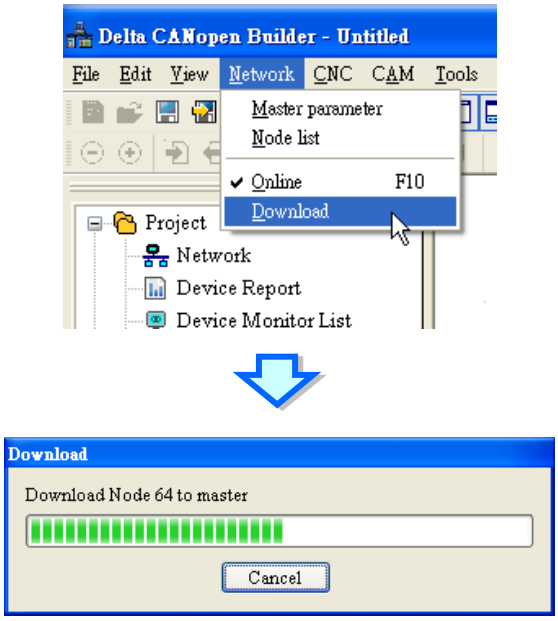

Node Configuration...
Node-Id: 2
Name: DVPCOPM Slave
Node Information(Hex)
Vendor Id: 000001DD
Device Type: 00000000
Product Code: 00000052
Revision: 00010002
Error Control Protocol
Auto SDO Configuration
Emergency COB-ID: 82
Nodeguard COB-ID: 702
PDO from EDS file
Index PDO Name Type Inhibit Event
1406 Receive PDO7 parameter 255 - -
1407 Receive PDO8 parameter 255 - -
1800 Transmit PDO1 parameter 255 50 0
1801 Transmit PDO2 parameter 255 50 0
1802 Transmit PDO3 parameter 255 50 0
Copy EDS file
Add
Delete
Define PDO
Configured PDO
Index COB-ID R/T Len Type Description
1400 202 Rx 8 255 RxPDO 1
1401 302 Rx 8 255 RxPDO 2
1800 182 Tx 8 255 TxPDO 1
1801 282 Tx 8 255 TxPDO 2
PDO Mapping
Properties
OK
Cancel


Delta CANopen Builder - Untitled
File Edit View Network CNC CAM Tools
Master parameter
Node list
Online F10
Download
Project
Network
Device Report
Device Monitor List


Node List Setting
List Setting
Available Nodes:
Node-ID
Node Name
002
DVPCOPM Slave
Node List:
Node-ID
Node Name
Output Table
Device
Device Image
D6282_L
D6282_H
D6283_L
D6283_H
D6284_L
D6284_H
D6285_L
D6285_H
D6286_L
D6286_H
D6287_L
D6287_H
D6288_L
D6288_H
D6289_L
D6289_H
Input Table
Device
Device Image
D6032_L
D6032_H
D6033_L
D6033_H
D6034_L
D6034_H
D6035_L
D6035_H
D6036_L
D6036_H
D6037_L
D6037_H
D6038_L
D6038_H
D6039_L
D6039_H
Unit ID:
1
OK
Cancel


Node List Setting
List Setting
Available Nodes:
Node-ID
Node Name
Node List:
Node-ID
Node Name
002
DVPCOPM Slave
Output Table
Device
Device Image
D6282_L [002]RxPDO-Rx_DATA0
D6282_H [002]RxPDO-Rx_DATA0
D6283_L [002]RxPDO-Rx_DATA1
D6283_H [002]RxPDO-Rx_DATA1
D6284_L [002]RxPDO-Rx_DATA2
D6284_H [002]RxPDO-Rx_DATA2
D6285_L [002]RxPDO-Rx_DATA3
D6285_H [002]RxPDO-Rx_DATA3
D6286_L [002]RxPDO-Rx_DATA4
D6286_H [002]RxPDO-Rx_DATA4
D6287_L [002]RxPDO-Rx_DATA5
D6287_H [002]RxPDO-Rx_DATA5
D6288_L [002]RxPDO-Rx_DATA6
D6288_H [002]RxPDO-Rx_DATA6
D6289_L [002]RxPDO-Rx_DATA7
D6289_H [002]RxPDO-Rx_DATA7
Input Table
Device
Device Image
D6032_L [002]TxPDO-Tx_DATA0
D6032_H [002]TxPDO-Tx_DATA0
D6033_L [002]TxPDO-Tx_DATA1
D6033_H [002]TxPDO-Tx_DATA1
D6034_L [002]TxPDO-Tx_DATA2
D6034_H [002]TxPDO-Tx_DATA2
D6035_L [002]TxPDO-Tx_DATA3
D6035_H [002]TxPDO-Tx_DATA3
D6036_L [002]TxPDO-Tx_DATA4
D6036_H [002]TxPDO-Tx_DATA4
D6037_L [002]TxPDO-Tx_DATA5
D6037_H [002]TxPDO-Tx_DATA5
D6038_L [002]TxPDO-Tx_DATA6
D6038_H [002]TxPDO-Tx_DATA6
D6039_L [002]TxPDO-Tx_DATA7
D6039_H [002]TxPDO-Tx_DATA7
Unit ID:
1
OK
Cancel

Step 3: Download the parameters to the master station.

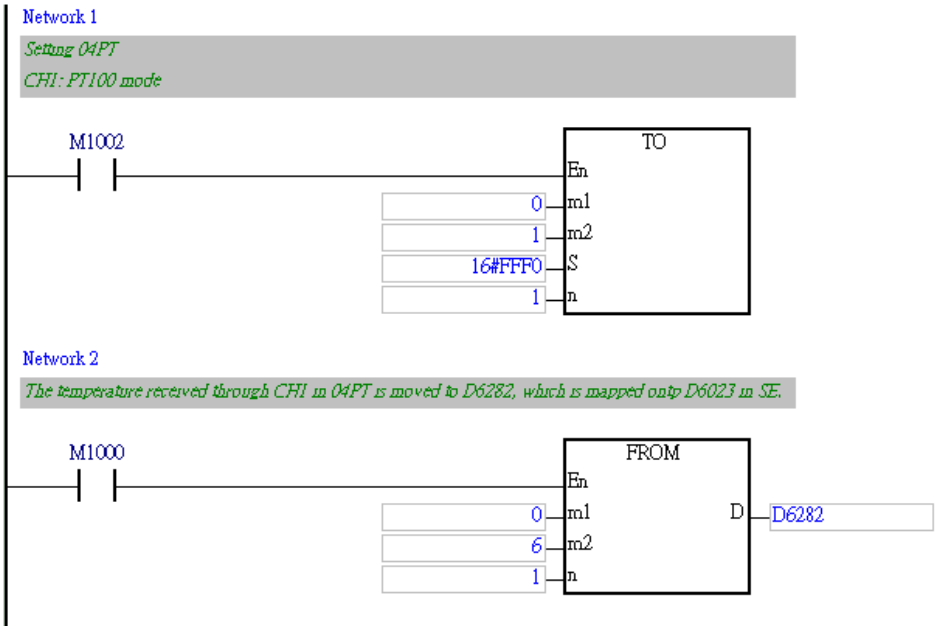


Step 4: Supply the power to the module again.

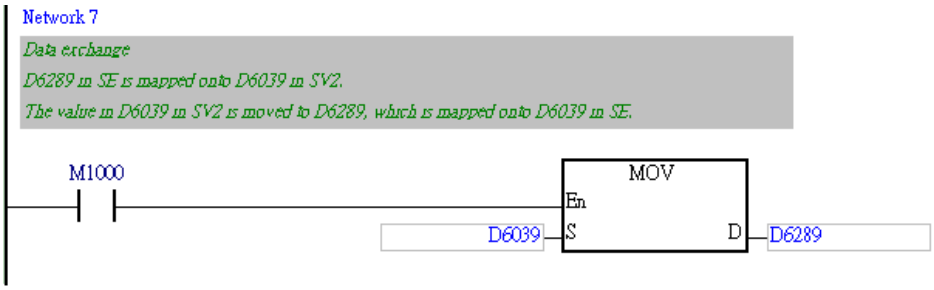
Please refer to DVPCOMPM-SL CANopen Master Communication Module Operation Manual for more information.

6. Control program

- Set the channel 1 in the temperature measurement module to PT100 mode.



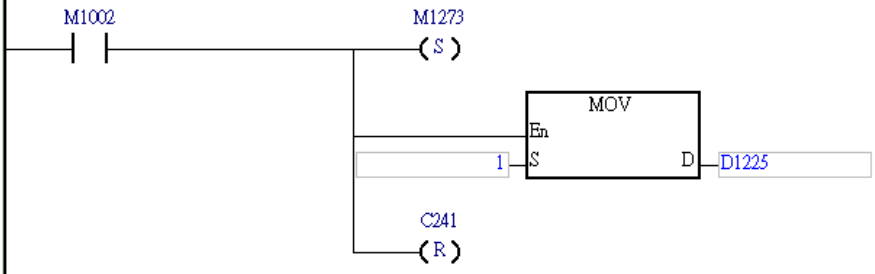
- The slave station DVP28SV2 receives data from the master station DVP12SE, and then DVP28SV2 sends data to DVP12SE through CANopen.



- Set the high-speed output Y0 in DVP28SV2. X0 uses the high-speed counter C241.

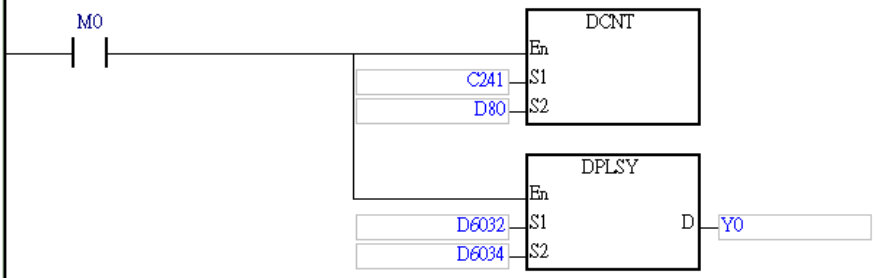
Network 3

Setting 28SV2
M1273: Enabling the external input X0
The value in D1225 determined the count mode.
Count mode: One time the frequency of A/B-phase inputs
Resetting the high-speed counter C241



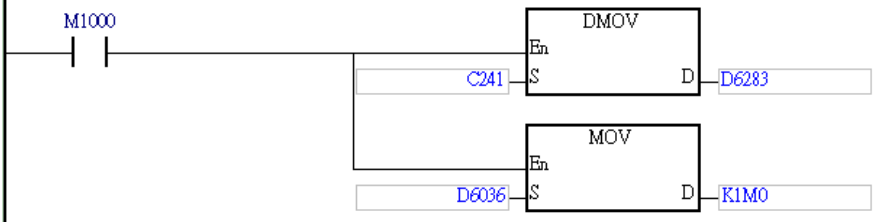
Network 4

C241 counts the pulses received through X0.
The frequency of pulse outputs is stored in D6282 in SE, which is mapped onto D6023 in SV2.
The number of pulse outputs is stored in D6284, which is mapped onto D6034 in SV2.



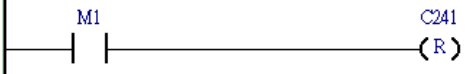
Network 5

The value in the high-speed counter C241 is moved to D6283 in SV2, which is mapped onto D6033 in SE.
D6286 in SE is mapped onto D6036 in SV2, which determines the states of M0~M4.



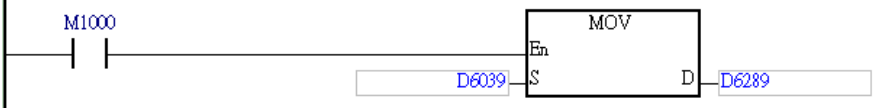
Network 6

Clearing the counter value in C241



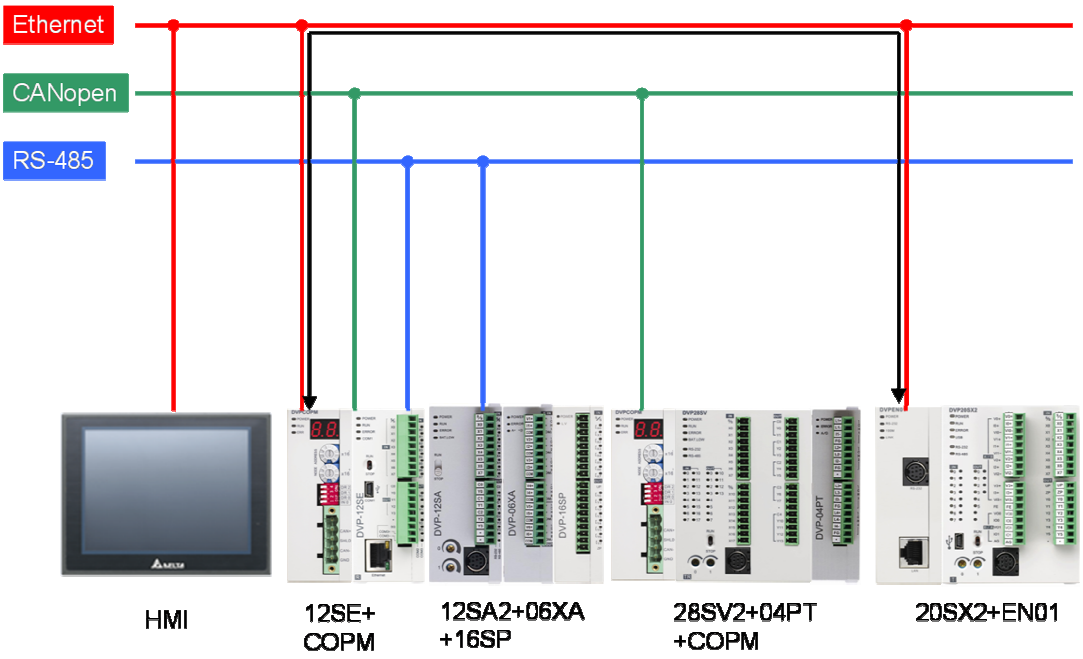
Network 7

Data exchange
D6289 in SE is mapped onto D6039 in SV2.
The value in D6039 in SV2 is moved to D6289, which is mapped onto D6039 in SE.

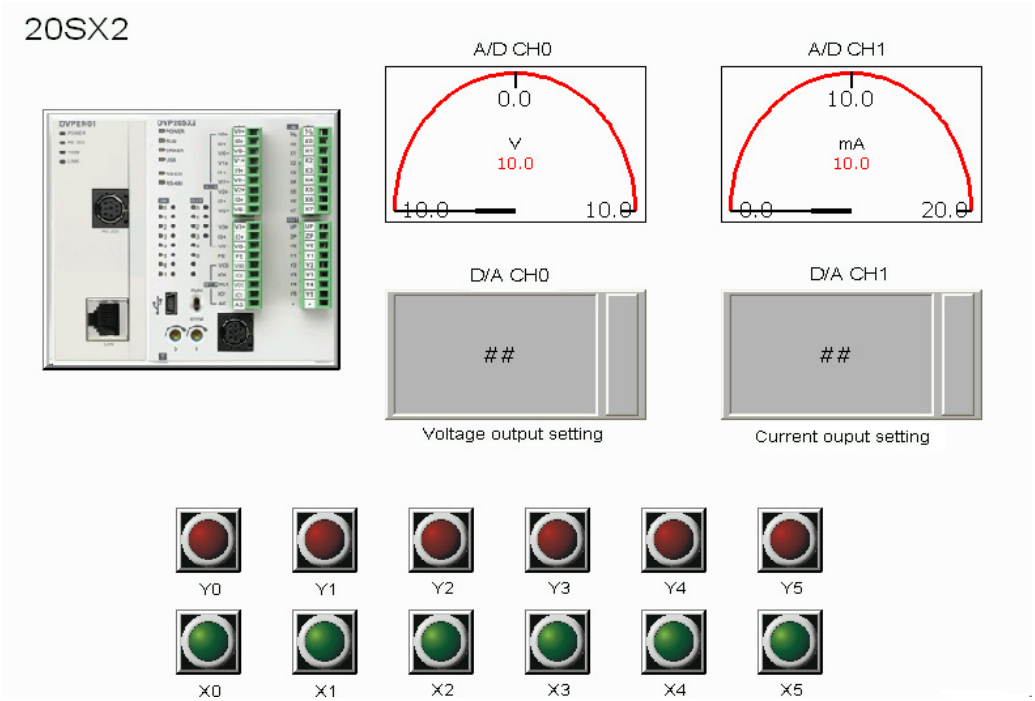


4.4 Functions of DVP20SX2

1. Page on the HMI
   - DVPEN01-SL is connected to the left side of DVP20SX2. The master station DVP12SE exchanges data with DVP20SX2 through Ethernet. It is used to measure room temperature. An equivalent Ethernet network is shown below.



   - Users can set the voltage output of D/A CH0. The voltage sent is in the range of -10 V to 10 V. The users can also set the current output of D/A CH1. The current sent is in the range of 0 mA to 20 mA.
   - Yn connected to Xn (n=0~5). When Yn is set to ON, Xn is ON. When Yn is set to OFF, Xn is OFF. The page displayed on the HMI is shown below.



- The HMI displays the devices which are involved in data exchange.

	HMI
Voltage input of A/D CH0 (D1110)	D300
Current input of A/D CH1 (D1111)	D301
Voltage output of D/A CH0 (D1116)	D400
Current output of D/A CH1 (D1117)	D401
States of X0~X5	M10~M15
States of Y0~Y5	M30~M35
Setting Y0~Y5	M50~M55

2. Connection between analog inputs and analog outputs, and connection between digital inputs and digital outputs

   There are four A/D channels, two D/A channels, eight digital inputs, and six digital outputs in DVP20SX2. The digital inputs X0~X5 are connected to the digital outputs Y0~Y5.

DI	Connection	DO
X0	←→	Y0
X1	←→	Y1
X2	←→	Y2
X3	←→	Y3
X4	←→	Y4
X5	←→	Y5

   The A/D channels CH0 and CH1 are connected to the D/A channels CH0 and CH1.

Mode	A/D	Connection	D/A
Voltage mode	CH0	←→	CH0
Current mode	CH1	←→	CH1

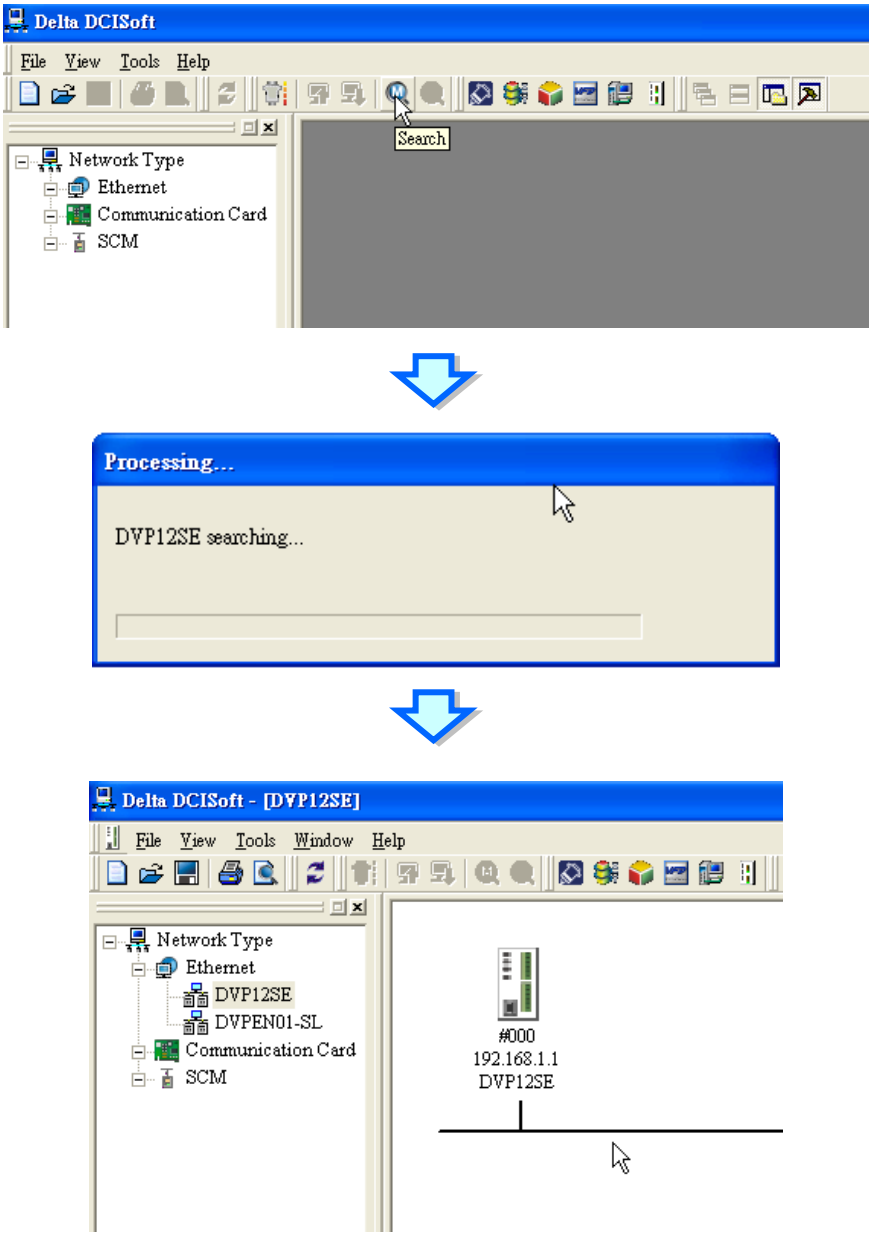
3. Setting Ethernet

   - Users have to connect DVP12-SE, DVPEN01-SL, and DVS to a computer through networking cables, and use DCISoft to set the IP address of DVPEN01-SL and the devices which can be involved in data exchange. The master station DVP12SE communicates with the slave station DVP20SX2 through Ethernet.

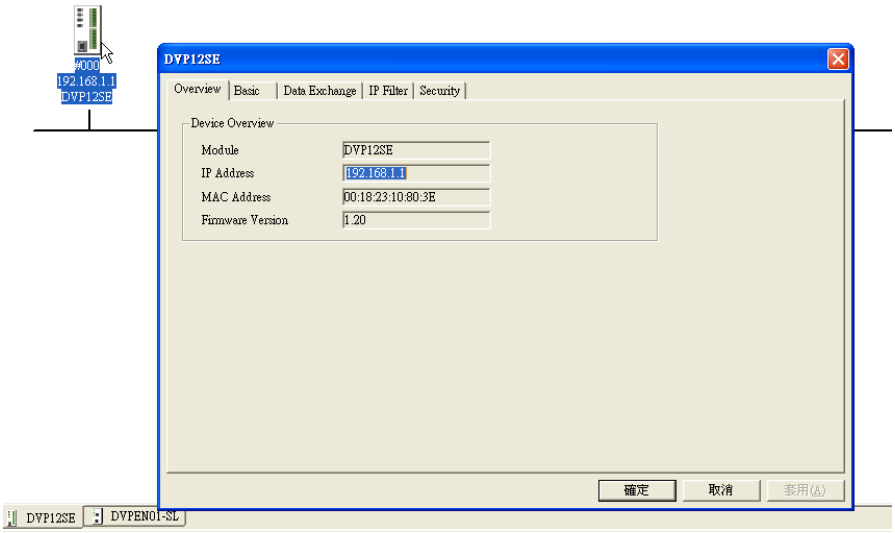
	DVP20SX2	Direction	DVP12SE	HMI
Voltage input of A/D CH0 (D1110)	D200	→	D100	D300
Current input of A/D CH1 (D1111)	D201	→	D101	D301
Voltage output of D/A CH0 (D1116)	D100	←	D200	D400
Current output of D/A CH1 (D1117)	D101	←	D201	D401
States of X0~X5	D202	→	D102	M10~M15
States of Y0~Y5	D203	→	D103	M30~M35
Writing data into DVP20SX2	D102	←	D202	
Reading data from DVP20SX2	D204	→	D104	D104
Setting Y0~Y5	D103	←	D203	M50~M55

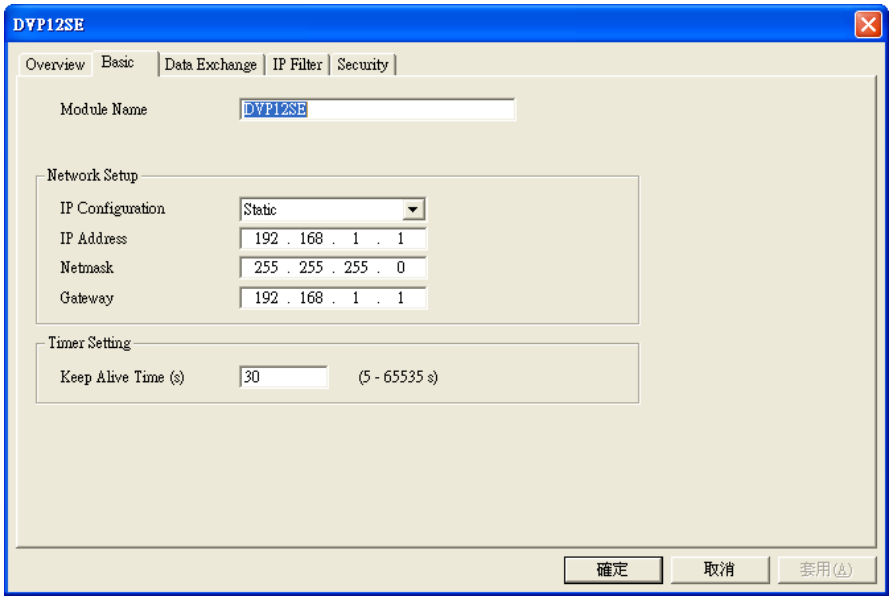
4. Setting the software

Step 1: Search for the node on the network.

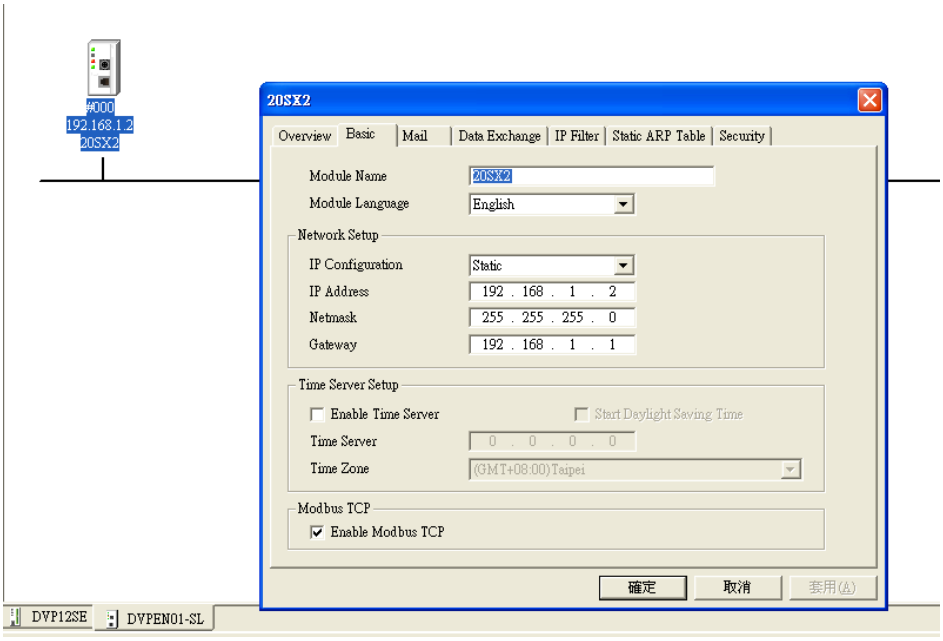


Step 2: Set the IP address of DVP12SE.

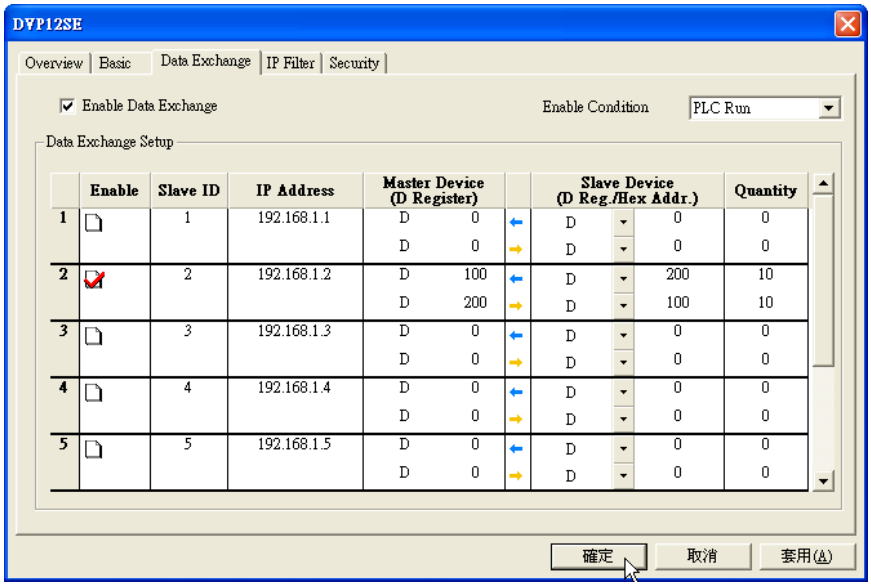




Step 3: Set the IP address of DVPEN01-SL which is connected to the left side of DVP20SX2.



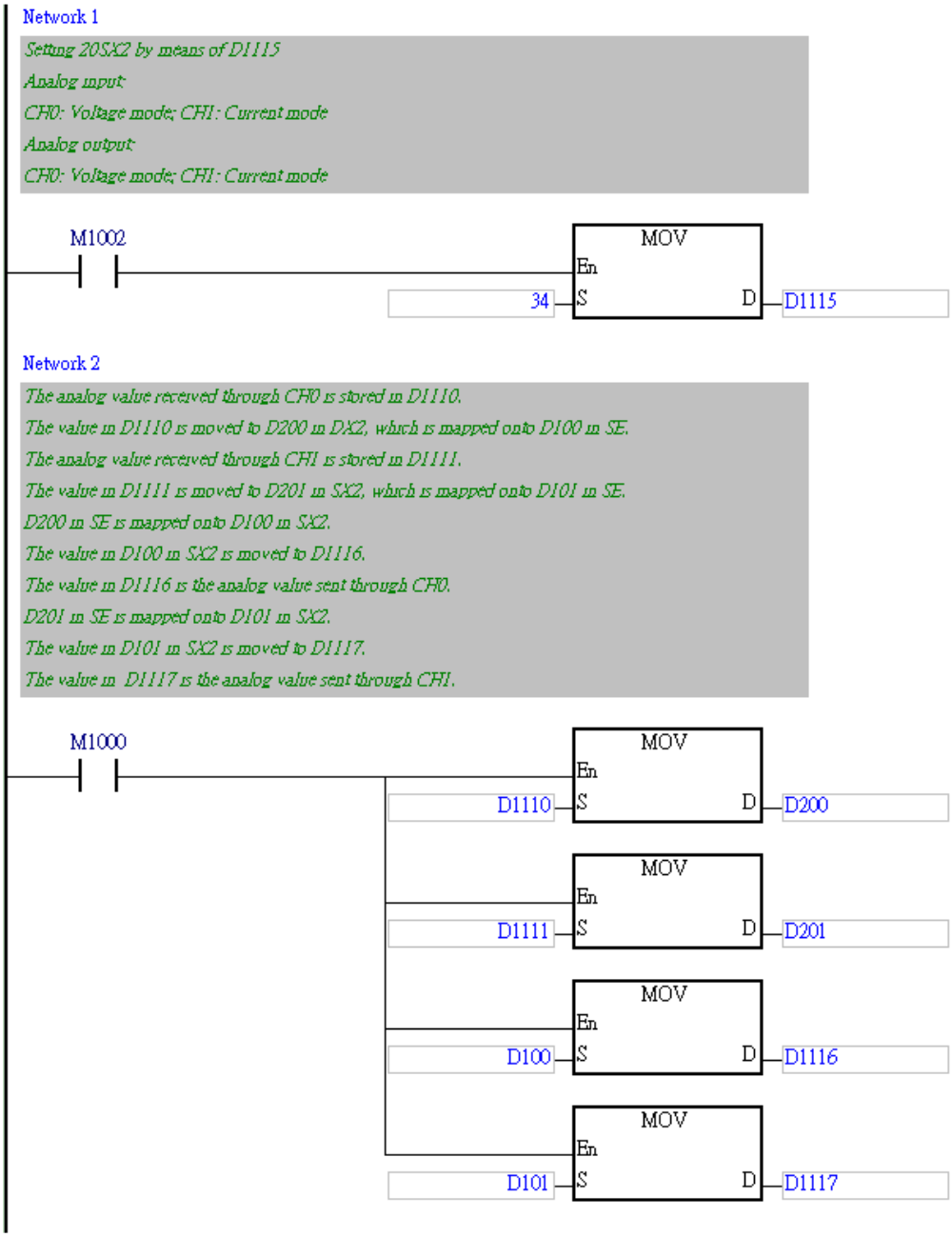
Step 4: Set the devices which can be involved in data exchange.



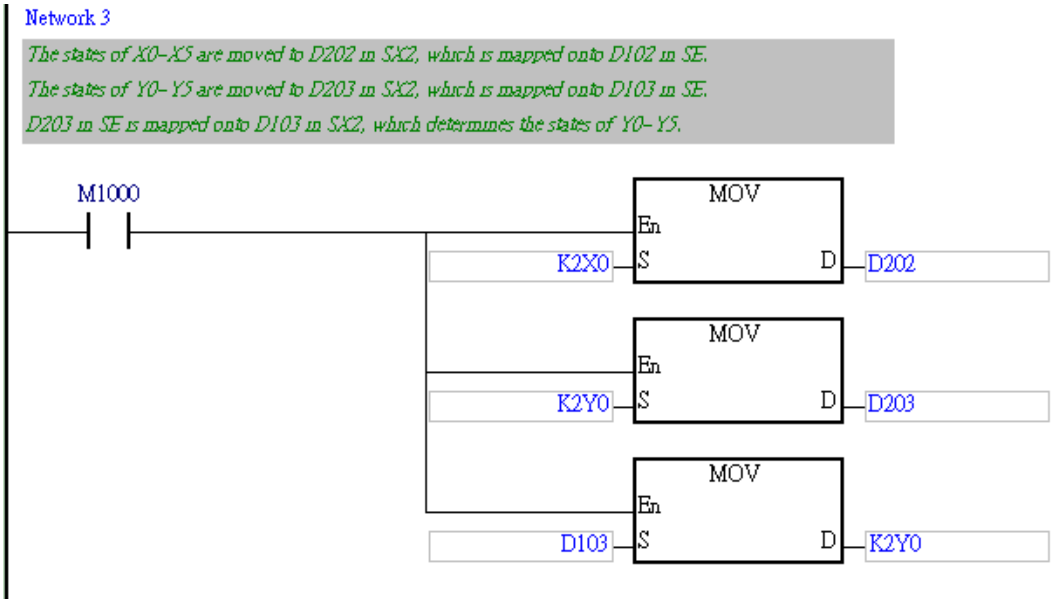
Please refer to DVPEN01-SL Ethernet Communication Module operation Manual for more information.

5. Control program

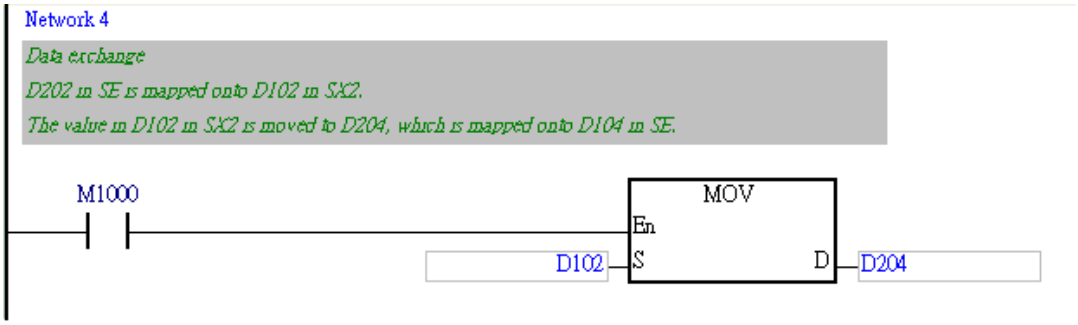
- The setting of analog inputs and the setting of analog outputs are shown below.



- DVP20SX2 is mapped onto DVP12SE. The program is shown below.

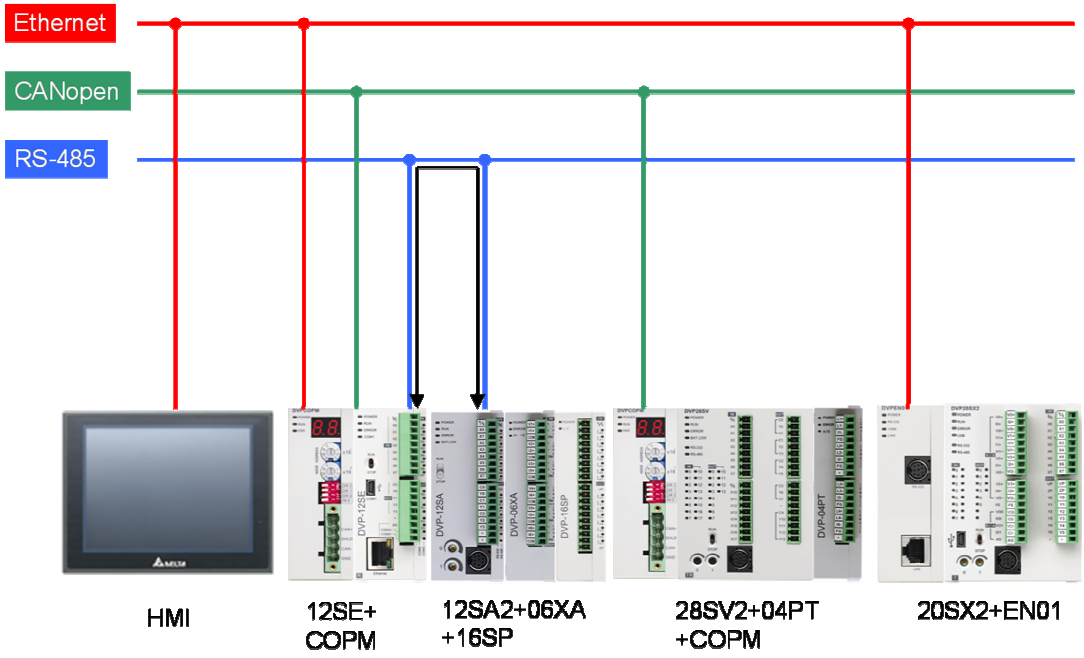


- The slave station DVP20SX2 receives data from the master station DVP12SE, and then DVP20SX2 sends data to DVP12SE through Ethernet.

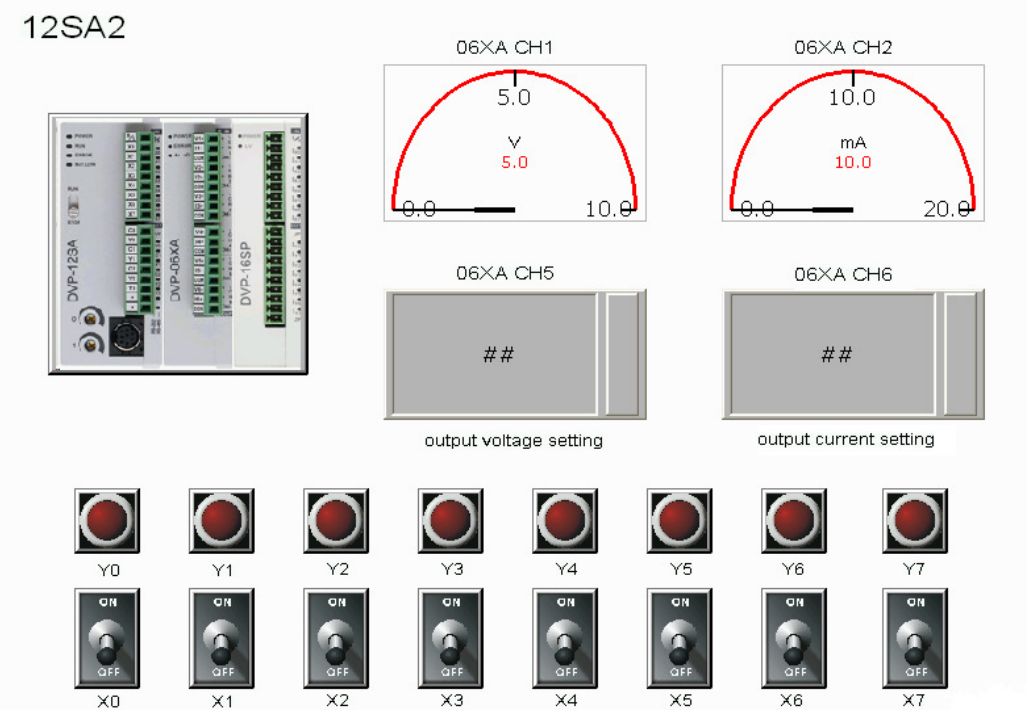


4.5 Functions of DVP12SA2

1. Page on the HMI
   - DVP06XA-S and DVP16SP are connected to the right side of DVP12SA2. An equivalent RS-485 network is shown below.



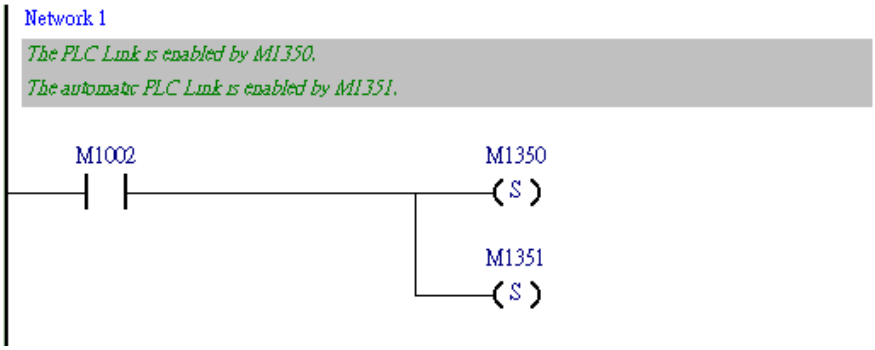
   - When the digital input Xm on the panel is set to ON, the digital output Ym on the panel is ON. When the digital input Xm on the panel is set to OFF, the digital output Ym on the panel is OFF. (m=0~7)
   - DVP06XA-S and DVP16SP are connected to the right side of DVP12SA2. The page displayed on the HMI is shown below.



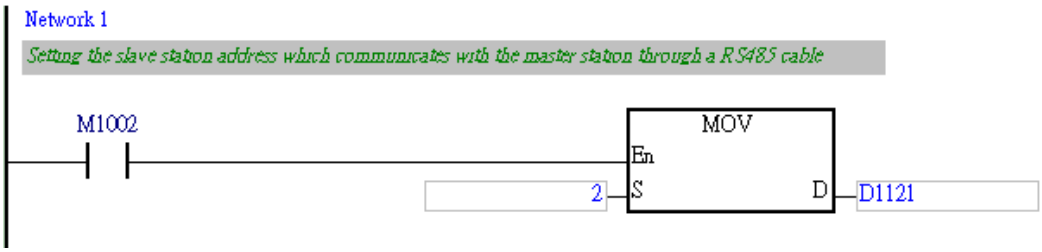
- The HMI displays the devices which are involved in data exchange.

	HMI
States of X0~X7 on DVP16SP	M20~M27
States of Y0~Y7 on DVP16SP	Y20~Y27

2. Connection between analog inputs and analog outputs, and connection between digital inputs and digital outputs
   - Users can use VR1 to control the voltage sent to DVP06XA-S, and use VR2 to control the current sent to DVP06XA-S. CH1 in DVP06XA-S is set to voltage input mode. The external voltage detected by CH1 is converted into the corresponding lsb. CH5 is set to voltage output mode. The lsb is converted into the corresponding voltage. The voltage is sent by CH5. CH2 is set to voltage input mode. The external voltage detected by CH2 is converted into the corresponding lsb. CH6 is set to current output mode. The lsb is converted into the corresponding current. The current is sent by CH6.
   - The digital inputs X0~X7 on DVP16SP correspond to the switches X0~X7 on the panel, the digital outputs Y0~Y7 on DVP16SP correspond to the LED indicators Y0~Y7 on the panel.
3. Setting RS-485
   - Set DVP12SE to master mode.



   - Set DVP12SA2 to slave mode.

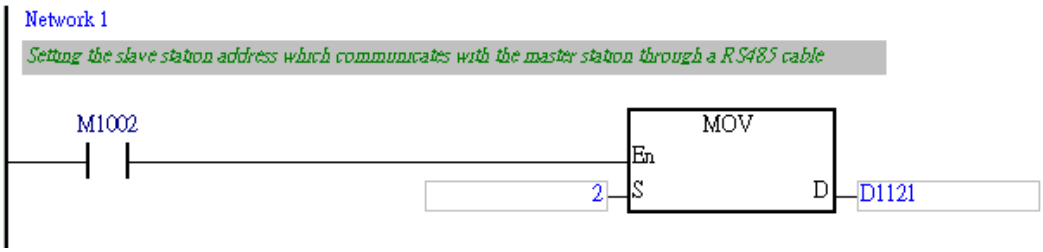


Please refer to chapter 2 in DVP-PLC Application Manual for more information.

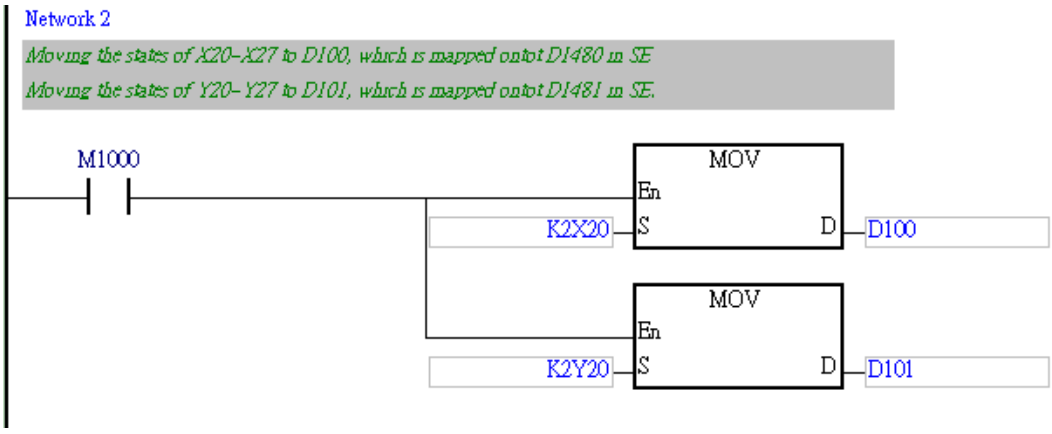
- The master station DVP12SE communicates with the slave station DVP12SA2 through RS-485.

	DVP12SA2	Direction	DVP12SE	HMI
States of X0~X7 on DVP16SP	D100	→	D1480	M20~M27
States of Y0~Y7 on DVP16SP	D101	→	D1481	Y20~Y27
Writing data into DVP12SA2	D202	←	D1498	
Reading data from DVP12SA2	D104	→	D1484	D1484

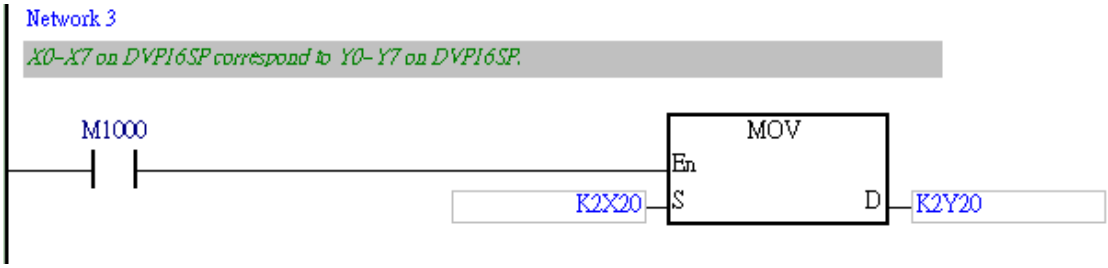
4. Control program
   - Set the slave station address of DVP12SA2.



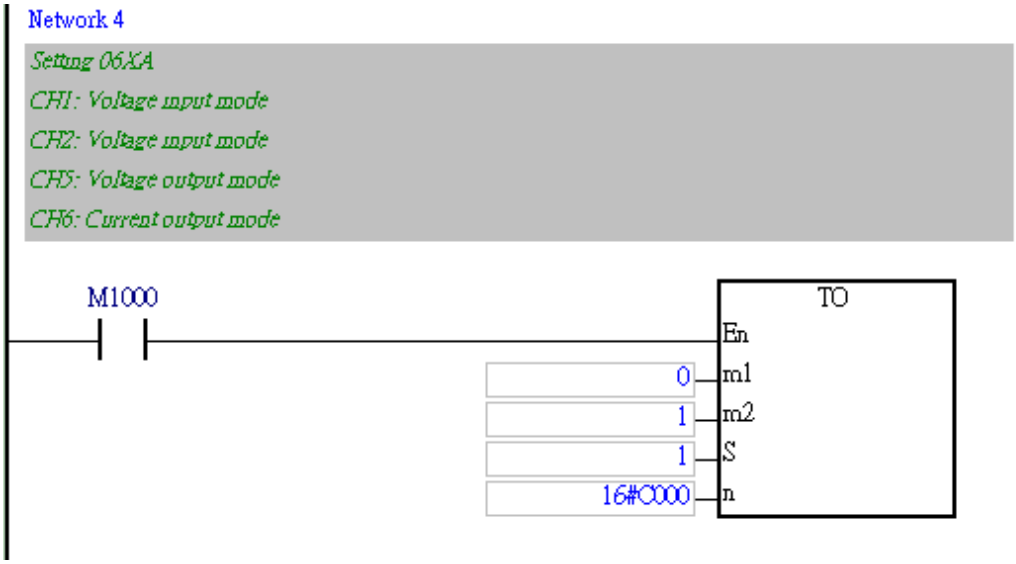
   - DVP12SA2 is mapped onto DVP12SE. The program is shown below.



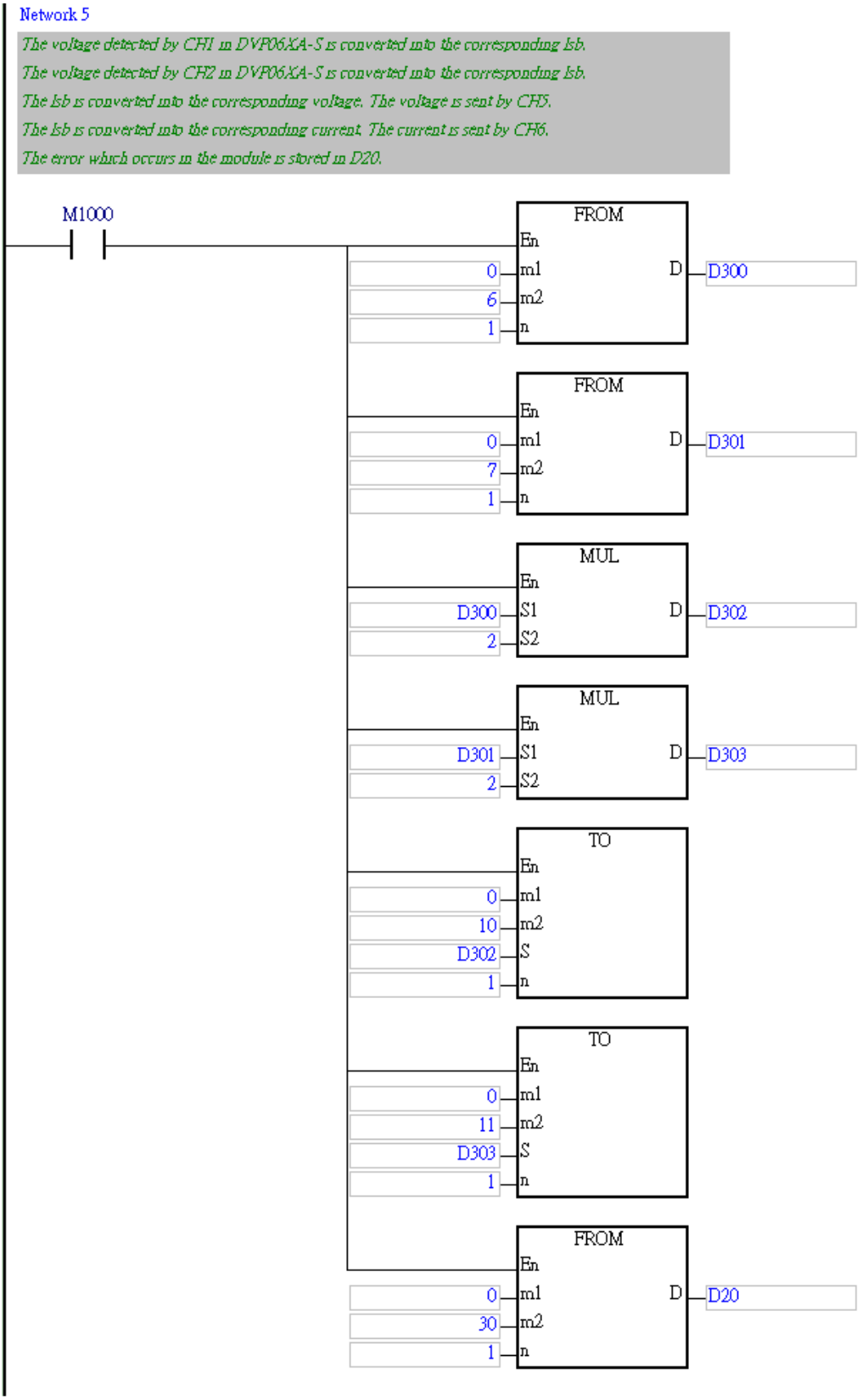
   - The digital inputs X0~X7 on DVP16SP corresponds to the digital outputs Y0~Y7 on DVP16SP.



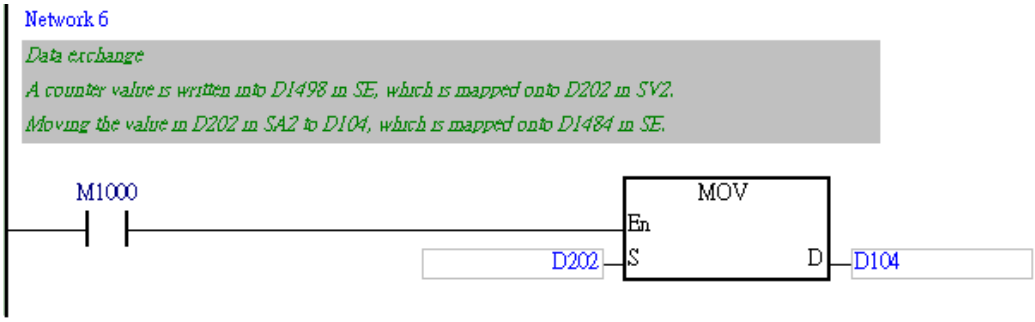
- The setting of channels in DVP06XA-S is shown below.



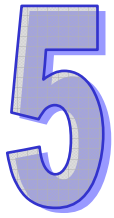
- The setting of digital inputs in DVP06XA-S and the setting of digital outputs DVP06XA-S are shown below.



- The slave station DVP12SA2 receives data from the master station DVP12SE, and then DVP12SA2 sends data to DVP12SE through RS-485.



Chapter 5 Examples of Programming



Simple examples of programming are provided in this chapter. Users can test the function of a training kit by means of these examples. Please refer to DVP-PLC Application Examples of Programming for more information.

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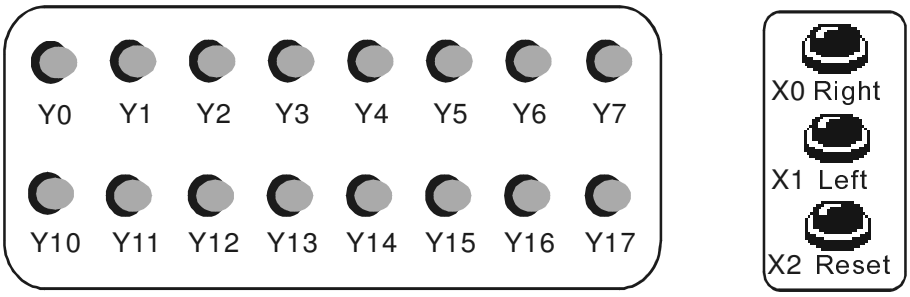
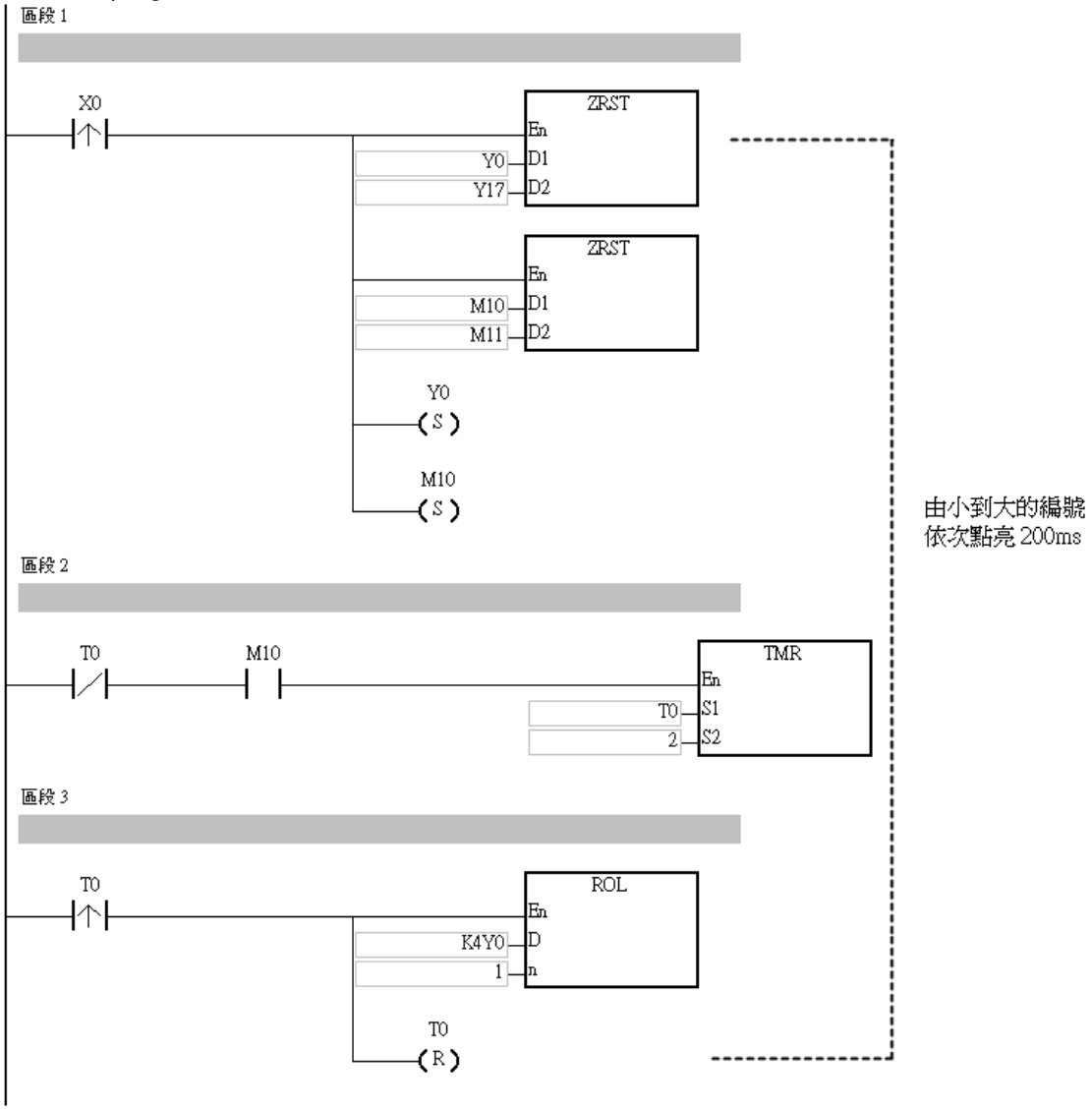
5.1 ROL/ROR—Neon Lamp Design

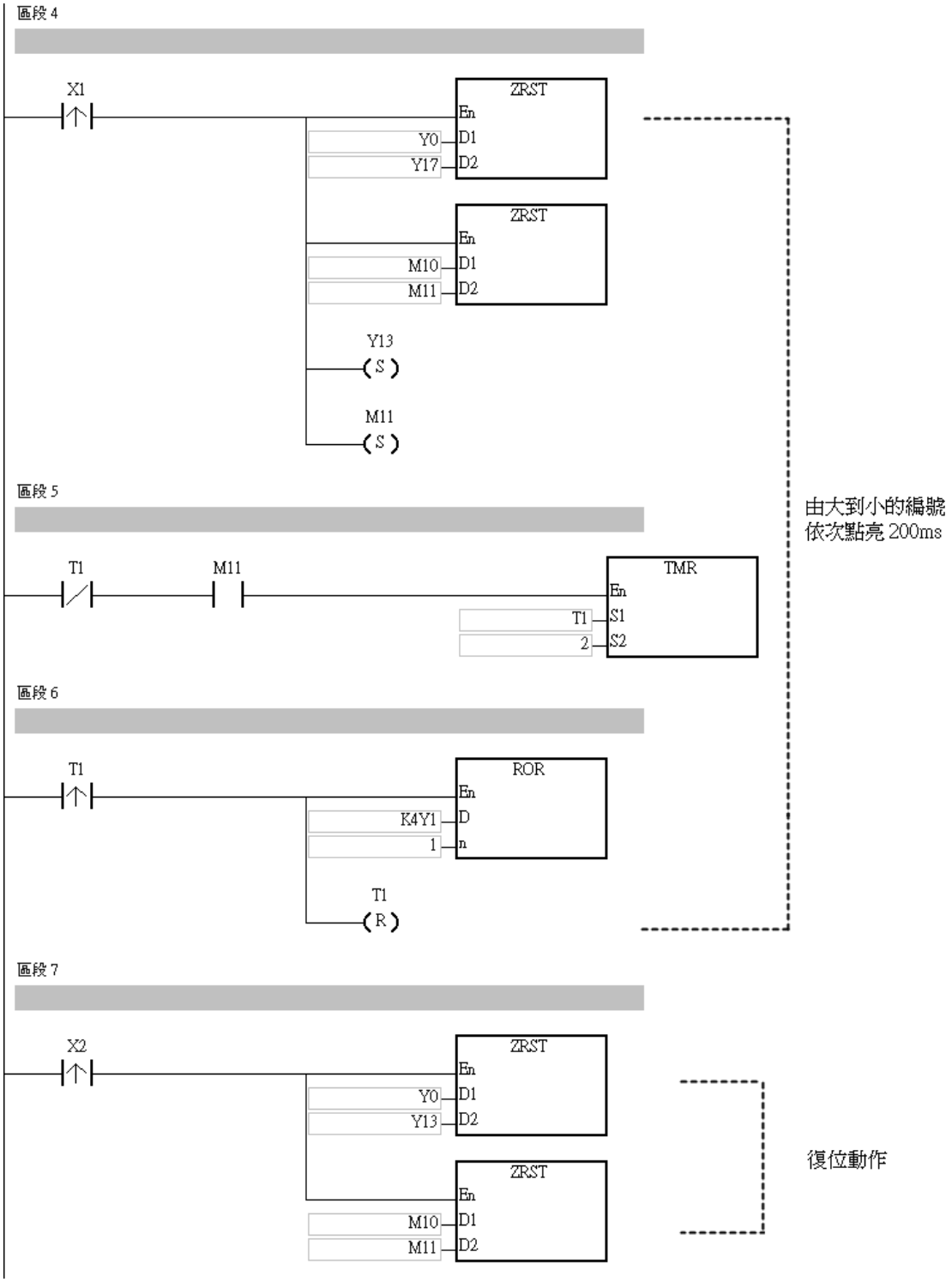


1. Control purpose
   - After the Right Rotation button is pressed, the 16 neon lamps will be turned on for 200 milliseonds in the order Y0~Y7 and Y10~Y17.
   - After the Left Rotation button is pressed, the 16 neon lamps will be turned on for 200 milliseonds in the order Y17~Y10 and Y7~Y0.
   - Users do not have to press the Reset button when switching between the Right Rotation button and the Left Rotation button.
   - After the Reset button is pressed, all the neon lamps will be turned off.
2. Devices

Device	Function
X0	Right Rotation button X0=ON when the button is pressed.
X1	Left Rotation button X1=ON when the button is pressed.
X2	Reset button X2=ON when the button is pressed.
T0/T1	200 ms timer Time base: 100 ms.
Y0~Y17	16 neon lamps

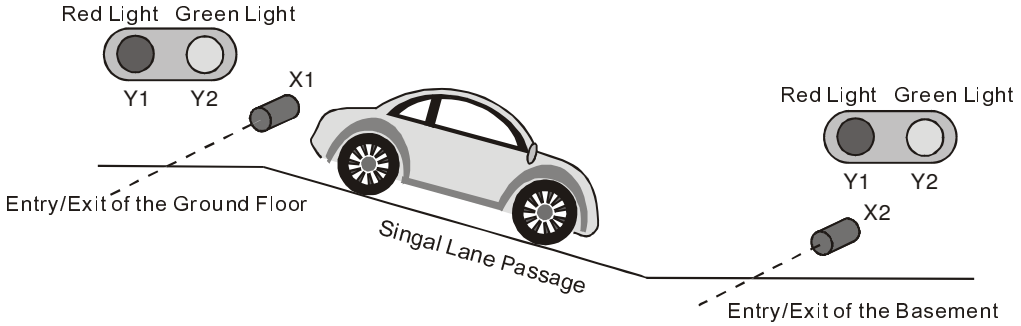
3. Control program




區段 4
X1
ZRST
En
Y0
D1
Y17
D2
ZRST
En
M10
D1
M11
D2
Y13
S
M11
S
區段 5
T1
M11
TMR
En
T1
S1
2
S2
區段 6
T1
ROR
En
K4Y1
D
1
n
T1
R
區段 7
X2
ZRST
En
Y0
D1
Y13
D2
ZRST
En
M10
D1
M11
D2
由大到小的編號
依次點亮 200ms
復位動作

4. Program description
   - After the Right Rotation button is pressed, X0 will be turned ON, and the instruction ZRST will be executed. When ZRST is executed, Y0~Y17 and M10~M11 are reset to OFF. When the instruction SET is executed, Y0 and M10 are set to ON. When M10 is ON, the instruction TMR is executed. After 200 milliseconds, T0 will be turned ON, and the instruction ROL will be executed. When ROL is excuted, Y1 is ON. After ROL is executed, the instruction RST will be executed. When RST is executed, T0 is reset.
   - In the next scan cycle, T0 starts counting again. After 200 milliseconds, ROL will be executed again, and Y2 will be ON. Y0~Y17 are turned ON for 200 milliseconds in order.
   - The use of the Left Rotation button is similar to the use of the Right Rotation button. However, the Left Rotation button uses the instruction ROR to turn ON the neon lamps in the order Y17~Y10 and Y7~Y0.
   - After the Reset button is pressed, X2 will be turned ON, Y0~Y17 and M10~M11 will be reset, and all the neons will be turned OFF. ZRST put after the rising edge-triggered contact ensures that the neon lamps are turned ON from Y0 or Y17.

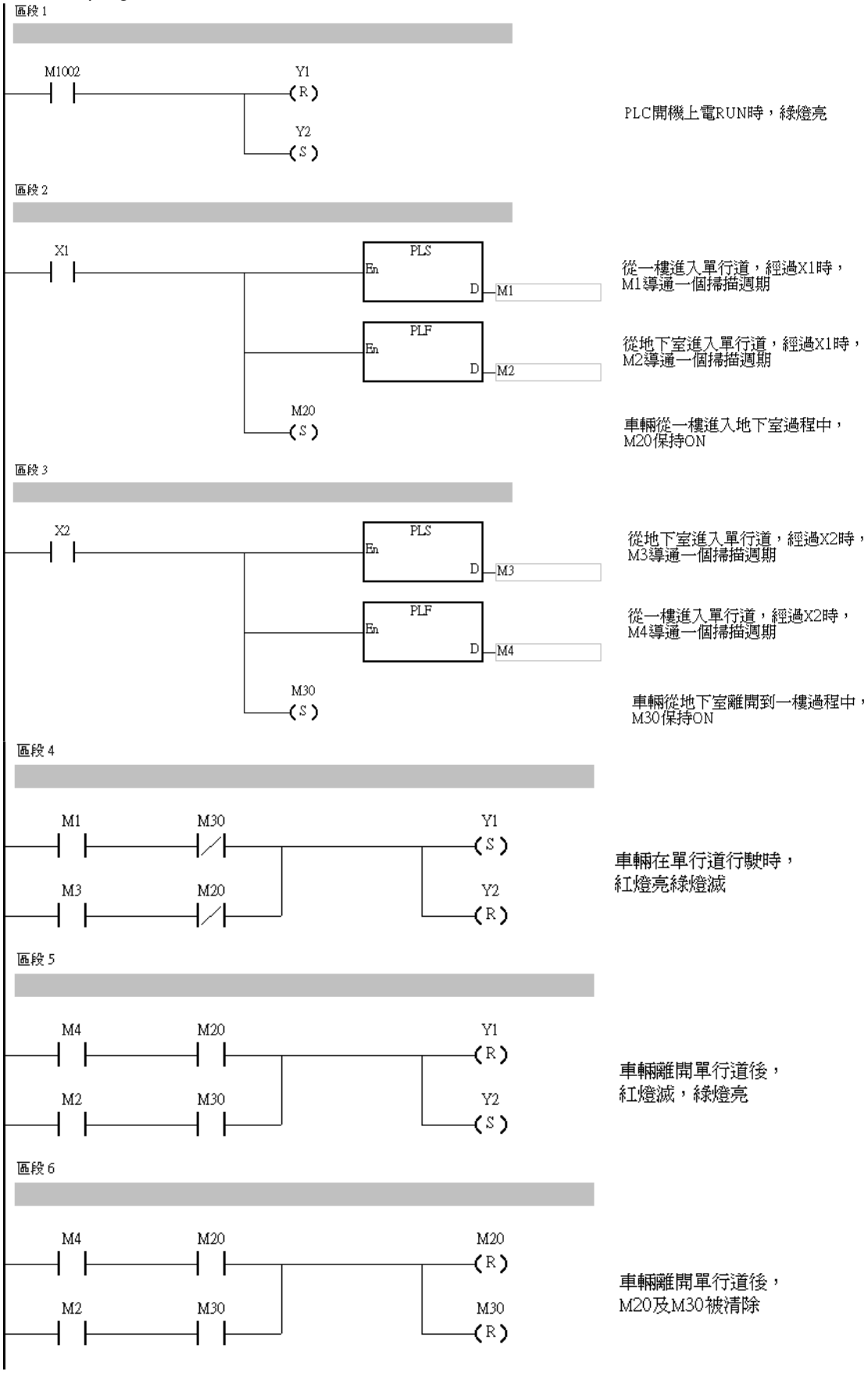
5.2 Entry/Exit Control of the Underground Car Park



1. Control purpose
   - The entry/exit of the underground car park is a single lane passage which needs the traffic lights to control the cars. Red lights prohibit cars entering or leaving while green lights allow cars to enter or leave.
   - When a car enters the passage from the entry of the ground floor, the red lights both on the ground floor and the basement will be ON, and the green lights will be OFF. Any car entering or leaving is prohibited during the process till the car passes through the passage completely. When the passage is clear, the green lights will be ON again and allow other cars entering from the ground floor or the basement.
   - Similarly, when a car leaves the basement and enters the passage, any car entering or leaving is prohibited till the car passes from the passage to the ground completely.
   - When a PLC runs, the initial setting of traffic lights will be green lights ON and red lights OFF.
2. Devices

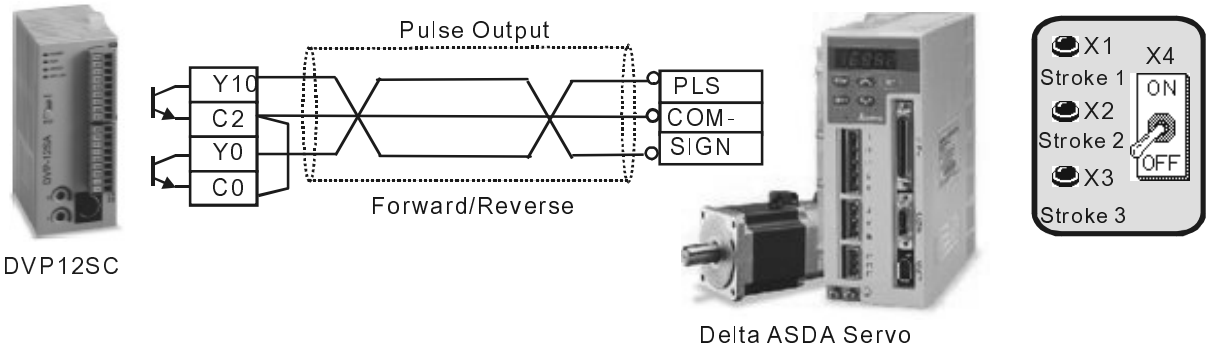
Device	Function
X1	Photoelectric switch at the ground floor entry/exit X1 is ON when a car passes.
X2	Photoelectric switch at the basement entry/exit X2 is ON when a car passes.
M1	M1 will be ON for one scan cycle if a car from the ground floor passes X1.
M2	M2 will be ON for one scan cycle if a car from the basement passes X1.
M3	M3 will be ON for one scan cycle if a car from the basement passes X2.
M4	M4 will be ON for one scan cycle if a car from the ground floor passes X2
M20	M20 is ON when a car is in the process of entering the passage from the ground floor.
M30	M30 is ON when a car is in the process of entering the passage from the basement.
Y1	Red lights at the entry/exit of the ground floor and the basement
Y2	Green lights at the entry/exit of the ground floor and the basement

3. Control program



4. Program description
   - The ground floor and the basement share the same red light signal Y1 and green light signal Y2.
   - The key of the program is to judge whether the car is entering or leaving the passage at the ground floor entry/exit when M1 is ON to activate Y1 because [PLS M1] will be executed in both entering and leaving conditions. Therefore, the confirming signal M20 is required for confirming that the car is entering the passage from the ground floor.
   - Also, it needs to be judged whether the car is entering or leaving the passage at the basement entry/exit when M3 is ON because [PLS M3] will be executed in both entering and leaving conditions. Therefore, the confirming signal M30 is required for confirming that the car is entering the passage from the basement.

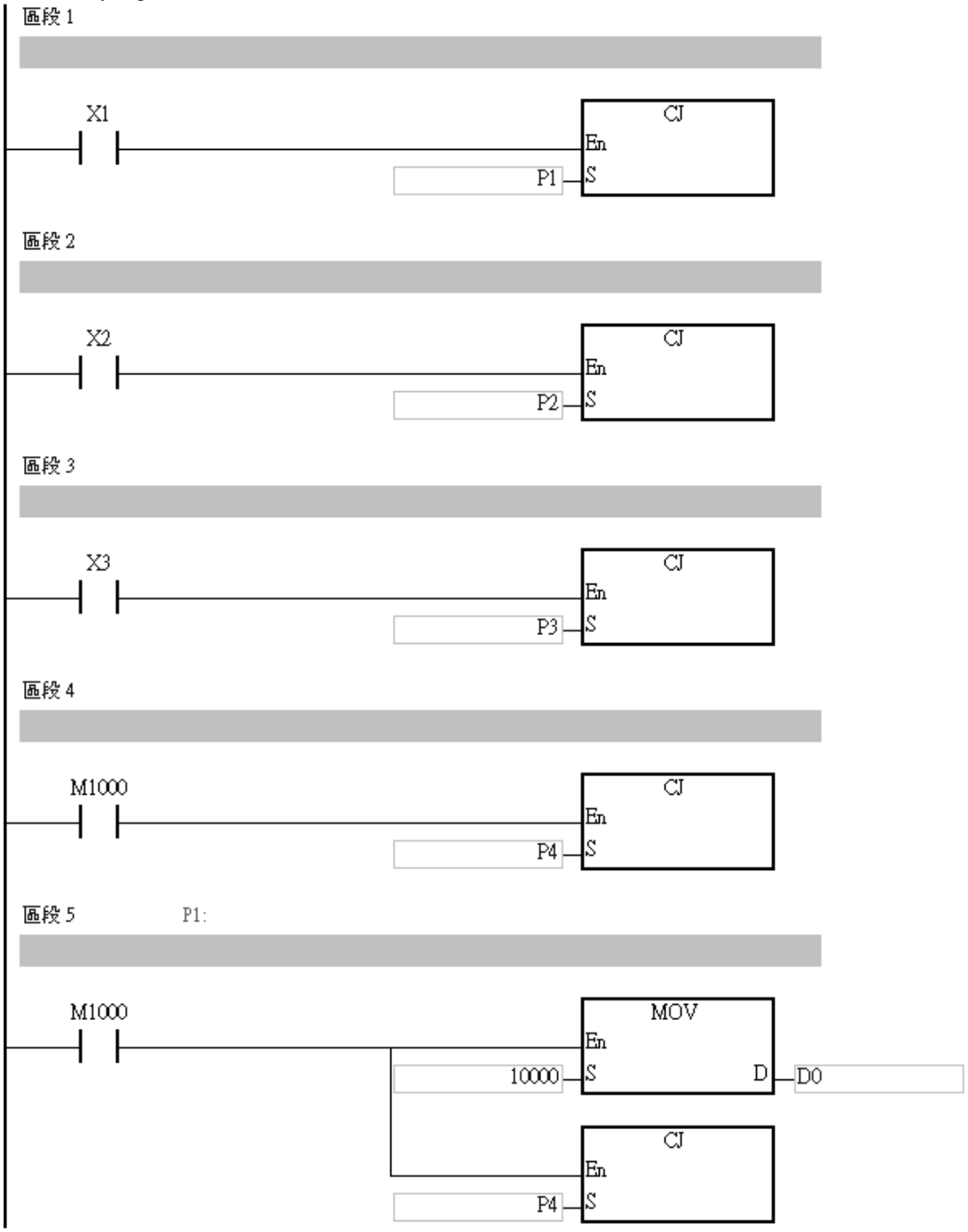
5.3 Recipe Setting by the CJ Instruction

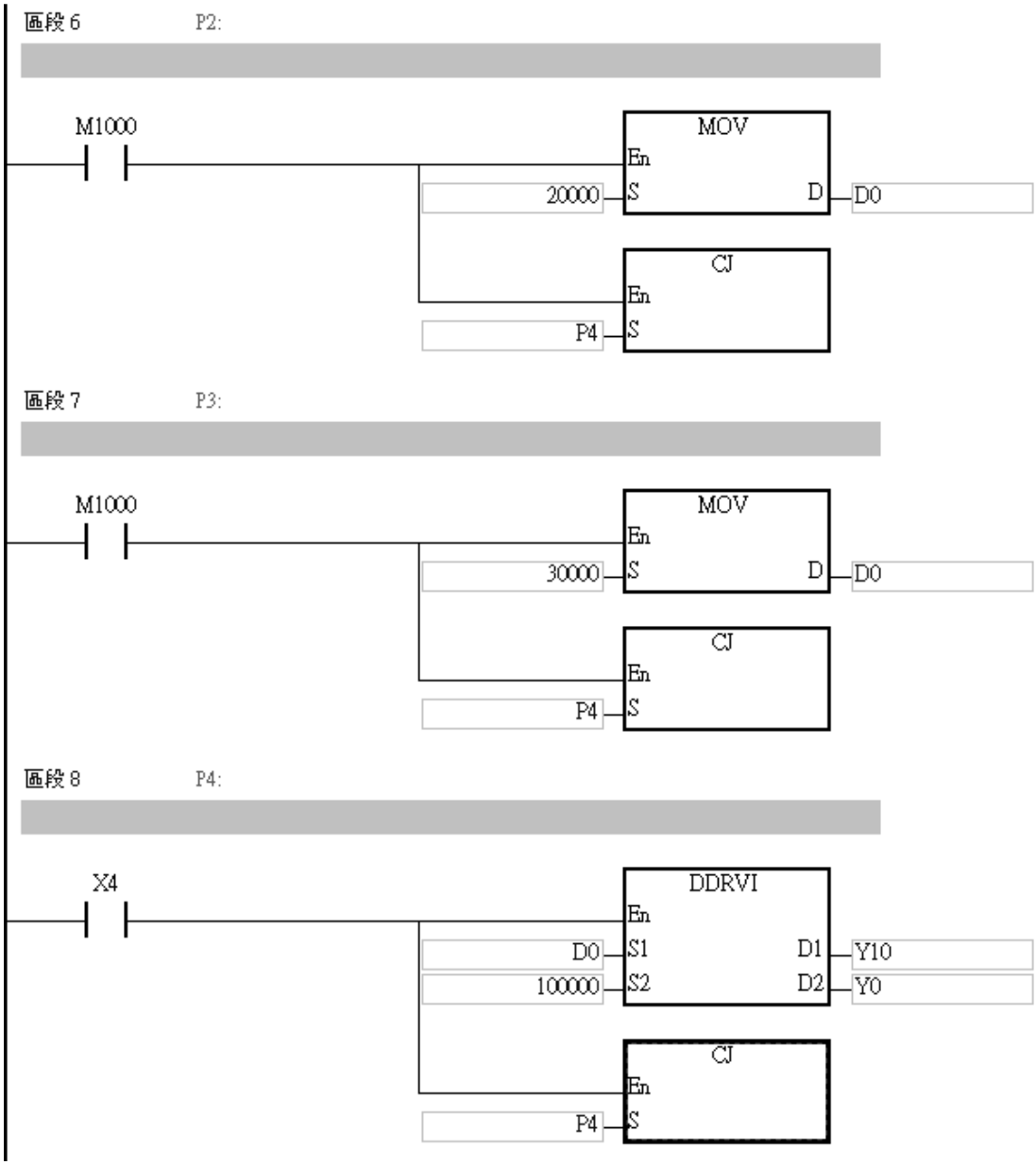


1. Control purpose
   - A Delta DVP12SC series PLC controls 3 stroke distances of Delta ASDA servo by sending pulses. Users can choose an adequate stroke distance to meet the working requirement by pressing 3 individual switches.
2. Devices

Device	Function
X1	X1 is ON when the Stroke 1 switch is pressed.
X2	X2 is ON when the Stroke 2 switch is pressed.
X3	X3 is ON when the Stroke 3 switch is pressed.
X4	X4 is ON when the servo positioning switch is pressed.
Y0	Pulse direction control
Y10	Pulse output point

3. Control program

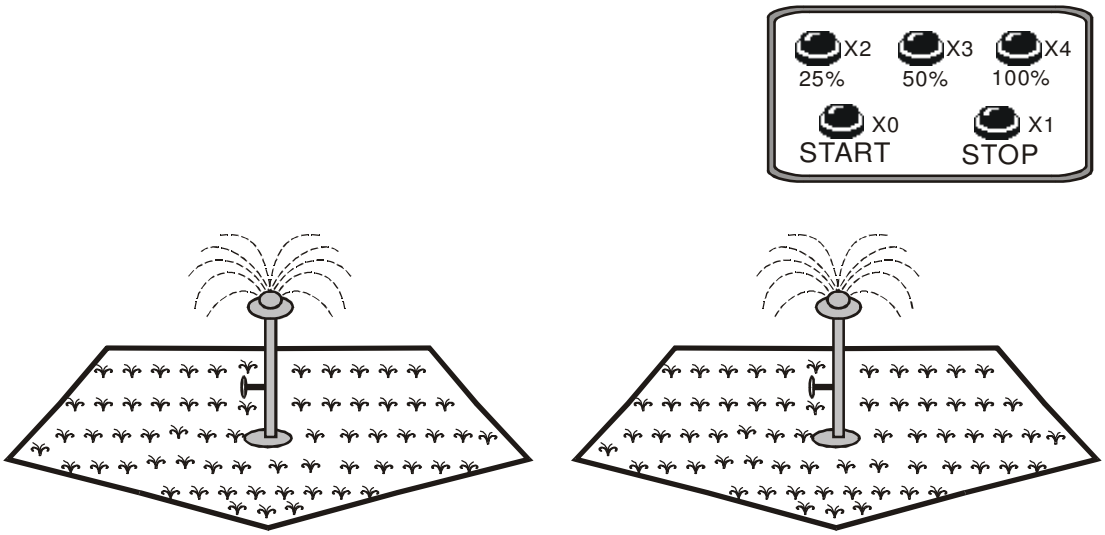




4. Program description
   - If X1 is ON, X2 is OFF, and X3 is OFF, the execution of the program will jump from [CJ P1] to P1. After the execution of the program jumps from [CJ P1] to P1, the constant K10000 will be stored in D0, that is, the first stroke distance will be selected, and the execution of the program will jump to P4 to get ready to output pulses.
   - If X2 is ON, X1 is OFF, and X3 is OFF, the execution of the program will jump from [CJ P2] to P2. After the execution of the program jumps from [CJ P2] to P2, the constant K20000 will be stored in D0, that is, the second stroke distance will be selected, and the execution of the program will jump to P4 to get ready to output pulses.
   - If X3 is ON, X1 is OFF, and X2 is OFF, the execution of the program will jump from [CJ P3] to P3. After the execution of the program jumps from [CJ P3] to P3, the constant K30000 will be stored in D0, that is, the third stroke distance will be selected, and the execution of the program will jump to P4 to get ready to output pulses.
   - If X1 is OFF, X2 is OFF, and X3 is OFF, the instruction [CJ p4] will be executed, and the execution of the program will jump to P4 directly to get ready to output pulses.
   - If X4 is ON, the instruction [DDRVI D0 K10000 Y10 Y0] will be executed, that is, Y10 will output a certain number of pulses on a frequency of 100 KHz (the value in D0 is the number of pulses output), and Y0 will control the pulse direction. Since the distance the servo motor

operates is proportional to the number of pulses recieved, the object of controlling the distance the servo operates can be achieved by setting the number of pulses output by the PLC.

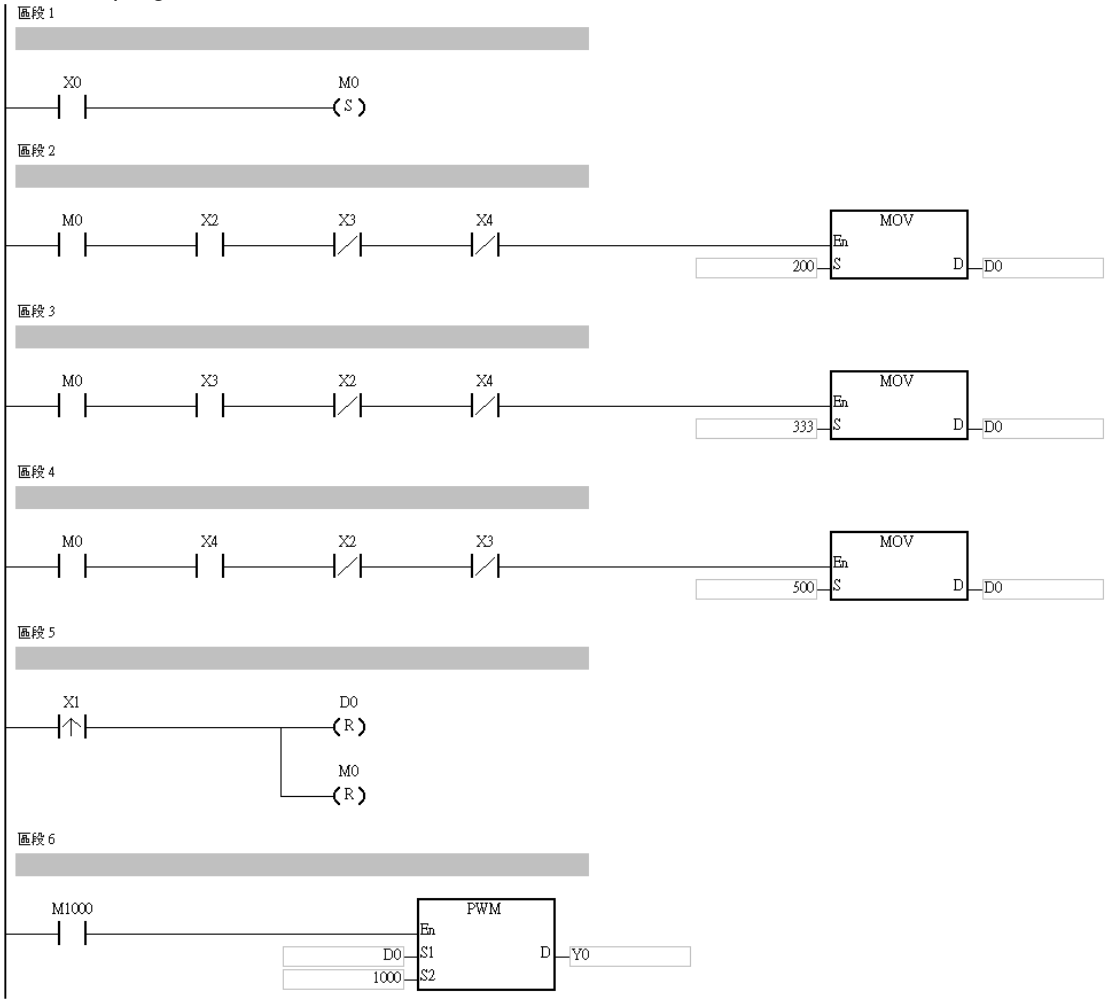
5.4 PWM–Sprayer Valve Control Program



1. Control purpose
   - In order to reduce the energy lost during the gradual shut-down/start-up process, we apply the switching method which immediately turns on and turns off the current valve. The switching method is somewhat like cutting off a current, and is therefore called a clipper. However, in the practical application we put a transistor between the power and the motor to perfom the function of a clipper. A pulse signal will be applied to the base of the transistor so as to generate a pulse current between the base and the emitter. The input voltage of motor is in proportion to the t_{on}/t_{off} value. Therefore, the motor voltage could be adjusted by modulating the t_{on}/t_{off} value. There are various methods for modulating this value, and the most common one is to adjust the time (t_{on}) for which the valve is ON rather than adjusting the number of times the valve is ON during a a particular length of time. The method is called PWM (Pulse-width modulation).
   - Users can control the the degree to which the sprayer vale is opened by adjusting the t_{on}/t_{off} value of PWM (24 V). The opening degrees which can be selected are 25%, 50%, and 100%.
2. Devices

Device	Function
X0	X0 is ON when the START button is pressed.
X1	X1 is ON when the STOP button is pressed.
X2	X2 is ON when the 25% button is pressed.
X3	X3 is ON when the 50% button is pressed.
X4	X4 is ON when the 100% button is pressed.
Y0	Controlling the degree to which the the valve is opened
D0	The degree to which the the valve is opened is stored in D0.

3. Control program



4. Program description

- In this program, the degree to which the sprayer valve is opened is controlled by the value in D0. Opening degree=t_{on}/t_{off} =D0/(K1000-D0)
- After the START button is pressed, X0 will be ON. When X0 si turned ON, M0 is set to ON. When M0 is ON, the water spraying system is ready. The water spraying systemd will start spraying water after the corresponding opening degree button is pressed.
- If the 25% button is pressed (X2 is ON), the value in D0 will be K200, D0/(K1000-D0)=0.25, and the opening degree will be 25%.
- If the 50% button is pressed (X3 is ON), the value in D0 will be K333, D0/(K1000-D0)=0.50, and the opening degree will be 50%.
- If the 25% button is pressed (X4 is ON), the value in D0 will be K500, D0/(K1000-D0)=1, and the opening degree will be 100%.
- After the STOP button is pressed, X1 will be ON. When X1 is turned ON, the value in D0 becomes 0, D0/(K1000-D0)=0, the opening degree becomes 0, and the system start flag M0 are reset to OFF.

Chapter 6 Troubleshooting

The malfunctions which may occur when a system operates, the reasons for the malfunctions, and possible solutions are described in this chapter.

Table of Contents

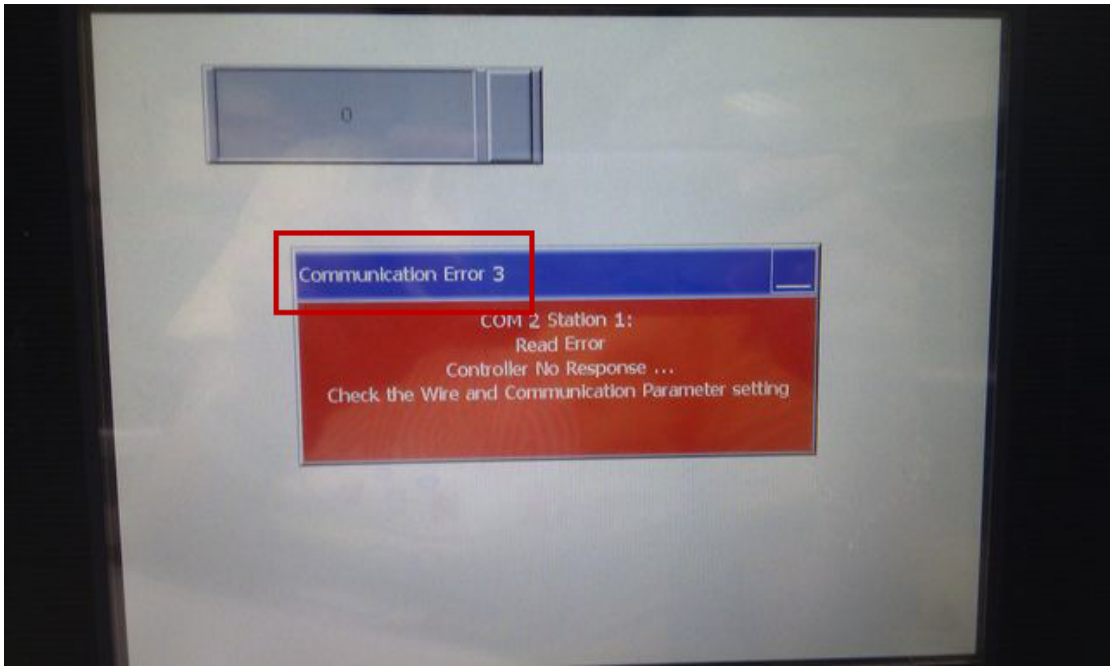
6.1 Basic Inspection of an HMI and Troubleshooting

1. Basic inspection

Item	Content
General inspection	1. Periodically inspect the screws of the connection between the HMI and device. 2. Make sure that oil, water, metallic particles or any foreign objects do not fall inside the HMI, control panel or ventilation slots and holes. As these will cause damage. 3. Make sure of the correct installation of the control panel. The HMI should be free from airborne dust, harmful gases or liquids.
Inspection before operation (Power is not supplied.)	1. Make sure that all wiring terminals are correctly insulated. 2. Make sure that all wiring is correct, otherwise malfunctions may occur. 3. Make sure that there are not any unused screws, metal strips, conductive materials, and inflammable materials inside the HMI. 4. Lower electromagnetic interference when device are influenced by it. 5. Make sure that the external voltage supplied to the HMI is correct.
Inspection before operation (Power is supplied.)	1. Check whether the power LED indicator is ON. 2. Check whether the communication among devices is normal. 3. Please contact our local distributor or Delta sales representatives if there are any abnormal conditions.

2. Communication error code

   If a communication error is detected, the corresponding error message will be shown on the HMI screen. “Communication Error 3” in the red frame in the figure below is an error message.



If an HMI can not communicate with a controller, users can refer to the following table for more information about the error code shown on the screen.

Error code	Communication error message	Reason	Troubleshooting
0x02	Unknown	Noise interference	Strengthen the equipment's immunity to noise, and use shielded cables.
0x03	NoResponse	The wiring, the PLC station number, and the values of the communication parameters (baudrate, parity bit, data bits, stop bit) are incorrect.	Please check whether the related setting is incorrect.
0x05	ControllerCheckSumError	When the HMI checks the PLC checksum, an error is found.	Please check whether the PLC checksum is incorrect. Users usually have to use PLC software.
0x06	CommandError	The command sent to the PLC is incorrect.	Please check whether the command sent by HMI is supported by the PLC.
0x07	AddressError	The PLC address from which data is read, or the PLC address into which data is written is incorrect.	Please check whether the PLC address set by the HMI is not supported by the PLC, or data can not be written into this address.
0x08	ValueError	The data written into the PLC is incorrect.	Pleas make sure of the values which can be accepted by the PLC.
0x0A	NoCTS	The CTS pin in HMI does not receive the RTS signal from the PLC.	Please check whether the CTS pin in the HMI is connected to the RTS pin in the PLC, or PLC sends the RTS signal.
0x0E	HMIStationNumberError	The HMI station number is incorrect.	Please check whether the station number of the HMI exceeds the legal range, or is the same as the station number of another station.
0x0F	PLCStationNumberError	The PLC station number is incorrect.	Please check whether the station number of the PLC exceeds the legal range, or is the same as the station number of another station.
0x10	UARTCommunicateFail	The bottom communication of the HMI is incorrect. The COM port is not opened correctly, or the HIM works so hard that the COM port can not function normally.	Please check whether the COM port used can function normally, or simply the operation of the HMI, e.g. delete the instructions ALARM and MACRO.

If the program in an HMI is destroyed or lost, please connect the HMI to a computer, and download the program again. Please refer to chapter 2 for more information.

6.2 Basic Inspection of a PLC and Troubleshooting

The malfunctions which commonly occur in a PLC and troubleshooting are described in the tables below.

1. System malfunction

Symptom	Troubleshooting and Corrective Actions
All LEDs are OFF	1. Check the power supply wiring. 2. Check whether the power supplied to the PLC control units is in the range of the rating. 3. Be sure to check the fluctuation in the power supply. 4. Disconnect the power supply wiring to the other devices if the power supplied to the PLC control unit is shared with them. If the LEDs on the PLC control unit are turned ON at this moment, the capacity of the power supply is not enough to control other devices as well. Prepare another power supply for other devices or increase the capacity of the power supply. 5. If the POWER LED still does not light up when the power is ON after the above corrective actions, the PLC should be sent back to the dealer or the distributor whom you purchased the product from.
ERROR LED is flashing	1. If the ERROR LED is flashing, the problem may be an invalid commands, communication error, invalid operation, or missing instructions, error indication is given by self-checking function and corresponding error code and error step are stored in special registers. The corresponding error codes can be read from the WPLSoft or HPP. Error codes and error steps are stored in the following special registers. Error code: D1004 Error step: D1137 2. If the connections between the PLCs fail and the LED flashes rapidly, this indicates the DC 24 V power supply is down. Please check for possible DC 24 V overload. 3. The LED will be steady if the program loop execution time is over the preset time (set in D1000), check the programs or the WDT (Watch Dog Timer). If the LED remains steady, download user program again and then power up to see if the LED will be OFF. If not, please check whether there is any noise interference or any foreign object in the PLC.

Symptom	Troubleshooting and Corrective Actions
Diagnosing Input Malfunction	When input indicator LEDs are OFF, 1. Check the wiring of the input devices. 2. Check that the power is properly supplied to the input terminals. 3. If the power is properly supplied to the input terminal, there is probably an abnormality in the PLC's input circuit. Please contact your dealer. 4. If the power is not properly supplied to the input terminal, there is probably an abnormality in the input device or input power supply. Check the input device and input power supply. When input indicator LEDs are ON, 1. Monitor the input condition using a programming tool. If the input monitored is OFF, there is probably an abnormality in the PLC's input circuit. Please contact your dealer. 2. If the input monitored is ON, check the program again. Also, check the leakage current at the input devices (e.g., two-wire sensor) and check for the duplicated use of output or the program flow when a control instruction such as MC or CJ is used. 3. Check the settings of the I/O allocation.
Diagnosing Output Malfunction	When output indicator LEDs are ON, 1. Check the wiring of the loads. 2. Check whether the power is properly supplied to the loads. 3. If the power is properly supplied to the load, there is probably an abnormality in the load. Check the load again. 4. If the power is not supplied to the load, there is probably an abnormality in the PLC's output circuit. Pleas contact your dealer. When output indicator LEDs are OFF, 1. Monitor the output condition using a programming tool. If the output monitored is turned ON, there is probably a duplicated output error. 2. Forcing ON the output using a programming tool. If the output indicator LED is turned ON, go to input condition check. If the output LED remains OFF, there is probably an abnormality in the PLC's output circuit. Please contact your dealer.

2. Error code in D1004: The error code stored in D1004 is a hexadecimal code.
   After you write the program into the PLC, the illegal use of operands (devices) or incorrect syntax in the program will result in flashing of ERROR indicator and M1004 = ON. In this case, you can find out the cause of the error by checking the error code (hex) in special register D1004. The address where the error occurs is stored in the data register D1137. If the error is a general loop error, the address stored in D1137 will be invalid. ◦

Error code	Description	Action
0001	Operand bit device S exceeds the valid range.	Check D1137. (Check the Error step number.) Re-enter the instruction correctly.
0002	Label P exceeds the valid range or duplicated.	
0003	Operand KnSm exceeds the valid range.	
0102	Interrupt pointer I exceeds the valid range or duplicated.	
0202	Instruction MC exceeds the valid range.	
0302	Instruction MCR exceeds the valid range.	
0401	Operand bit device X exceeds the valid range.	
0403	Operand KnXm exceeds the valid range.	
0501	Operand bit device Y exceeds the valid range.	

Error code	Description	Action
0503	Operand KnYm exceeds the valid range.	Check D1137. (Check the Error step number.) Re-enter the instruction correctly.
0601	Operand bit device T exceeds the valid range.	
0604	Operand word device T register exceeds the limit.	
0801	Operand bit device M exceeds the valid range.	
0803	Operand KnMm exceeds the valid range.	
0B01	Operand K, H available range error	
0D01	DECO operand misuse	
0D02	ENCO operand misuse	
0D03	DHSCS operand misuse	
0D04	DHSCR operand misuse	
0D05	PLSY operand misuse	
0D06	PWM operand misuse	
0D07	FROM/TO operand misuse	
0D08	PID operand misuse	
0D09	SPD operand misuse	
0D0A	DHSZ operand misuse	
0D0B	IST operand misuse	
0E01	Operand bit device C exceeds the valid range.	
0E04	Operand word device C register exceeds the limit.	Check the D1137. (Check the error step number.) Re-enter the instruction correctly.
0E05	DCNT operand CXXX misuse	
0E18	BCD conversion error	
0E19	Division error (divisor=0)	
0E1A	Device use is out of range (including index registers E, F).	
0E1B	Negative number after radical expression	
0E1C	FROM/TO communication error	
0F04	Operand word device D register exceeds the limit.	
0F05	DCNT operand DXXX misuse	
0F06	SFTR operand misuse	
0F07	SFTL operand misuse	
0F08	REF operand misuse	
0F09	Improper use of operands of WSFR, WSFL instructions	
0F0A	The number of times TTMR/STMR is used exceeds the range.	
0F0B	The number of times SORT is used exceeds the range.	
0F0C	The number of times TKY is used exceeds the range.	
0F0D	The number of times HKY is used exceeds the range.	
1000	ZRST operand misuse	
10EF	E and F misuse the operand or exceed the usage range.	
2000	The usage exceeds the limit (MTR, ARWS, TTMR, PR, HOUR).	

Error code	Description	Action
C400	An unrecognized instruction code is being used.	A circuit error will occur if a combination of instructions is incorrectly specified. Select a correct programming mode, and correct the identified error
C401	Loop error	
C402	LD/LDI continuously uses more than 9 times.	
C403	MPS continuously use more than 9 times.	
C404	FOR-NEXT exceeds 6 levels.	
C405	STL/RET is used between FOR and NEXT. SRET/IRET is used between FOR and NEXT. MC/MCR is used between FOR and NEXT. END/FEND is used between FOR and NEXT.	
C407	STL is continuously used more than 9 times	
C408	MC/MCR is used in STL, or I/P is used in STL.	
C409	STL/RET is used in a subroutine or an interrupt program.	
C40A	MC/MCR is used in a subroutine. MC/MCR is used in an interrupt program.	
C40B	MC/MCR does not begin from N0 or discontinuously.	
C40C	MC/MCR corresponding value N is different.	
C40D	I/P is used incorrectly.	
C40E	IRET is not followed by the last FEND instruction. SRET is not followed by the last FEND instruction.	
C40F	The PLC program and the data in the parameters have not been initialized.	
C41B	Invalid RUN/STOP instruction to extension module	
C41C	The number of input/output points of I/O extension unit is larger than the specified limit.	
C41D	The number of extension modules exceeds the range.	
C41F	Failing to write data into memory	
C430	Initializing parallel interface error	
C440	Hardware error in high-speed counter	
C441	Hardware error in high-speed comparator	
C442	Hardware error in MCU pulse output	
C443	No response from extension unit	
C4EE	No END command in the program	
C4FF	Invalid instruction (No such instruction exists.)	

3. Operation error

Devices	Description	Latching	STOP → RUN	RUN → STOP
M1067	Program execution error flag	None	Reset	Latching
M1068	Execution error latch flag	None	Latching	Latching
D1067	Algorithm error code	None	Reset	Latching
D1068	Step value of algorithm errors	None	Latching	Latching

Error code in D1067	Description
0E18	BCD conversion error
0E19	Division error (divisor=0)
0E1A	Floating point exceeds the usage range
0E1B	The value of square root is negative

6.3 Basic Inspection of DVP06XA-S and Error Code Table

- Checking the wiring
  1. Check whether the module is connected to 24 V power, and check whether the POWER LED indicator on the module is turned ON after the module is supplied with the power.
  2. Do not connect input AC power supply to any of the I/O terminals, otherwise serious damage may occur. Check all the wiring again before supplying power.
  3. Please isolate the analog input signal cables from other power cables.
  4. If the analog inputs are connected to current signals, the terminals V+ and I+ have to be short-circuited.
  5. If the ripple in the input voltage results in the noise interference with the wiring, please connect the module to the capacitor having a capacitance within the range between 0.1 μF and 0.47 μF with a working voltage of 25 V.
  6. Please isolate the analog output signal cables from other power cables.
  7. If the ripple is large for the input terminal of the load and results in the noise interference with the wiring, please connect the module to the capacitor having a capacitance within the range between 0.1 μF and 0.47 μF with a working voltage of 25 V.
  8. Please connect the terminal ⏚ on the power module and the terminal ⏚ on the analog output module DVP06XA-S to the system earth point, and ground the system earth point or connect it to the machine cover.
- Checking the program
  1. Check whether the use of the devices in the program is correct.
  2. Check whether the setting of the number of values which will be averaged and the related setting are correct.
- CR#30: Please refer to the table below for more information about the error code stored in CR#30.

Error description	Content	b15~b8	b7	b6	b5	b4	b3	b2	b1	b0
Power source abnormal (low voltage alarm)	K1 (H'1)	Reserved	0	0	0	0	0	0	0	1
User setting D/A output exceeds range	K2 (H'2)		0	0	0	0	0	0	1	0
Setting mode error	K4 (H'4)		0	0	0	0	0	1	0	0
Offset/gain error	K8 (H'8)		0	0	0	0	1	0	0	0
Hardware malfunction	K16 (H'10)		0	0	0	1	0	0	0	0
Digital range error	K32 (H'20)		0	0	1	0	0	0	0	0
Average times setting error	K64 (H'40)		0	1	0	0	0	0	0	0
Instruction error	K128 (H'80)		1	0	0	0	0	0	0	0
Note: Each error code will have corresponding bit (b0 ~ b7). Two or more errors may happen at the same time. 0 means normal and 1 means having error. Example: If the digital input exceeds 4,000, error (K2) will occur. If the analog output exceeds 10V, both analog input value error K2 and K32 will occur. (A/D does not support displaying error K2.)										

6.4 Basic Inspection of DVP04PT-S and Error Code Table

- Checking the wiring
  1. Check whether the module is connected to 24 V power, and check whether the POWER LED indicator on the module is turned ON after the module is supplied with the power.
  2. Do not connect input AC power supply to any of the I/O terminals, otherwise serious damage may occur. Check all the wiring again before supplying power.
  3. Use only the wires that are packed with the temperature sensor for the analog inputs, and separate the wires from other power cables or any wire that may cause noise.
  4. The terminal FG is grounded for noise suppression.
  5. Please connect the terminal ⏚ on the power module and the terminal ⏚ on the temperature measurement module DVP04PT-S to the system earth point, and ground the system earth point or connect it to the machine cover.
- Checking the program
  1. Check whether the use of the devices in the program is correct.
  2. Check whether the setting of the number of values which will be averaged and the related setting are correct.
- CR#30: Please refer to the table below for more information about the error code stored in CR#30.

Error description	Content	b15~b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Power source abnormal	K1 (H'1)	Reserved	0	0	0	0	0	0	0	0	0	0	0	1
The contact is not connected to anything.	K2 (H'2)		0	0	0	0	0	0	0	0	0	0	1	0
Hardware malfunction	K16 (H'10)		0	0	0	0	0	0	0	1	0	0	0	0
Average times setting error	K64 (H'40)		0	0	0	0	0	1	0	0	0	0	0	0
Instruction error	K128 (H'80)		0	0	0	0	1	0	0	0	0	0	0	0
The contact of CH1 is not connected to anything. (Abnormal conversion)	K256 (H'100)		0	0	0	1	0	0	0	0	0	0	0	0
The contact of CH2 is not connected to anything. (Abnormal conversion)	K512 (H'200)		0	0	1	0	0	0	0	0	0	0	0	0
The contact of CH3 is not connected to anything. (Abnormal conversion)	K1024 (H'400)		0	1	0	0	0	0	0	0	0	0	0	0
The contact of CH4 is not connected to anything. (Abnormal conversion)	K2048 (H'800)		1	0	0	0	0	0	0	0	0	0	0	0
Note: Each error code will have corresponding bit (b0 ~ b7). Two or more errors may happen at the same time. 0 means normal and 1 means having error.														

MEMO

Appendix A Communication Setting

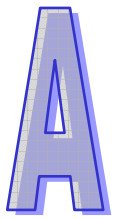
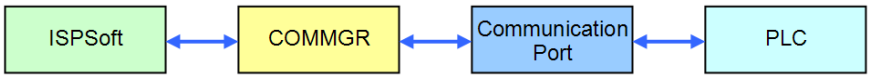


Table of Contents

A.1 Communication Setting

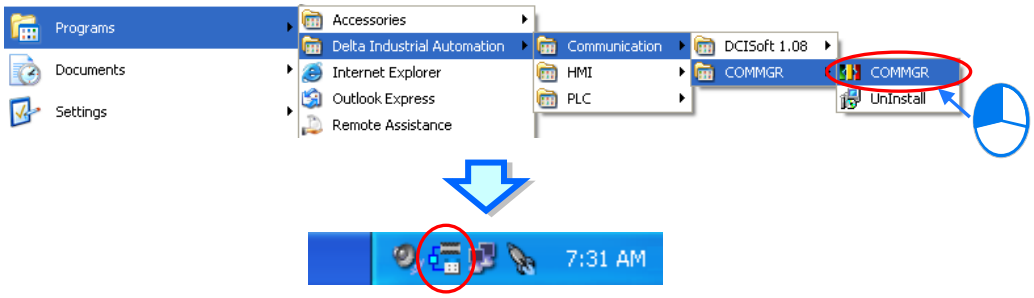
The communication between ISPSoft and a Delta PLC is shown below. The communication manager **COMMGR** is a communication interface between ISPSoft and a PLC. This section introduces how to create a connection between ISPSoft and a PLC, and complete a basic test.



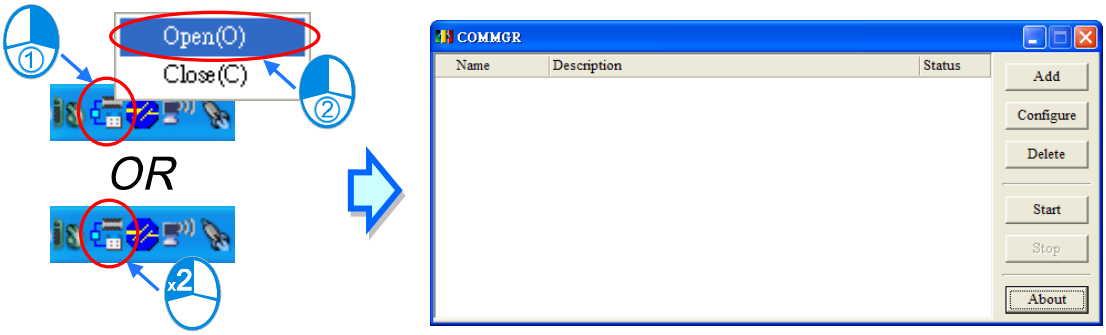
***1. Please refer to section 1.2 for more information about the installation of COMMGR.**
***2. COMMGR is used with ISPSoft version 2.0 and above. An older version of ISPSoft still communicates with a PLC in a traditional way.**

A.1.1 Starting/Closing COMMGR

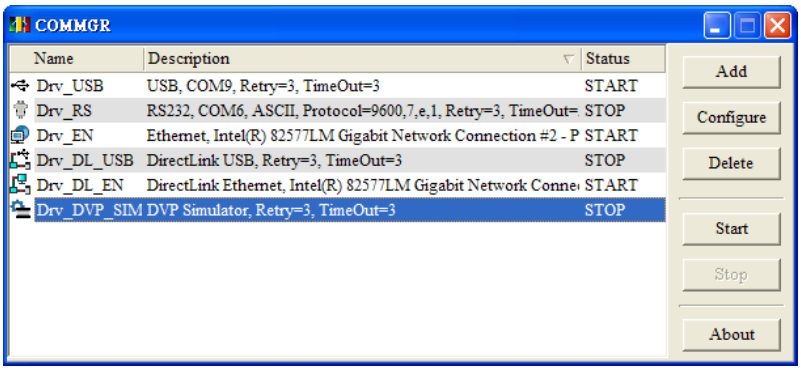
After COMMGR is installed on a computer successfully, a shortcut to COMMGR is created on the **Start** menu. Users can click the shortcut on the **Start** menu to start COMMGR. After the installation of COMMGR is complete, users have to start it by themselves. However, whenever the computer is restarted, the system starts COMMGR automatically, and the icon representing COMMGR is displayed on the system tray. If the icon representing COMMGR is not displayed on the system tray, users can start COMMGR by clicking the shortcut on the **Start** menu.



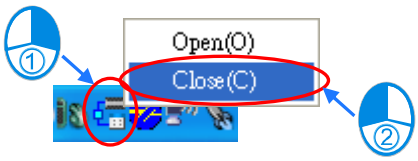
After COMMGR is started successfully, the icon representing COMMGR will be displayed on the system tray. Users can open the **COMMGR** window by double-clicking the icon. They can also open the **COMMGR** window by right-clicking the icon, and clicking **Open** on the context menu.



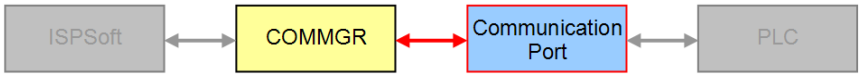
The **COMMGR** window is shown below. The drivers created are listed in the window. ISPSoft connects to COMMGR by means of specifying a driver. Users can manage the drivers through the buttons at the right side of the window. Please refer to the section below for more information about managing drivers.



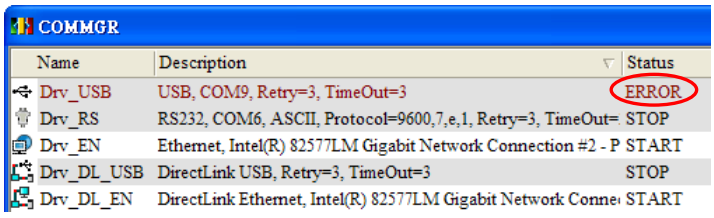
Users can close the **COMMGR** window by clicking or in the upper right corner of the window. However, the icon representing COMMGR is still displayed on the system tray. If users want to close COMMGR completely, they can right-click the icon displayed on the system tray, and click **Close** on the context menu.



A.1.2 Managing Drivers

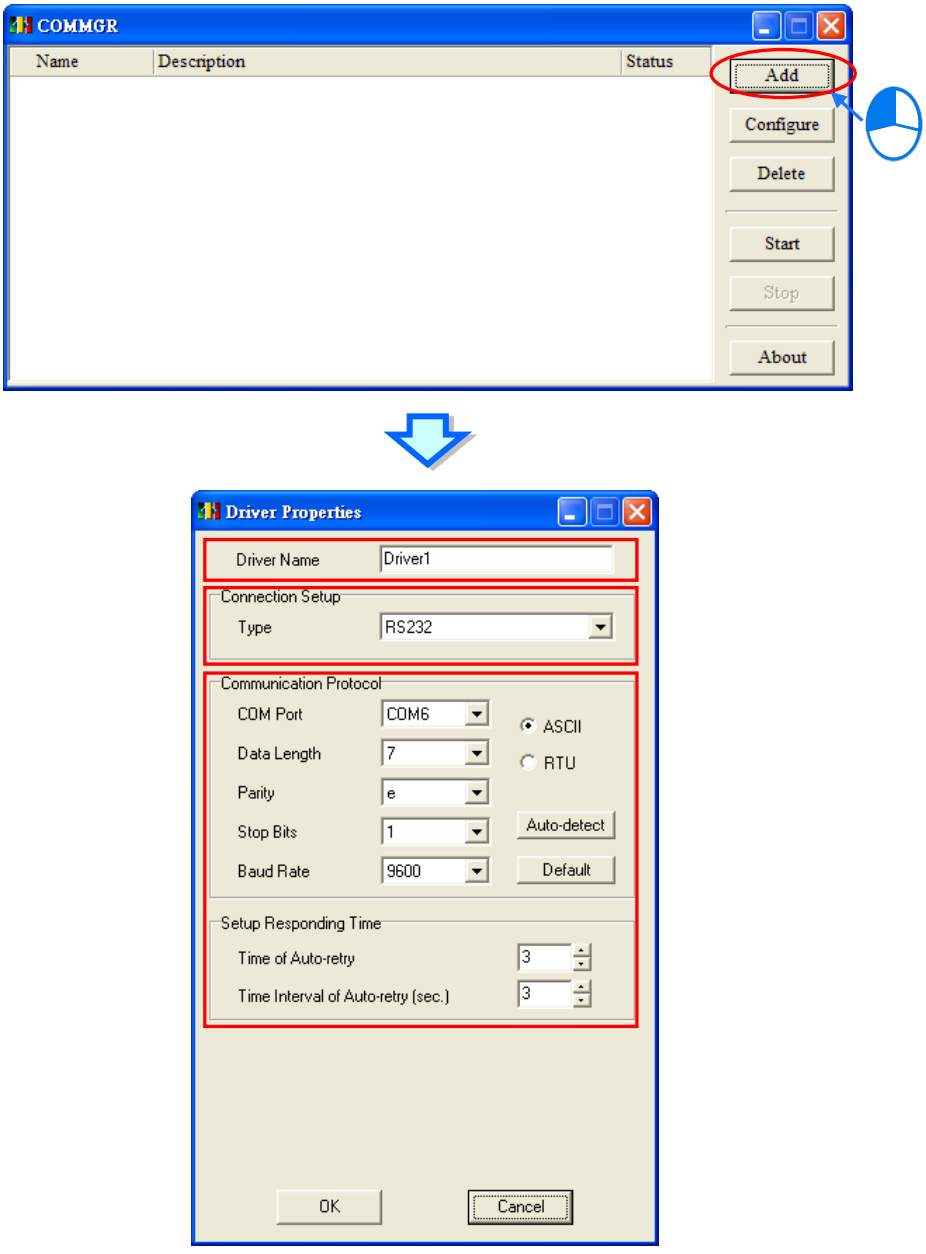


The drivers listed in the **COMMGR** window connect programs and communication ports. If the status of a driver displayed in the **COMMGR** window is **START**, COMMGR connects to the communication port specified by the driver. Whenever the computer is restarted, COMMGR starts the driver automatically. However, if COMMGR can not connect to the communication port specified by a driver, COMMGR automatically stops the driver, the status of the driver displayed in the window is **ERROR**, and the icon representing COMMGR on the system tray is marked with a red cross.



A.1.3 Creating a Connection—Creating a Driver

Click **Add** in the **COMMGR** window to open the **Driver Properties** window.



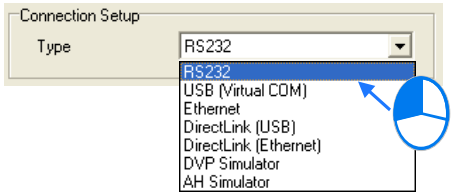
The steps of creating a driver are as follows.

(1) **Driver name**

Users can type a driver name in the **Driver Name** box. A driver name is composed of 31 characters at most. Special marks such as *, #, ?, \, %, @, and etc. can not be used except _.

(2) **Connection type**

Users can select a connection type in the **Type** drop-down list box. The connection types supported by COMMGR are as follows.



- **RS232**

  A computer communicates with a PLC through a communication port on the computer.
- **USB (Virtual COM)**

  A computer can connect to a PLC equipped with a USB port through a USB cable. However, users have to make sure that a USB driver is installed on a computer before the computer connects to a PLC equipped with a USB port. Please refer to appendix A for more information about installing a USB driver.
- **Ethernet**

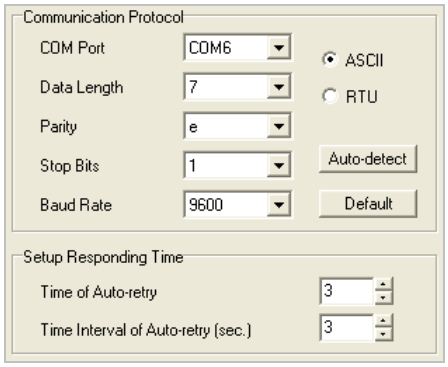
  A computer communicates with a PLC through an Ethernet port on the computer.
- **DirectLink (USB) & DirectLink (Ethernet)**

  They are the connection functions provided by Delta human-machine interfaces (HMI). If a PLC connects to a HMI normally, a computer can connect to the HMI through a USB cable or Ethernet, and connect to the PLC indirectly. Please refer to manuals for Delta human-machine interfaces for more information about setting a connection.
- **DVP Simulator & AH Simulator**

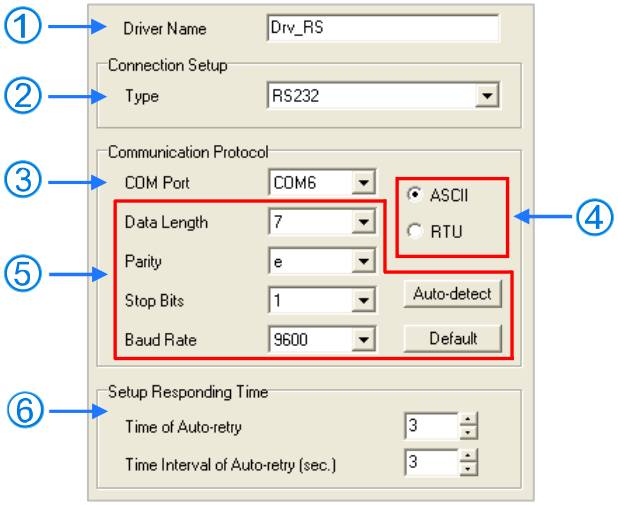
  This type of driver functions as a virtual channel connecting a simulator. If users specify this type of driver in ISPSoft, COMMGR will transmit data between ISPSoft and a simulator once related connection operation is performed. It is as if COMMGR connected to a real PLC. (This mode is a framework adopted by ISPSoft version 2.00 and above.)

(3) **Communication parameters**

Communication parameters are set according to a connection type selected. Different connection types have different communication parameters. The setting of parameters for the different connection types is described in the following sections.



- **Setting communication parameters for RS232**



(1) Users can type a driver name in the **Driver Name** box. Special marks can not be used except _.

(2) Select **RS232** in the **Type** drop-down list box in the **Connection Setup** section.

(3) Select a RS232 communication port in the **COM Port** drop-down list box. Each item in the **COM Port** drop-down list box is composed of a device name and a communication port number. The communication ports in the **COM Port** drop-down list box are the same as the communication ports in the **Device Manager** window.

(4) The communication format can be **ASCII** or **RTU**.

(5) The communication protocol for exchanging data through a communication port selected must be the same as the communication protocol for exchanging data through a communication port on a device connected. If users click **Default**, all communication parameters will return to the default values.

If users do not know the communication protocol for exchanging data through a communication port on a device connected, the users can connect the device to a RS232 communication port selected with a RS232 cable, and click **Auto-detect** to automatically detect the communication protocol. If the communication protocol is detected successfully, the related communication parameters in the **Driver Properties** window are set. However, when the communication protocol is detected automatically, the **COM Port** parameter and the **ASCII/RTU** parameter are not detected. As a result, the users have to set the **COM Port** parameter and the **ASCII/RTU** parameter before clicking **Auto-detect**.

(6) Users can select the number of times the sending of a command is retried if a connection error occurs in the **Time of Auto-retry** box, and select an interval of retrying the sending of a command in the **Time Interval of Auto-retry** box.

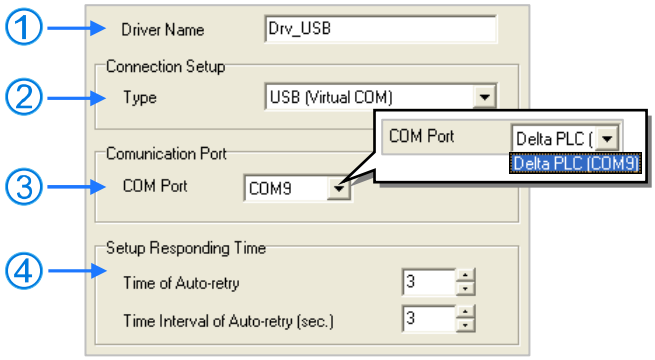
***. When the Driver Properties window is opened, the information about the communication ports in the Device Manager window is retrieved once. However, the information in the COM Port drop-down list box will not be updated. If a device is added to the computer system after the Driver Properties window is opened, the device will not be displayed in the COM Port drop-down list box. Users have to close the Driver Properties window, and open it again.**

- **Setting communication parameters for USB (virtual COM)**

  If users want to connect a USB port on a computer to a PLC, they have to make sure of the items below before opening the **Driver Properties** window.

  (a) A USB driver is installed on the computer.

  (b) The computer is connected to the PLC through a USB cable. The computer and the PLC operate normally.



  (1) Users can type a driver name in the **Driver Name** box. Special marks can not be used except _.

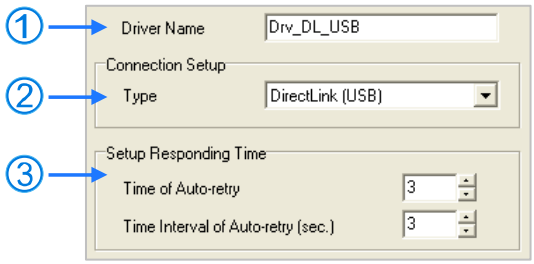
  (2) Select **USB (Virtual COM)** in the **Type** drop-down list box in the **Connection Setup** section.

  (3) Select a communication port in the **COM Port** drop-down list box. If users have made sure of the two items above, the PLC which is connected and its communication port will be displayed in the **COM Port** drop-down list box.

  (4) Users can select the number of times the sending of a command is retried if a connection error occurs in the **Time of Auto-retry** box, and select an interval of retrying the sending of a command in the **Time Interval of Auto-retry** box.

  ***. Please refer to section A.2 or appendix A in ISPSoft User Manual for more information about installing a USB driver.**

- **Setting communication parameters for DirectLink (USB)**

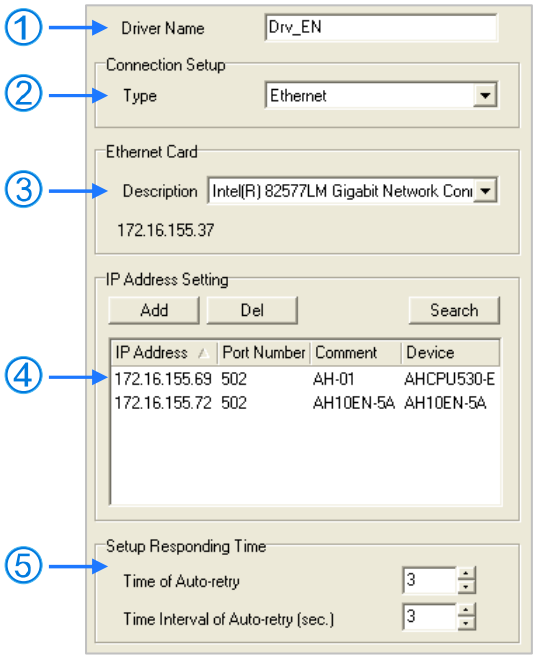


  (1) Users can type a driver name in the **Driver Name** box. Special marks can not be used except _.

  (2) Select **DirectLink (USB)** in the **Type** drop-down list box in the **Connection Setup** section.

  (3) Users can select the number of times the sending of a command is retried if a connection error occurs in the **Time of Auto-retry** box, and select an interval of retrying the sending of a command in the **Time Interval of Auto-retry** box.

- **Setting communication parameters for Ethernet**



(1) Users can type a driver name in the **Driver Name** box. Special marks can not be used except _.

(2) Select **Ethernet (USB)** in the **Type** drop-down list box in the **Connection Setup** section.

(3) Select a network interface card in the **Description** drop-down list box. An IP address assigned to a network interface card selected is displayed in the lower left corner of the **Ethernet Card** section.

(4) Owing to the characteristics of Ethernet, a computer can communicate with all devices on a network. Users can create the IP addresses of devices connected to this driver in the **IP Address Setting** section.

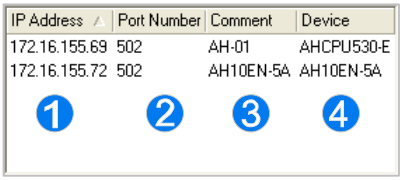
- Some devices support the **Search** function. After users click **Search** to search for IP addresses, results are displayed in the **IP Address Setting** section.
- After users click **Add** to add a new IP address to the list of IP addresses in the **IP Address Setting** section, they can type related information in the **IP Address** section, the **Port Number** column, and the **Comment** column.

❶ Users can type the IP address of a device connected in this column.

❷ Users can type a communication port number specified. If it is not necessary to specify a communication port number, please use the default communication port number 502.

❸ Users can type a comment in this column.

❹ Users can not type a device in this column. After users click **Search**, a device which is found is displayed in this column.



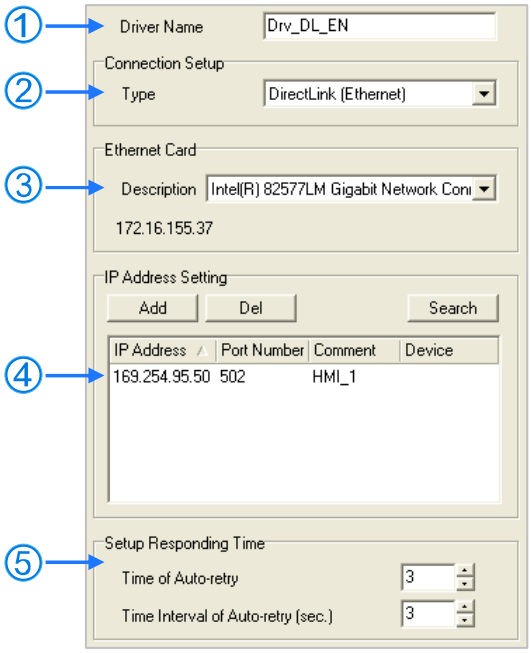
- After users select an IP address, they can click **Del** or press DEL on the keyboard to delete the IP address from the list.

(5) Users can select the number of times the sending of a command is retried if a connection error occurs in the **Time of Auto-retry** box, and select an interval of retrying the sending of

a command in the **Time Interval of Auto-retry** box.

***. When the Driver Properties window is opened, the information about the network interface cards in the computer is retrieved once. However, the information in the Description drop-down list box will not be updated. If a network interface card is added to the computer system after the Driver Properties window is opened, the network interface card will not be displayed in the Description drop-down list box. Users have to close the Driver Properties window, and open it again.**

- **Setting communication parameters for DirectLink (Ethernet)**



(1) Users can type a driver name in the **Driver Name** box. Special marks can not be used except _.

(2) Select **DirectLink (Ethernet)** in the **Type** drop-down list box in the **Connection Setup** section.

(3) Select a network interface card in the **Description** drop-down list box. An IP address assigned to a network interface card selected is displayed in the lower left corner of the **Ethernet Card** section.

(4) Owing to the characteristics of Ethernet, a computer can communicate with all devices on a network. Users can create the IP addresses of devices connected to this driver in the **IP Address Setting** section.

- Delta human-machine interfaces support the **Search** function. After users click **Search** to search for IP addresses, results are displayed in the **IP Address Setting** section.

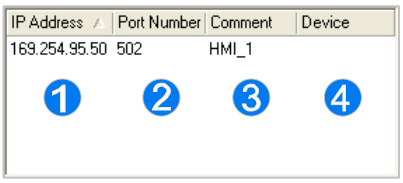
➢ After users click **Add** to add a new IP address to the list of IP addresses in the **IP Address Setting** section, they can type related information in the **IP Address** section, the **Port Number** column, and the **Comment** column.

❶ Users can type the IP address of a device connected in this column.

❷ Users can type a communication port number specified. If it is not necessary to specify a communication port number, please use the default communication port number 502.

❸ Users can type a comment in this column.

❹ No device will be displayed in this column even if a device is found.

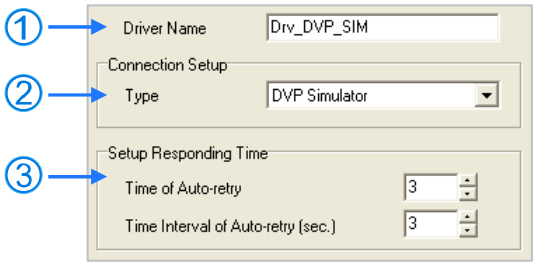


➢ After users select an IP address, they can click **Del** or press DEL on the keyboard to delete the IP address from the list.

(5) Users can select the number of times the sending of a command is retried if a connection error occurs in the **Time of Auto-retry** box, and select an interval of retrying the sending of a command in the **Time Interval of Auto-retry** box.

***. When the Driver Properties window is opened, the information about the network interface cards in the computer is retrieved once. However, the information in the Description drop-down list box will not be updated. If a network interface card is added to the computer system after the Driver Properties window is opened, the network interface card will not be displayed in the Description drop-down list box. Users have to close the Driver Properties window, and open it again.**

- **Setting communication parameters for a DVP simulator**



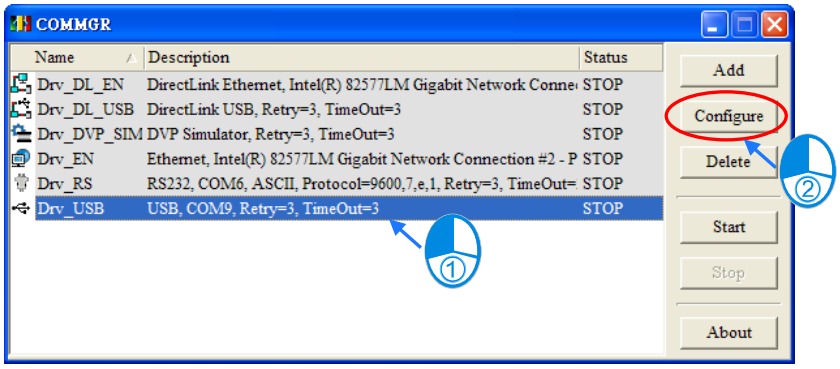
(1) Users can type a driver name in the **Driver Name** box. Special marks can not be used except _.

(2) Select **DVP Simulator** in the **Type** drop-down list box in the **Connection Setup** section.

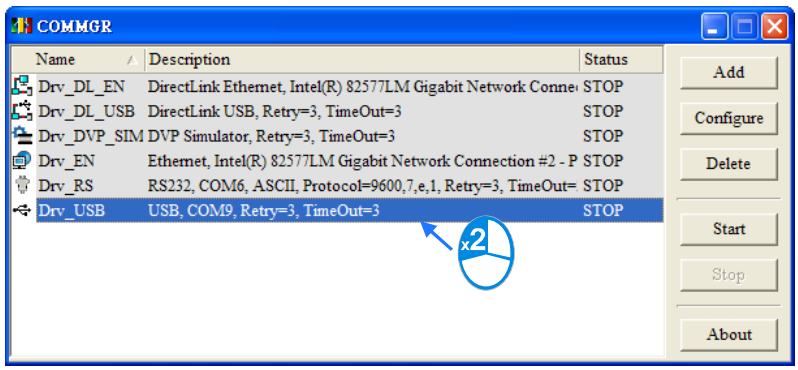
(3) Users can select the number of times the sending of a command is retried if a connection error occurs in the **Time of Auto-retry** box, and select an interval of retrying the sending of a command in the **Time Interval of Auto-retry** box.

A.1.4 Creating a Connection–Configuring/Deleting a Driver

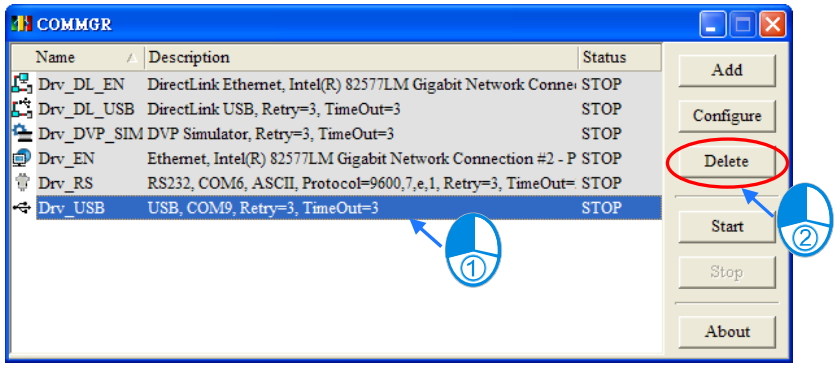
If users want to modify parameters for a driver, they have to stop the driver, and click **Configure**, or double-click the driver to open the **Driver Properties** Window. The users can set the parameters in the **Driver Properties** Window according to the description in section A.1.3.



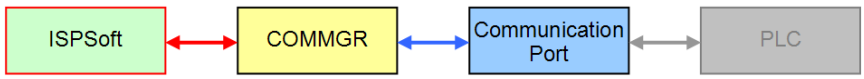
OR



If users want to delete a driver, they have to make sure that the driver stops, select the driver, and click **Delete**, or press DEL on the keyboard to delete the driver.



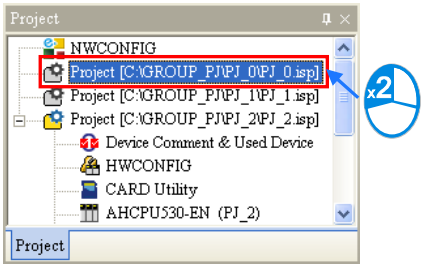
A.1.5 Creating a Connection Between ISPSoft and COMMGR



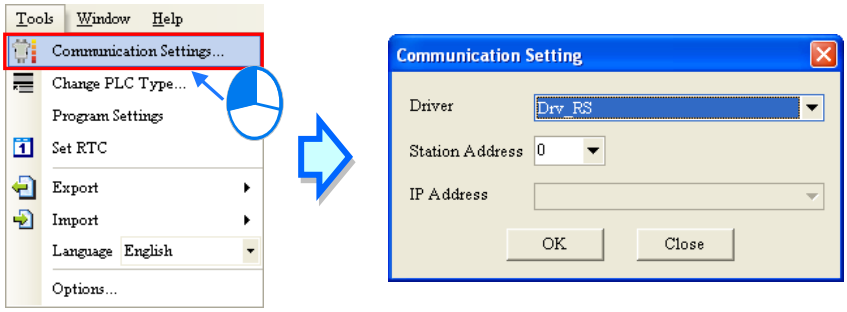
After drivers are created and started in COMMGR, users can specify drivers in ISPSoft. After the setting is complete, a connection between ISPSoft and COMMGR is created. The users have to specify a driver for every project. As a result, the users have to open the projects in a group, and

specify drivers for them.

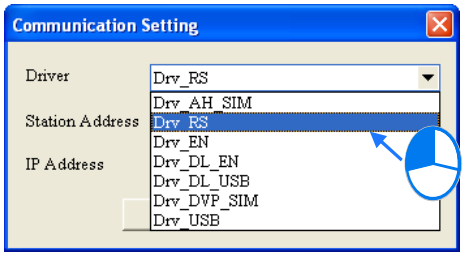
(1) First, users have to activating a project in a group. If a project is a single project, it does not need to be activated.



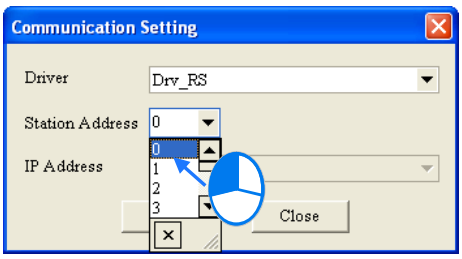
(2) After the users click **Communication Settings…** on the **Tools** menu, the **Communication Setting** window appear.



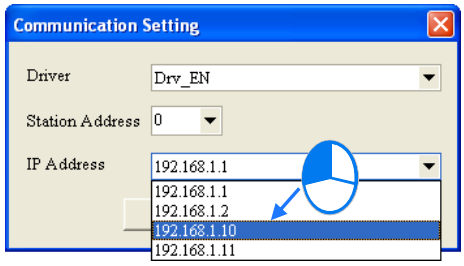
(3) Select a driver in the **Driver** drop-down list box in the **Communication Setting** window.



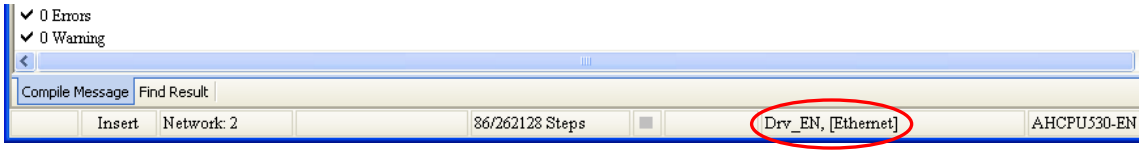
(4) Select the station address of the PLC connected to the computer in the **Station Address** drop-down list box. If the users do not know the station address, they can select 0 in the **Station Address** drop-down list box.



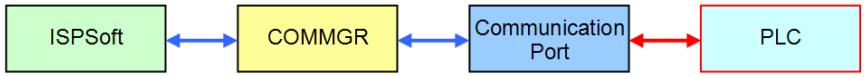
(5) If the connection type that the driver uses is Ethernet or DirectLink (Ethernet), the users have to select an IP address created in COMMGR in the **IP Address** drop-down list box.



(6) After the setting is complete, users can click **OK**. The information about the driver which is connected is displayed in the status bar.



A.1.6 Connecting a PLC and a Communication Port

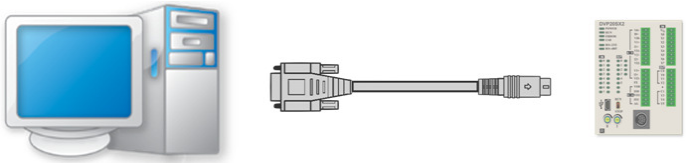


After all setting is complete, users can connect a PLC to a communication port specified through a communication cable. Some common ways to connect a PLC to a communication port, and some points for attention are listed below. Please refer to PLC manuals for more information about connecting PLCs to communication ports.

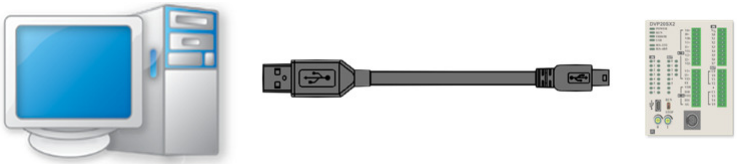
1. DVP series PLC (RS232)

   A computer is connected to a DVP series PLC through a Delta communication cable. The connection type that a driver uses is RS232.

   Note: Users have to make sure that the communication protocol for exchanging data through a driver is the same as the communication protocol for exchanging data through a communication port on a PLC before they connect the driver to the PLC.



2. DVP-SX2/DVP-SE series PLC (USB)
   A DVP-SX2/DVP-SE series PLC is equipped with a type B mini USB interface. Users can connect a DVP-SX2/DVP-SE series PLC to a computer with a USB cable. Owing to the fact that a DVP-SX2/DVP-SE series PLC converts USB to RS232, the RS232 standard for serial communication is adopted. The connection type that a driver uses must be RS232.
   Note:
   (a) Users have to make sure that the USB driver for a DVP-SX2/DVP-SE series PLC has been installed on a computer. Please refer to appendix A in ISPSoft User Manual for more information.
   (b) Users have to make sure that the communication protocol for exchanging data through a driver is the same as the communication protocol for exchanging data through a communication port on a PLC before they connect the driver to the PLC.

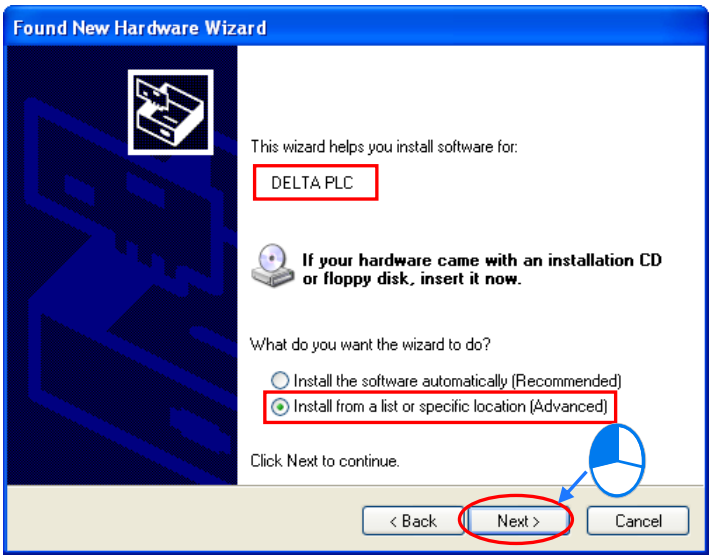


A.2 Installing the USB Driver for a PLC

The installation of the USB driver for a PLC on Windows XP is introduced below. If users want to install the USB driver for a PLC on another operating system, they have to refer to the instructions in the operating system for more information about the installation of new hardware.

(1) Make sure that the PLC is supplied with power normally. Connect the PLC to a USB port on the computer with a USB cable. Select the **No, not this time** option button in the **Found New Hardware Wizard** window, and then click **Next**.

(2) The name of the USB device detected is displayed in the window. The device name shown in the figure below is the name of an AH500 series CPU module. Different models have different names. Please select the **Install from a lost or specific location (Advanced)** option button.

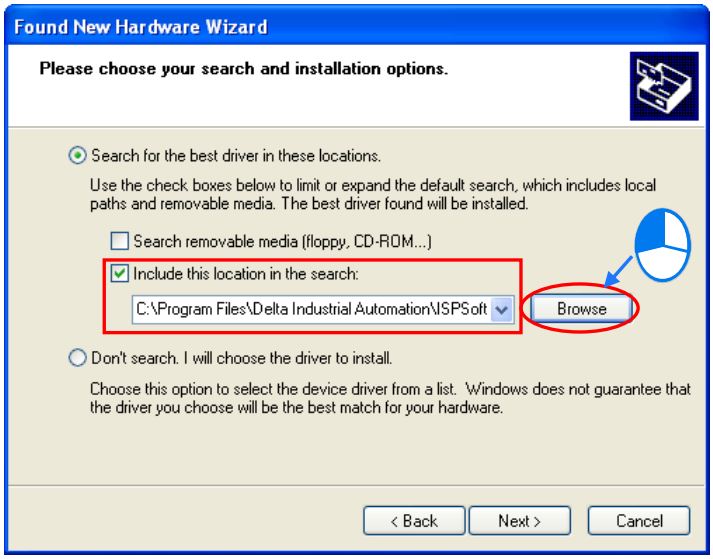


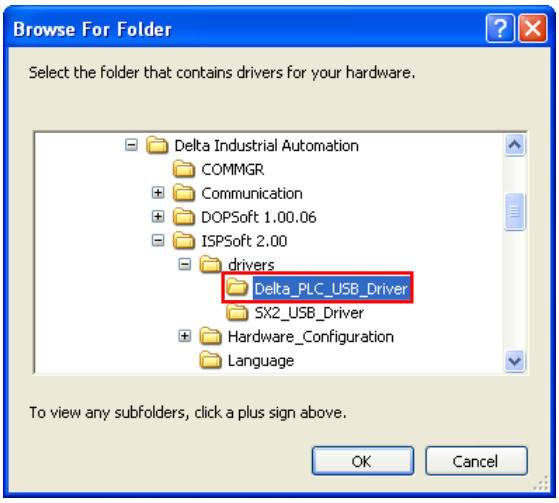
(3) The Delta PLCs which are equipped with built-in USB interfaces are listed in the tabled below. After ISPSoft version 2.00 or above is installed, the drivers for DVP-SX2 series PLCs, DVP-SE series PLCs, and AH500 series CPU modules will be in the folders denoted by the paths in the table.

Model	Path
DVP-SX2	Installation path of ISPSoft\drivers\SX2_USB_Driver\
DVP-SE	Installation path of ISPSoft\drivers\Delta_PLC_USB_Driver\
AH500	Installation path of ISPSoft\drivers\Delta_PLC_USB_Driver\

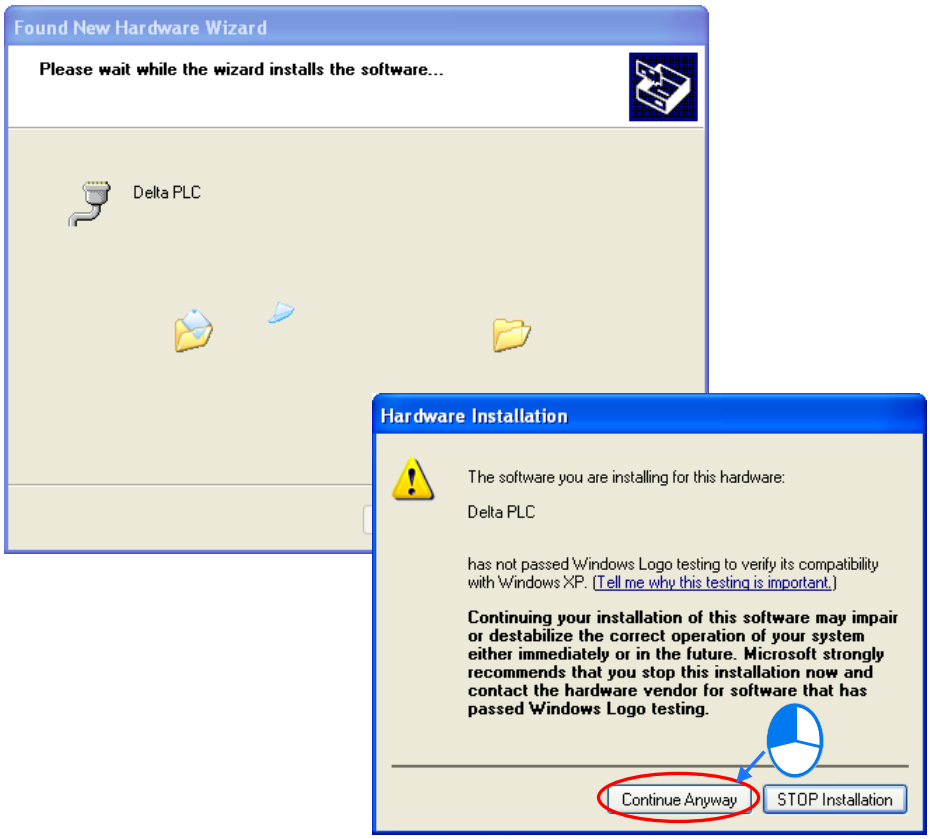
***. The default installation path of ISPSoft is C:\Program Files\Delta Industrial Automation\ISPSoftx.xx.**

Specify a path according to the PLC which is connected. If the driver for a PLC is gotten in another way, users have to specify the corresponding path. Click **Next** to carry on the installation.

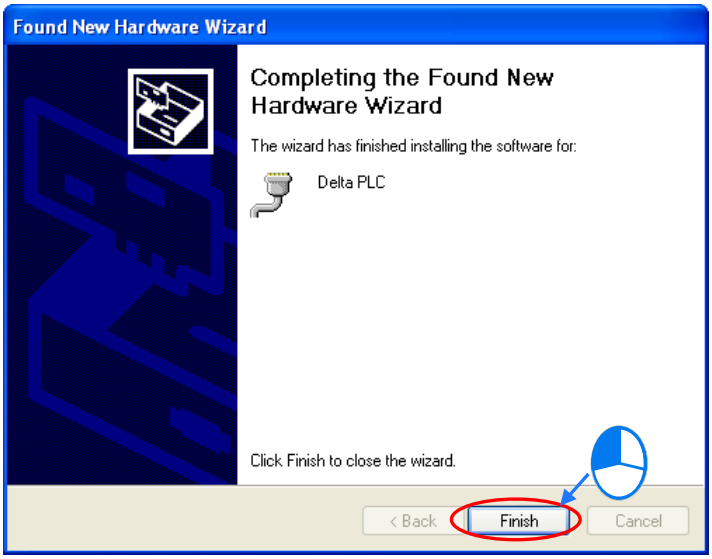




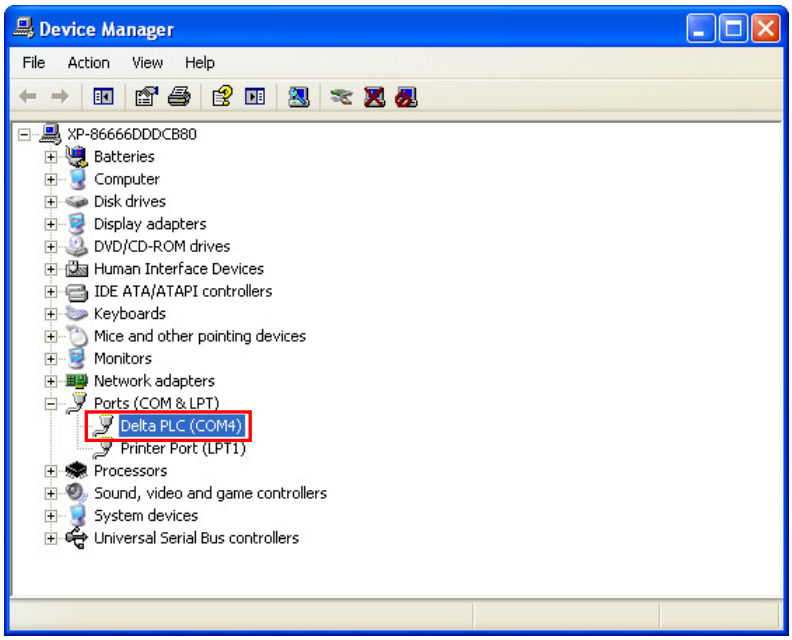
(4) After the correct driver is found in the folder denoted by the path, the system will install the driver. If the **Hardware Installation** window appears during the installation, please click **Continue Anyway**.



(5) Click **Finish** after the installation is finished.



(6) Open the **Device Manager** window after the installation is finished. If the name of the USB device connected is under **Ports (COM&LPT)**, the installation of the driver is successful. The operating system assigns a communication port number to the USB device.



***. The device name shown in the figure above is the name of an AH500 series CPU module. Different models have different names.**

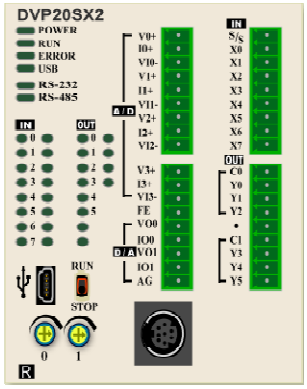
Additional remark

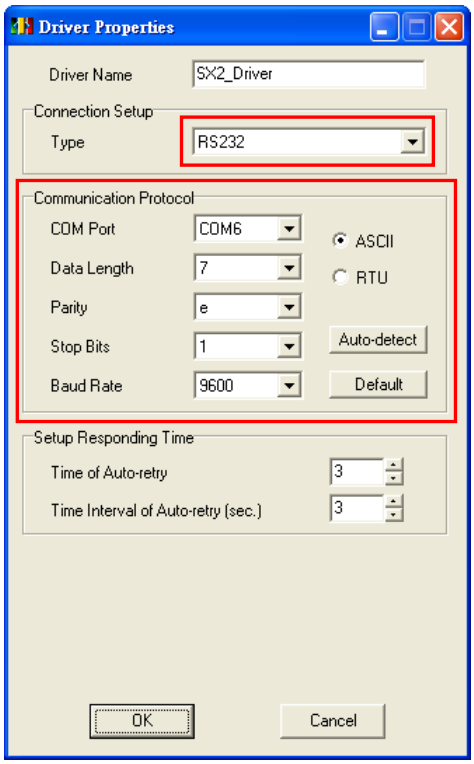
- If the PLC is connected to another USB port on the computer, the system may ask users to install the driver again. The users can follow the steps above, and install the driver again. After the driver is installed, the communication port number that the operating system assigns to the USB device may be different.
- If Windows XP SP3 has not been installed on the computer, an error message will appear during the installation. Users can deal with the problem in either way below.
  (a) Cancel the installation, install Windows XP SP3, and reinstall the driver according to the steps above.
  (b) Get the file needed, and specify the path pointing to the file in the **Files Needed** window.

A.3 Setting the USB Port on a DVP-SX2 Series PLC

The operation of the USB port on a DVP-SX2 series PLC differs from the operation of the USB ports on other models in that a circuit which converts USB to RS-232 is installed in the DVP-SX2 series PLC. As a result, the operation inside the DVP-SX2 series PLC adopts RS-232 although the port on the PLC is a USB port. Users must select **RS232** in the **Type** drop-down list box in the **Driver Properties** window if they want to create a driver in COMMGR. The setting of the communication protocol for exchanging data through the USB port is the same as the setting of the communication protocol for exchanging data through a general RS-232 port.

Users can set the communication protocol for exchanging data through the USB port on a DVP-SX2 PLC by means of writing a value into D1109. Please refer to the programming manual for DVP-SX2 series PLCs for more information. If users want to create the driver in COMMGR, they have to make sure that the communication protocol for exchanging data through the driver is the same as the communication protocol for exchanging data through the USB port on a DVP-SX2.

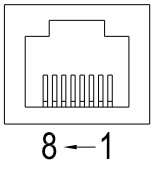




A.4 Ethernet Port/Mini-Din Connector/RS-485 Port/Mini-USB Port/CANopen Connector

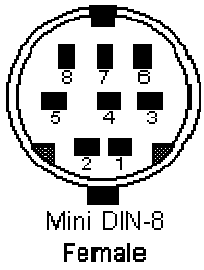
- **Ethernet port**

Pin	Signal	Description
1	TX+	Transmitting data +
2	TX-	Transmitting data -
3	RX+	Receiving data +
4	--	N/C
5	--	N/C
6	RX-	Receiving data -
7	--	N/C
8	--	N/C



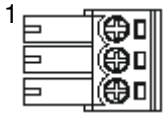
- **Mini-DIN connector**

Pin	Signal	Description
1	5V	5 V DC
2	5V	5 V DC
3	--	N/C
4	RX	Receiving data
5	TX-	Transmitting data
6	--	N/C
7	--	N/C
8	GND	Ground



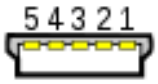
- **RS-485 port**

Pin	Signal	Description
1	D+	Data +
2	D–	Data -
3	SG	Sign ground



- **USB port**

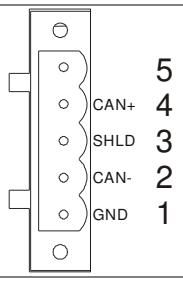
Pin	Function
1	VBUS (4.4–5.25 V)
2	D–
3	D+
4	Ground
5	Ground



- **CANopen connector**

A CANopen connector is connected to a CANopen network.

Pin	Signal	Description
1	GND	0 V DC
2	CAN_L	Signal -
3	SHLD	Shielded cable
4	CAN_H	Signal +
5	-	Reserved



Appendix B Accessory List

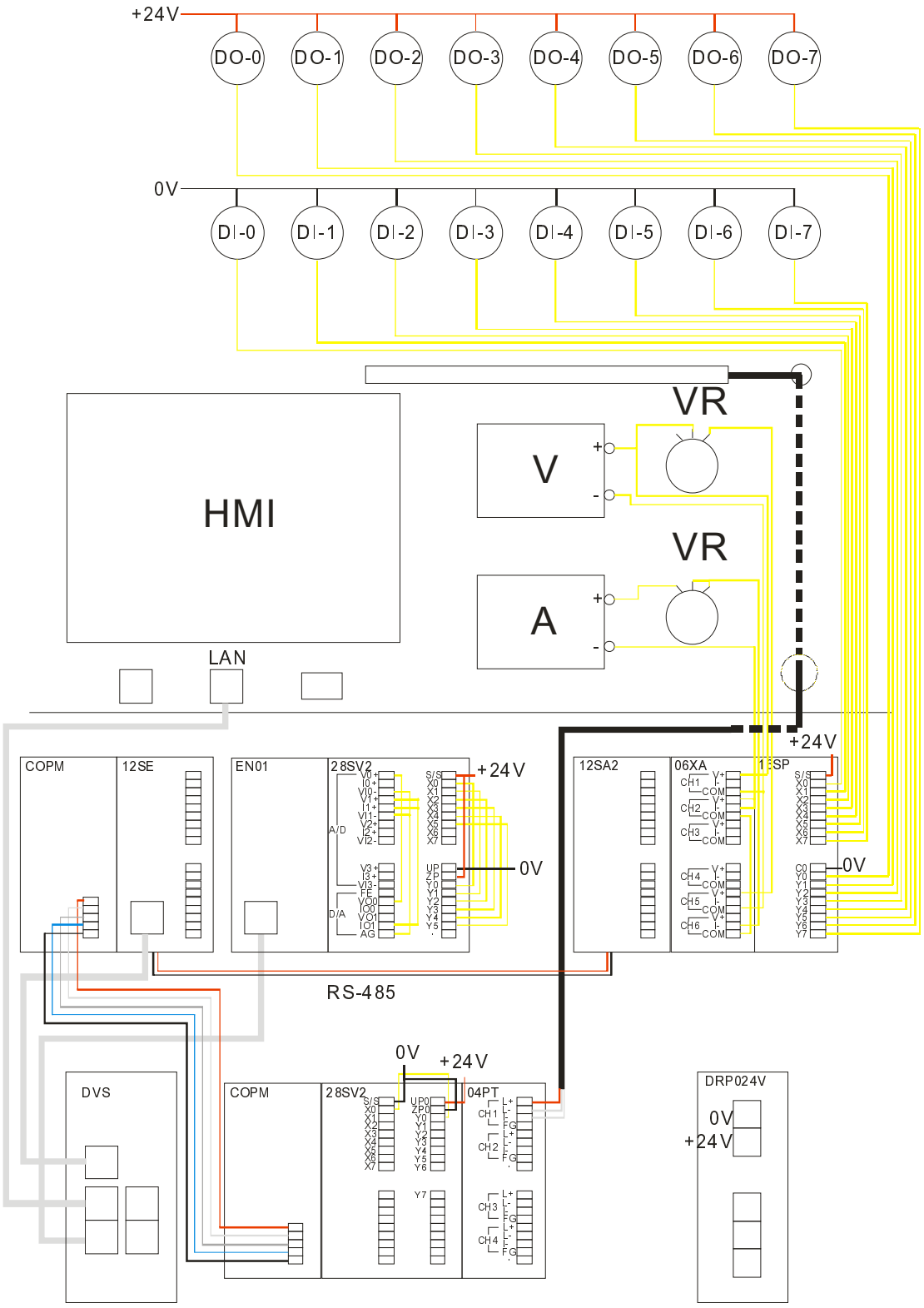
Table of Contents

B.1 Accessory List

Accessory	Quantity
Ethernet RJ45 communication cable	4
Four pin connector to five pin connector USB cable	1
Type A plug to Type B plug USB cable	1
CANopen cable	1
Power cable	1
IFD6500	1
USB disk	1

The contents of the USB disk are described below.

Software	ISPSoft
	DOPSoft
	DCISoft
	CANopen Builder
	COMMGR
Document	ISPSoft User Manual
	DOPSoft User Manual
	DVPEN01-SL Ethernet Communication Module Operation Manual
	DVPCOPM-SL CANopen Master Communication Module Operation Manual
	DVP-ES2/EX2/SS2/SA2/SX2/SE&TP Operation Manual—Programming
Program	Examples of programming



Wiring of the training kit

MEMO