Smarter. Greener. Together.

Industrial Automation Headquarters

Delta Electronics, Inc.
Taoyuan Technology Center
No.18, Xinglong Rd., Taoyuan City,
Taoyuan County 33068, Taiwan
TEL: 886-3-362-6301 / FAX: 886-3-371-6301

Asia

Delta Electronics (Jiangsu) Ltd.
Wujiang Plant 3
1688 Jiangxing East Road,
Wujiang Economic Development Zone
Wujiang City, Jiang Su Province, P.R.C. 215200
TEL: 86-512-6340-3008 / FAX: 86-769-6340-7290

Delta Greentech (China) Co., Ltd.
238 Min-Xia Road, Pudong District,
ShangHai, P.R.C. 201209
TEL: 86-21-58635678 / FAX: 86-21-58630003

Delta Electronics (Japan), Inc.
Tokyo Office
2-1-14 Minato-ku Shibadaimon,
Tokyo 105-0012, Japan
TEL: 81-3-5733-1111 / FAX: 81-3-5733-1211

Delta Electronics (Korea), Inc.
1511, Byucksan Digital Valley 6-cha, Gasan-dong,
Geumcheon-gu, Seoul, Korea, 153-704
TEL: 82-2-515-5303 / FAX: 82-2-515-5302

Delta Electronics Int'l (S) Pte Ltd.
4 Kaki Bukit Ave 1, #05-05, Singapore 417939
TEL: 65-6747-5155 / FAX: 65-6744-9228

Delta Electronics (India) Pvt. Ltd.
Plot No 43 Sector 35, HSIIDC
Gurgaon, PIN 122001, Haryana, India
TEL : 91-124-4874900 / FAX : 91-124-4874945

Americas

Delta Products Corporation (USA)
Raleigh Office
P.O. Box 12173,5101 Davis Drive,
Research Triangle Park, NC 27709, U.S.A.
TEL: 1-919-767-3800 / FAX: 1-919-767-8080

Delta Greentech (Brasil) S.A.
Sao Paulo Office
Rua Itapeva, 26 - 3° andar Edificio Itapeva One-Bela Vista
01332-000-São Paulo-SP-Brazil
TEL: 55 11 3568-3855 / FAX: 55 11 3568-3865

Europe

Delta Electronics (Netherlands) B.V.
Eindhoven Office
De Witbogt 20, 5652 AG Eindhoven, The Netherlands
TEL : +31 (0)40-8003800 / FAX : +31 (0)40-8003898

AS-0249320-01

*We reserve the right to change the information in this manual without prior notice.

2016/09/30

AS Series Quick Start

www.deltaww.com

Smarter. Greener. Together.

AS Series Quick Start

Revision History

Version	Revision	Date
1st	The first version was published.	2016/09/30

AS Series Quick Start

Table of Contents

Chapter 1 Introduction

Chapter 2 Programming

Chapter 3 Downloading and Monitoring the Program

Chapter 1 Introduction

Table of Contents

1.1 Manuals

Delta Electronics, Inc. provides users with the manuals related to the AS series programmable logic controllers according to different application requirements.

AS series Hardware Manual: It introduces hardware specifications, addressing, wiring, maintenance, troubleshooting, and etc.

AS series Operation Manual: It introduces the configuration of the hardware, the setting of the connection, the operation of the CPU module, the setting of the software, and etc.

AS series Programming Manual: It introduces devices and instructions.

AS series Module Manual: It introduces module specifications, installation, setting, troubleshooting, and etc.

ISPSoft User Manual: It introduces the use of ISPSoft, including the variables, the connection, the programs, and the function blocks.

AS series Quick Start: It helps users create and use the system in a short time. AS series Quick Start not only introduces the basic system frameworks, but also teaches users to write a program step by step by means of simple examples, and download the program which includes the variables and the function blocks to the CPU module. Users can experience the convenience brought by the new functions. If an error occurs when the system runs, please refer to section 3.3.2 for more information about debugging the program. (Please refer to chapter 12 in AS series Operation Manual for more information about the troubleshooting.)

The graphic representations in the manual

Graph	Significance
🖱	Clicking the left mouse button
🖱	Clicking the right mouse button
🖱 x2	Double-clicking the left mouse button
🖱	Pressing and holding the left mouse button, and then moving the mouse without releasing the button.
⌨	Typing with a keyboard
①	Operating sequence (The graphic representation is used when the operating sequence is mentioned. For example, 🖱① and ② ⌨ .)
❶	Number used with a picture

1.2 System Frameworks

The AS series programmable logic controller is a medium-to-small type of programmable logic control system. The execution speed and the memory capacity are increased. Besides, the complete program development function of function blocks is supported. In order to meet users' more advanced application requirements, the AS series programmable logic controllers provide more flexible system extension frameworks. Under such system frameworks, users do not need to use several CPU modules to control the system because of the fact that there are too many I/O points or the equipment is too far away. The completeness of the system is retained, and users can be more efficient in developing the projects.

The minimum framework requirement for the AS series system:

To create the AS series system, one CPU module and one power supply module are needed for the operation of the CPU module.

Power supply module + AS series PLC (AS-PS02 + AS332T-A)

Limits for setting up a common framework of the AS PLC system:

Exceeding any one of the limit will trigger the PLC to send error message.

Limit 1: Up to 32 extension modules can be connected to the PLC. (The power module, CPU module, and remote module are not included.)

Limit 2: The maximum number of the digital I/O point is 1024. (The built-in digital I/O points of the CPU module are included.)

Limit 3: Up to 16 analog modules can be connected to the PLC. (AD, DA, XA, RTD, TC and LC are included.)

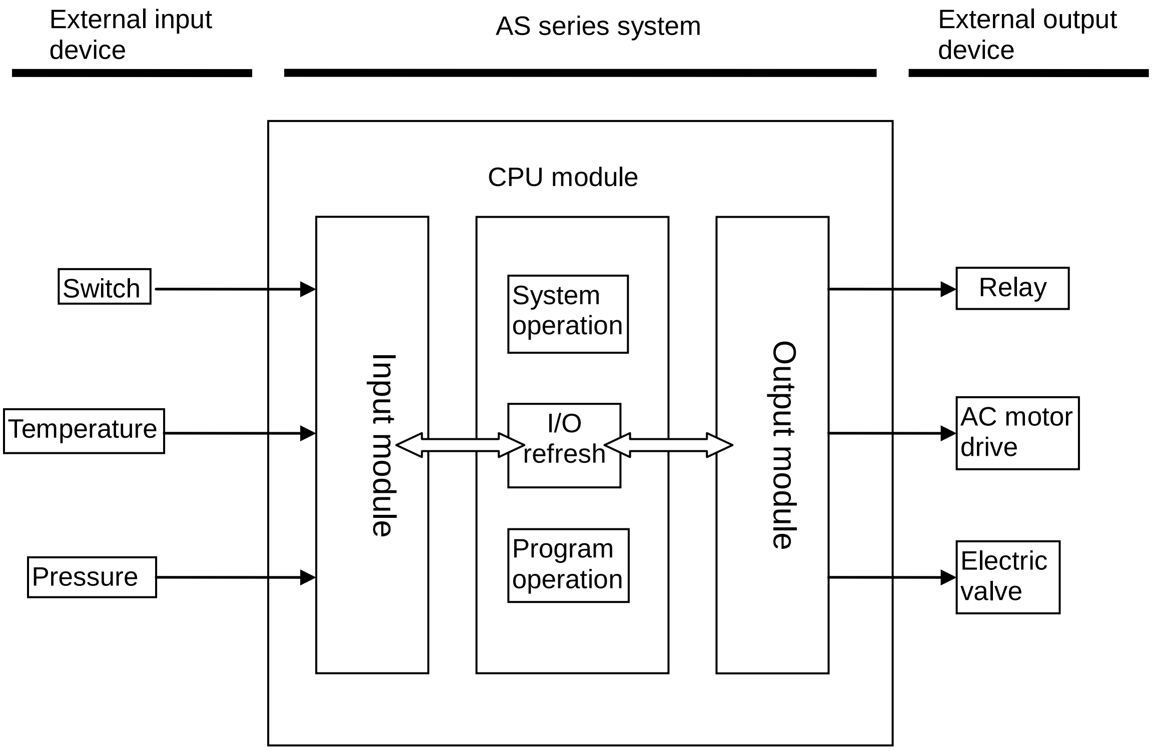
Limit 4: Up to 4 communication module (AS00SCM) can be connected to the PLC.

Limit 5: Up to 15 remote modules (AS00SCM+AS-FCOPM) can be connected to the PLC. And the remote modules can work with no more than 8 digital/analog modules.

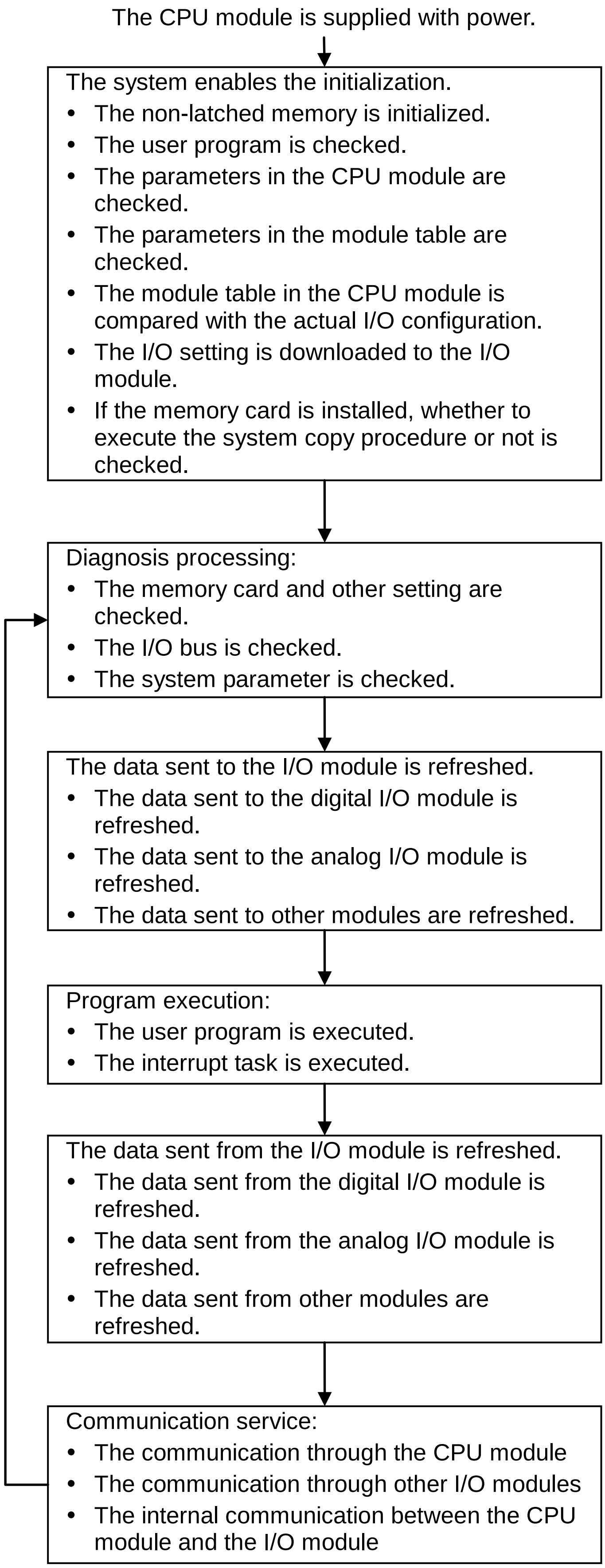
Limit 6: Remote modules can only connect to digital/analog module but not to communication or position control modules.

1.3 Operation of the CPU module

The CPU module is the nucleus of the AS series system. It is responsible for not only the execution of the logic program, but also the data exchange and the processing of the communication data. The relation between the AS series system and the external devices are illustrated below.



The operation of the CPU module is illustrated above. The system procedures related to the initialization, the diagnosis, and the communication, and the program procedures related to the external interrupts and timed interrupts are simplified. Users can refer to other manuals for more information. The operation of the CPU module is described below.



The CPU module is supplied with power.

The system enables the initialization.

- The non-latched memory is initialized.
- The user program is checked.
- The parameters in the CPU module are checked.
- The parameters in the module table are checked.
- The module table in the CPU module is compared with the actual I/O configuration.
- The I/O setting is downloaded to the I/O module.
- If the memory card is installed, whether to execute the system copy procedure or not is checked.

Diagnosis processing:

- The memory card and other setting are checked.
- The I/O bus is checked.
- The system parameter is checked.

The data sent to the I/O module is refreshed.

- The data sent to the digital I/O module is refreshed.
- The data sent to the analog I/O module is refreshed.
- The data sent to other modules are refreshed.

Program execution:

- The user program is executed.
- The interrupt task is executed.

The data sent from the I/O module is refreshed.

- The data sent from the digital I/O module is refreshed.
- The data sent from the analog I/O module is refreshed.
- The data sent from other modules are refreshed.

Communication service:

- The communication through the CPU module
- The communication through other I/O modules
- The internal communication between the CPU module and the I/O module

MEMO

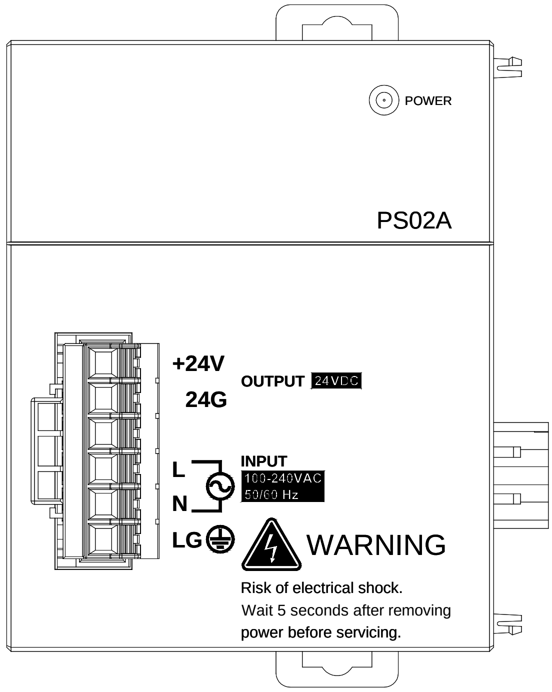
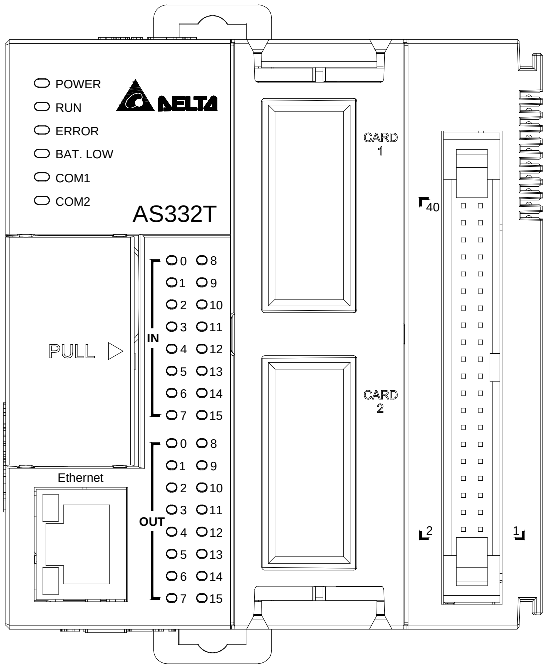
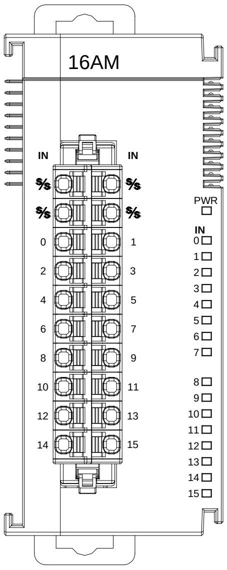
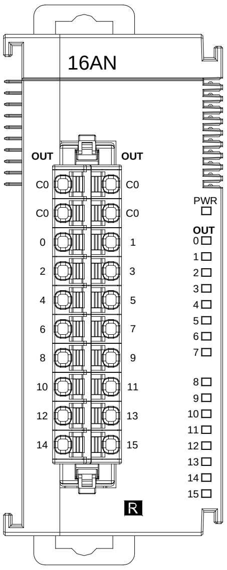
Chapter 2 Programming

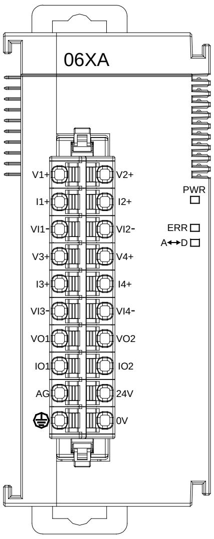
Table of Contents

2.1 Preparations

2.1.1 Hardware

The hardware needed in the example is as follows.

1. AS Series Power Moudle AS-PS02A x 1	2. AS Series CPU Moudle (built-in with Ethernet communication port) AS332T x 1
 POWER PS02A +24V 24G OUTPUT 24VDC L N INPUT 100-240VAC 50/60 Hz LG WARNING Risk of electrical shock. Wait 5 seconds after removing power before servicing.	 POWER RUN ERROR BAT. LOW COM1 COM2 DELTA AS332T PULL Ethernet IN OUT CARD 1 CARD 2 40 2 1
3. AS Series Digital Input Module (16 points) AS16AM10N-A x 1	4. AS Series Digital Output Module (16 points) AS16AN01R-A x 1
	

5. AS Series I/O Module (4AI+2AO points) AS06XA-A x 1


2.1.2 Software

The software needed in the example is as follows.

- ISPSoft version 3.0 or above
- COMMGR version 1.0 or above

2.1.3 Tools and Materials

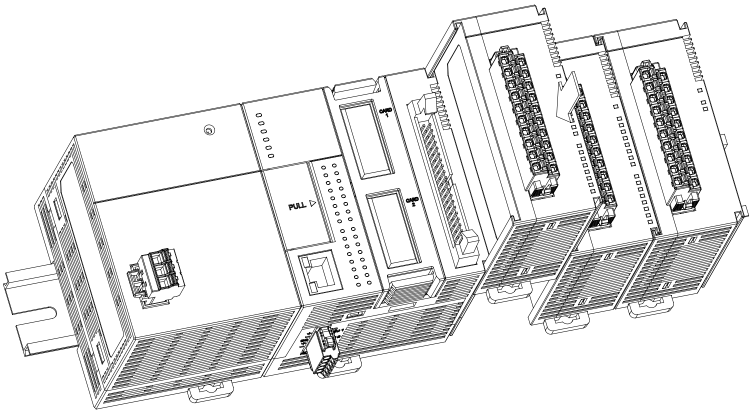
The tools and the materials need in the example are as follows.

- A personal computer in which the software mentioned above is installed
- A 100~240 VAC and 50/60 Hz power supply socket
- A 24 VDC power supply
- A cable
- A pin type terminal arranging kit
- At least 20 pieces of pin type terminals
- A screwdriver
- An USB cable or a network cable (If users want to connect the Ethernet port or the COM port (RS-232/RS-485) on the CPU module to the computer, they can refer to section 2.3.2 in ISPSoft User Manual for more information. If users want to know more about installing the USB driver, they can refer to appendix A in AS Operation Manual.)
- If necessary, users can prepare the accessories such as a switch and a bulb (to simulate the activity of the external equipment).

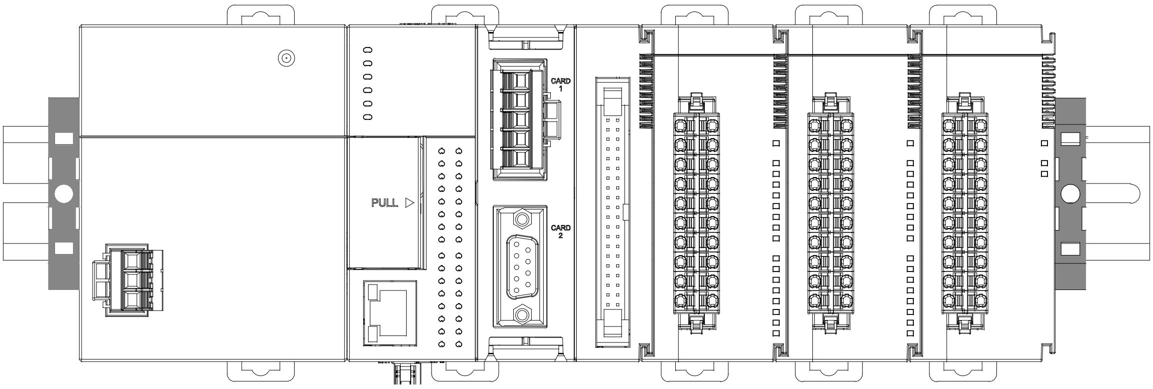
2.2 Installation

2.2.1 Installing Modules

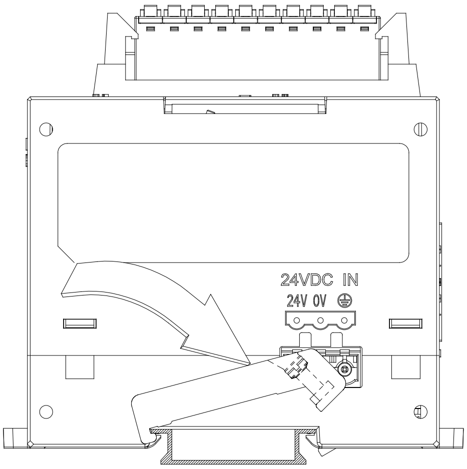
1. Please install the PLC onto the power supply module, and then insert the module hooks into the DIN rail mounting slot.
2. Link the I/O modules on the right side of the PLC and make sure they are hooked together, push the modules into the DIN rail until hearing a click. That means the module is on the DIN rail and is connected to the PLC as illustrated below.



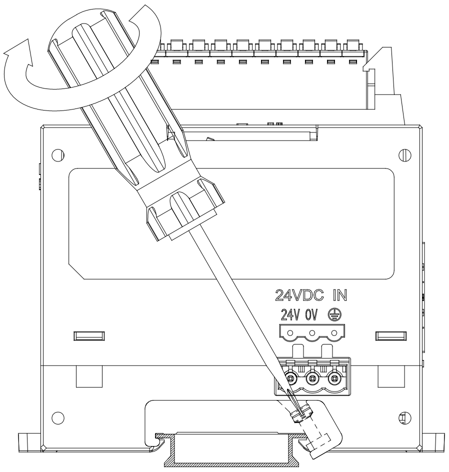
If there is a vibration source in the installation site, it is suggested to installed anti-vibration baffles on the sides of the AS series for better stabilization as the gray baffles illustrated below.



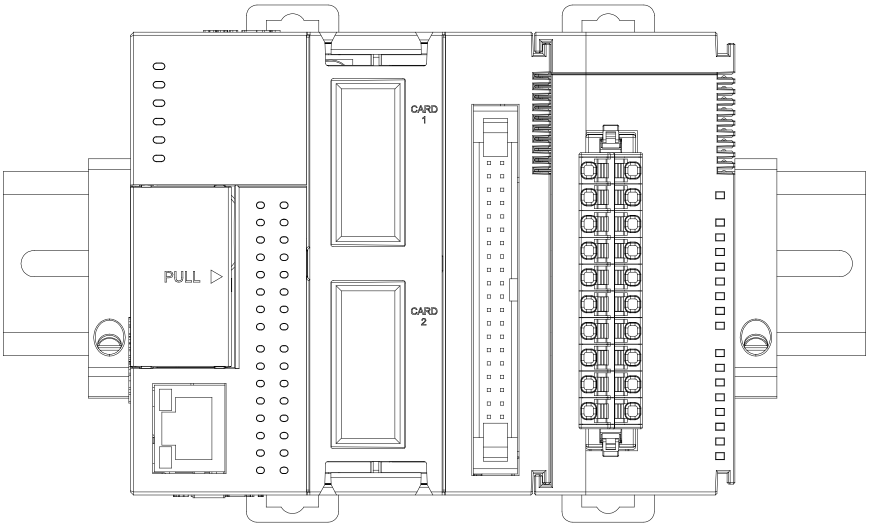
- **Install the baffles:**
  - ■ Hook the baffles onto the DIN rail and press it down as the directional arrow indicated below.



- Use screws to secure the baffle.



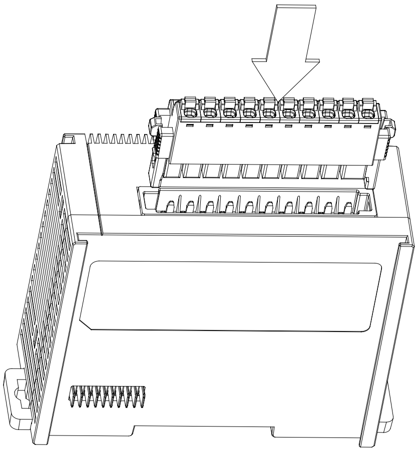
- The baffles installation is complete as the image shown below.



2.2.2 Installing Removable Terminal Blocks

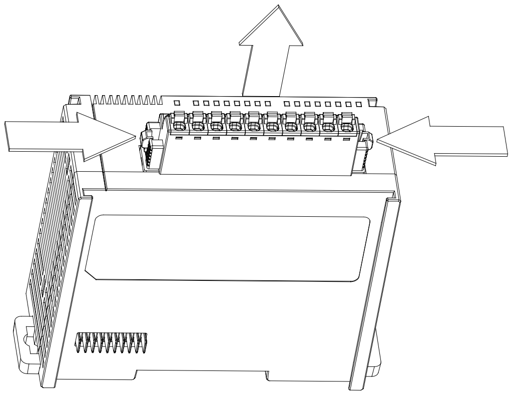
Please install the removable terminal block on the module, as illustrated below.

● **Installation**

1. Level the terminal block at the printed circuit board, and press it into the module.


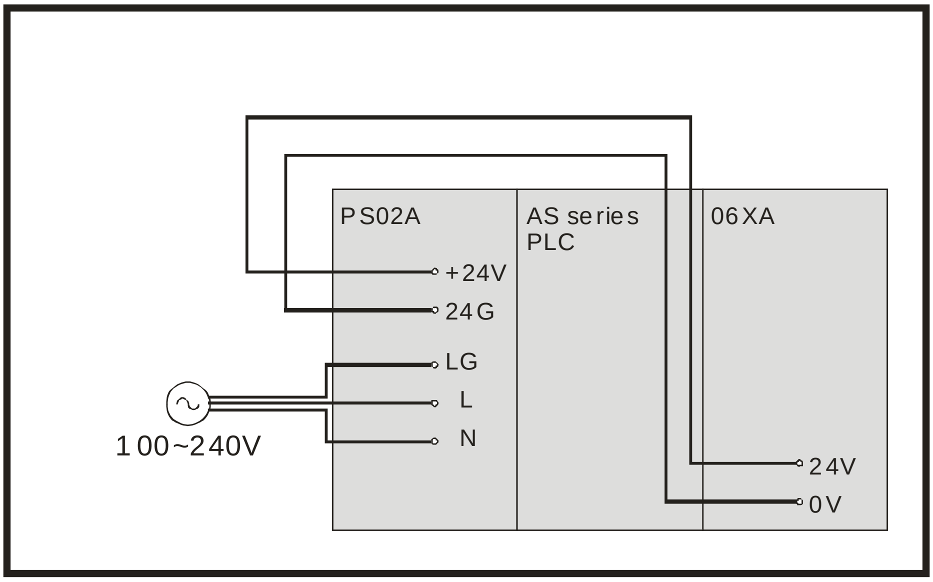
- **Removal**

1. Pull down the clip in the direction indicated by the arrow and then pull the terminal block up as illustrated below.



2.3 Wiring

After the modules are installed, the wiring of the modules follows. In order for the following example to proceed smoothly, the power supply module and the analog module have to be wired. Be sure to cut off the power supply before wiring the modules. To lend convenience and reality to the simulation, the signal lines can be connected to the switch and the bulb according to the personal needs. The rough framework is as follows.

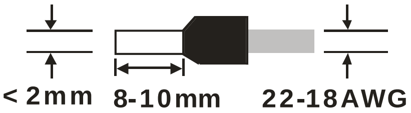


The wiring of the modules is described in detail below. (Please refer to AS series Hardware Manual for more information.)

2.3.1 Wiring the Power Supply Module

- The alternating-current input voltage is in the range of 100 VAC to 240 VAC. Please connect the power supply to the terminals L and N. If the 110 VAC or the 220 VAC power supply is connected to the input terminals +24V and 24G, the PLC will be damaged.
- If the power cut lasts for less than 10 milliseconds, the PLC keeps running without being affected. If the power cut lasts for long, or if the voltage of the power supply decreases, the PLC stops running, and there is no output. When the power supply returns to normal, the PLC resumes. (Users have to notice that there are latched auxiliary relays and registers in the PLC when they write the program.)
- Please use single-core cables or twin-core cables in a diameter of 22 AWG~18 AWG and with less than 2mm pin type

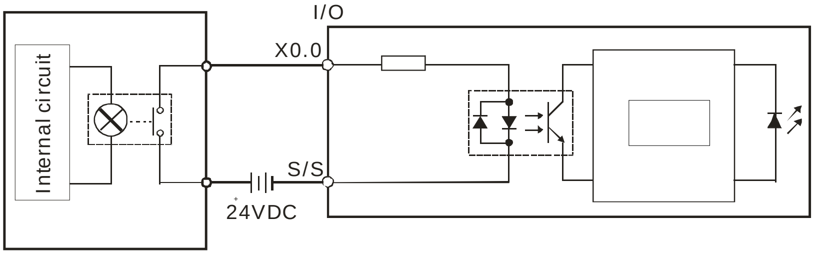
teminalrs. Only use copper conducting wires with a temperature of 60/75°C.



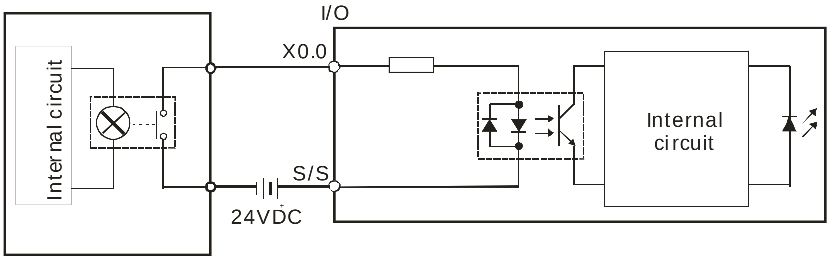
2.3.2 Wiring the Digital Input Module

The input signal is the direct-current power input. Sinking and sourcing are current driving capabilities of a circuit. They are defined as follows.

- **Sinking**



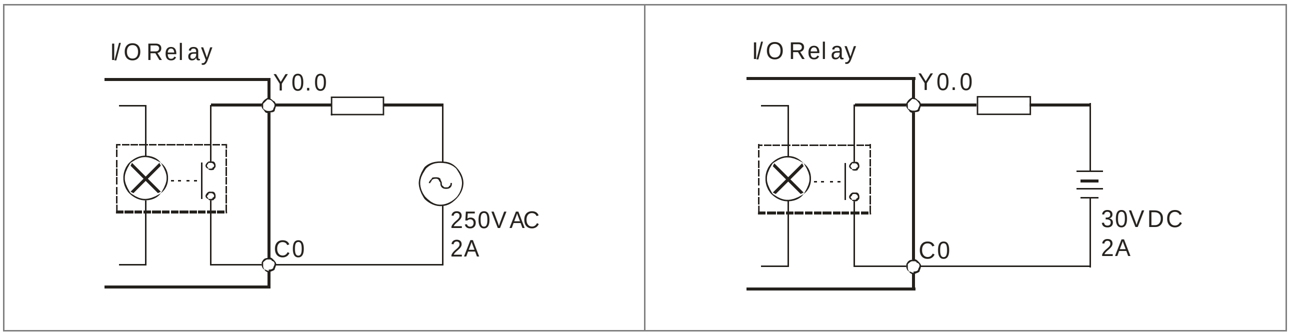
- **Sourcing**



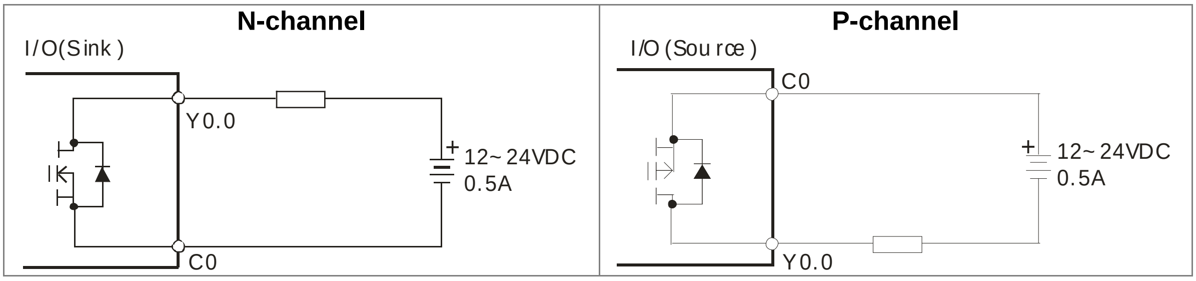
2.3.3 Wiring the Digital Output Module

The output unit can be the relay output, and the transistor outputs (N-channel and P-channel).

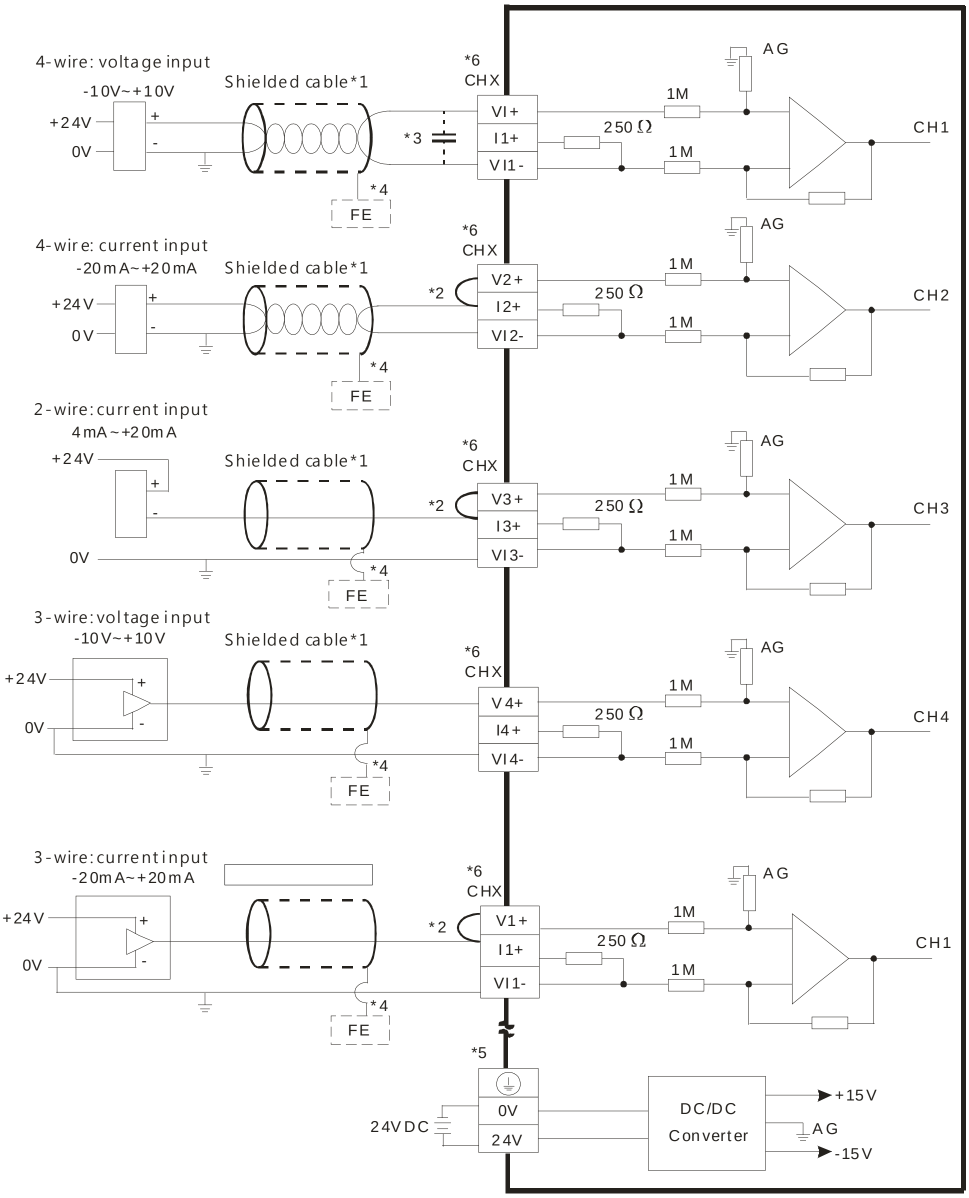
- **Relay output (the one used in this manual)**



- **Transistor output**



2.3.4 Wiring the Analog Input/Output Module



*1. Please use the shielded cables to isolate the analog input signal cables from other power cables.

*2. If the module is connected to a current signal, the terminals Vn+ and In+ (n=0~4) have to be short-circuited.

*3. 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.

*4. The FE of the shielded cable should be connected to earth ground.

*5. Please connect the terminal ⏚ to earth ground.

*6. Follow the above-mentioned connecting rules for CHx.

*7. The diameter of the cable used should be with the range between 24-22AWG (1mm). Please use the single-core cable or the twin-core cable. The temperature of the copper conducting wire should be 60/75°C.

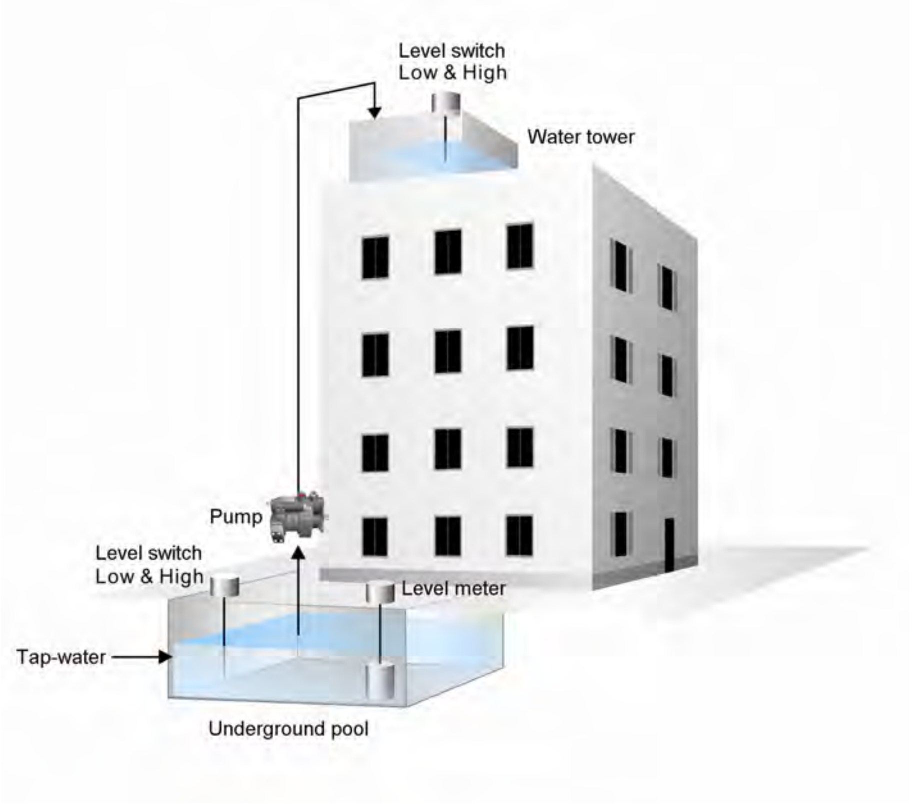
2.3.5 Supplying Power

After the wiring is complete, the CPU module can be supplied with power. Make sure that the CPU module is set to STOP before the CPU module is supplied with power. The CPU module executes the initialization after it is supplied with power. Owing to the fact that there is no hardware configuration in the CPU module, the error LED indicator is ON after the check is complete. This is a normal phenomenon which can be ignored temporarily.

2.4 Examples

After the hardware is installed, the wiring of the modules is complete, and the CPU module is supplied with power, users can write the program. In order for users to have a precise object and direction, the manual provides users with an example before they write the program. The manual teaches users how to create a new project and how to download the program to the CPU module step by step. The following are the contents of the example and the illustration of the framework.

- **System framework**



- **Control action**

The example is the basic design of the water supply of the multi-storey building. The tap-water is automatically supplied to the underground pool, and the water in the underground pool can be transported to the water tower on the top of the building through the pump. The water is distributed to every story in the building by means of gravity, and the action of the pump is controlled by the level switch of the underground pool and that of the water tower. In order to monitor the water supply, the level meter is installed in the underground pool. The water storage capacity of the underground pool is monitored at all times.

The devices connected to the I/O modules:

1. A single-point level switch (contact A)

   The single-point level switch is installed in the underground pool, and the signal (Low) contact is connected to the digital input module.
2. A two-point level switch (contact A)

The two-point level switch is installed in the water tower on the top of the building, and the signal (Low & High) contact is connected to the digital input module.

3. A pump

   The pump is installed near the underground pool. However, the device to which the PLC actually connects is not the pump but the control panel. For common uses, three digital inputs and one digital output for example, remote control x 1 (DI) & Run x 1 (DI) & Trip x 1 (DI) & Start x 1 (DO) are connected to the digital input/output module.

4. A level meter

   The level meter is installed in the underground pool, and the signal (Level) contact is connected to the analog input module. (0~10V correspond to 0~10M. 0 V represents that the water is 0.0 meters deep, and 10 V represents that the water is 10.0 meters deep.)

The control condition of the pump:

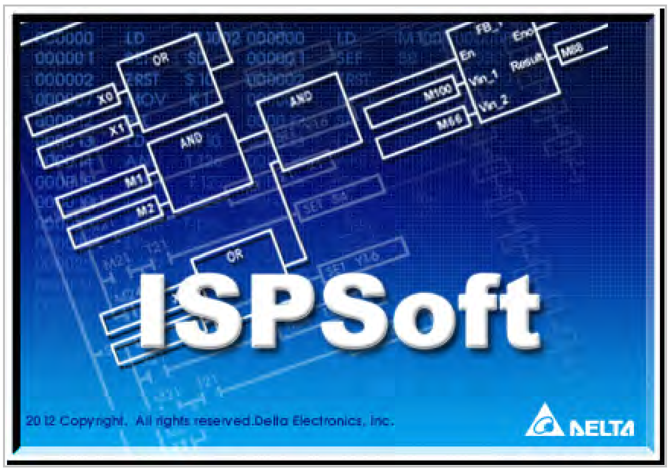
1. Start: If the water level inside the water tower is low and that inside the underground pool is not low, the pump will refill the water tower.
2. Stop: If the water level inside the water tower is high, or if the water level inside the underground pool is low, the pump stops running.

2.5 Creating Projects

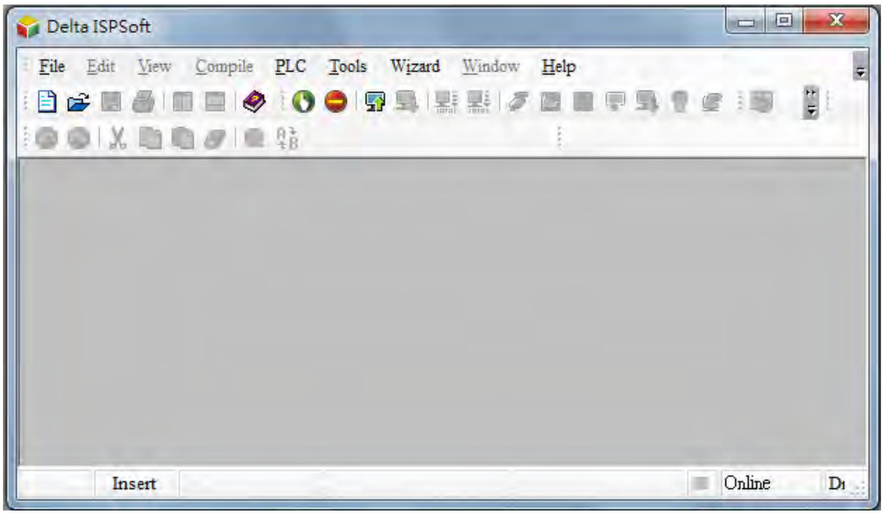
After users install the hardware and understand the control logic in the example, they can write the program.

Step 1: Open ISPSoft (Start→Programs→ Delta Industrial Automation→PLC→ISPSoftx.xx→ISPSoftx.xx)

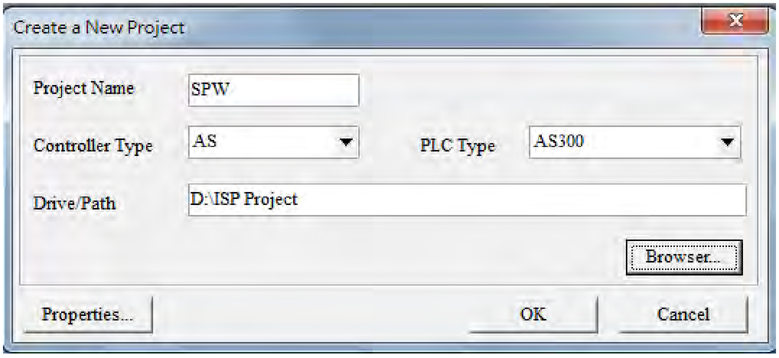
The start screen of the software:



Entering the main screen of the software:



Step 2: Click to create a project. The example is related to the water supply, and therefore the project name is SPW. The PLC type is AS300 series, and the file path is the default path. Finally, click **OK**.


Create a New Project

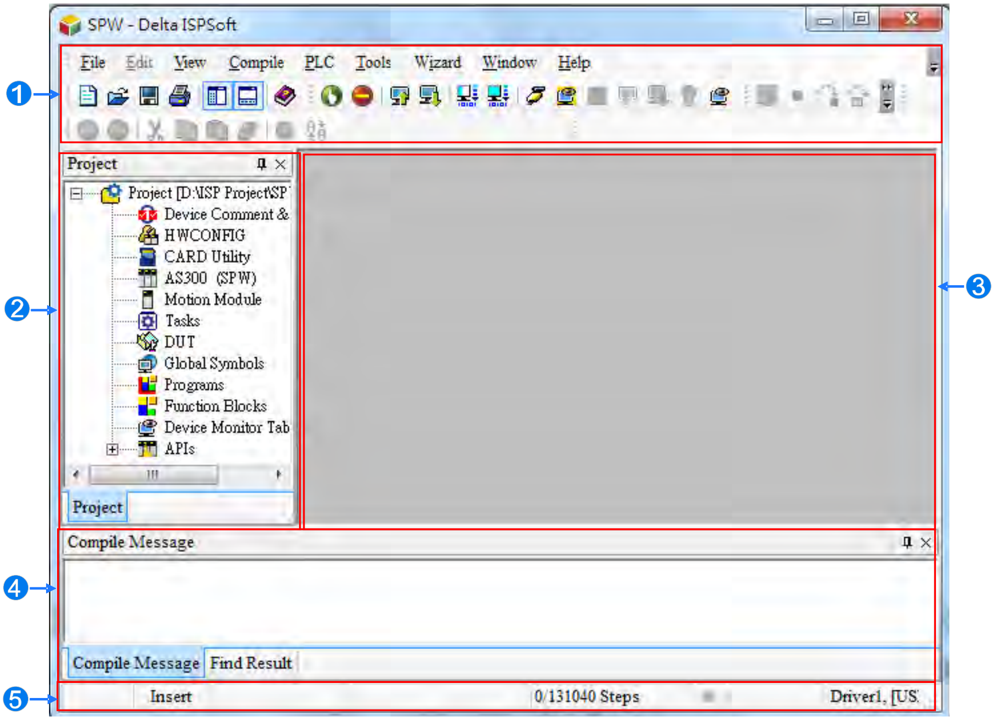
Project Name: SPW

Controller Type: AS

PLC Type: AS300

Drive/Path: D:\ISP Project

Next, the environment of the project is displayed, and the project name SPW appears in the upper left corner.



The operation interface of the software:

❶ Function area: The main functions of the software are in this area. Many functions which are frequently used are placed on the toolbar, and other functions are placed on the menus.

❷ Project management area: The framework of the project is displayed in this area. Users can understand the relation among the objects on the basis of the tree structure. The efficiency in managing the project is also increased.

❸ Work area: The editing work is in this area.

❹ Output area: The information resulting from the execution of the function is displayed in this area.

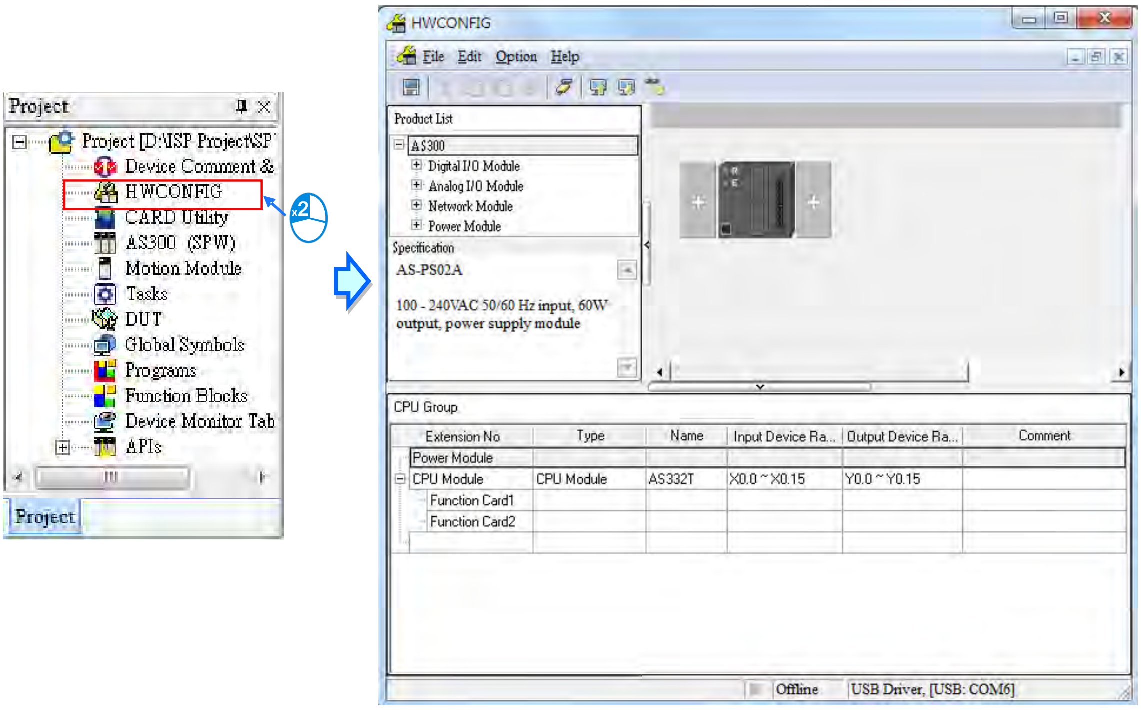
❺ Status area: The project and the communication information are displayed in this area.

2.6 Hardware Configuration

After the project is created, users can configure the hardware. Suppose the configuration is as follows.

- Digital input module (16 inputs)→X0.0~X0.15
- Digital output module (16 outputs) →Y0.0 ~ Y0.15
- Four-channel analog input module 06XA→ D28000 ~ D28009 (every channel takes 2 Words)
- Two-channel analog output module 06XA→ D28010 ~ D28019 (every channel takes 2 Words)
- The water level inside the underground pool is low.→X0.0
- The water level inside the water tower is low.→X0.1
- The water level inside the water tower is high.→X0.2
- Remote control of the pump→X0.3
- The pump runs.→X0.4
- The pump trips.→X0.5
- The pump starts.→Y0.0
- Water level inside the underground pool→D0

With the information above, users can configure the hardware practically. Double-click HWCONFIG in the window at the left side of the main screen of the software to open the configuration window.



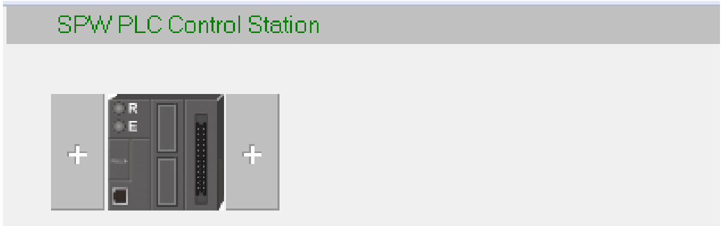
AS-PS02A

100 - 240VAC 50/60 Hz input, 60W output, power supply module

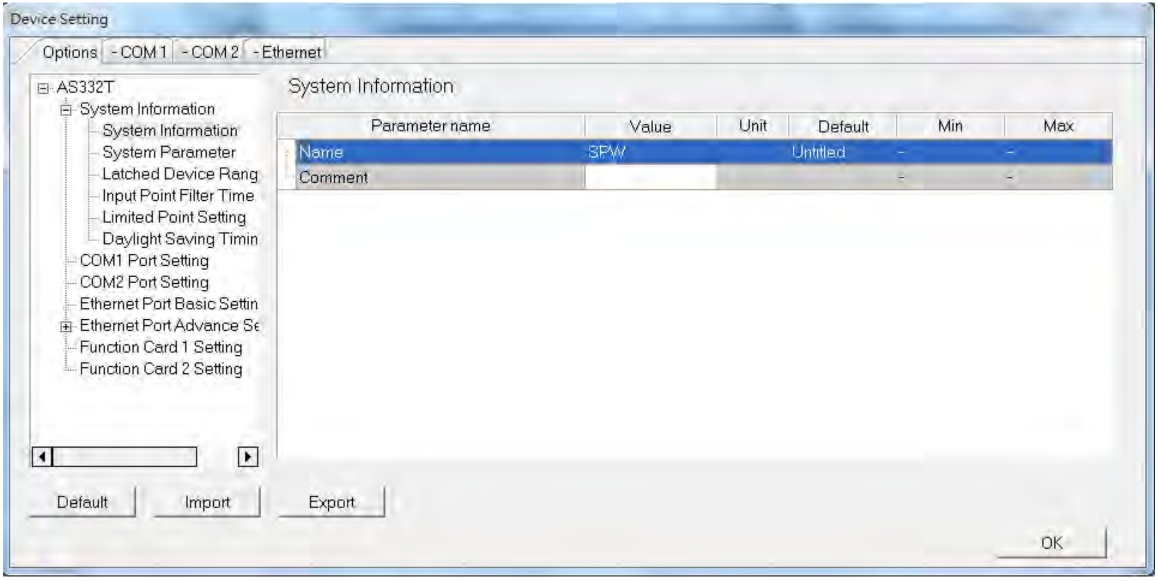
Extension No	Type	Name	Input Device Ra...	Output Device Ra...	Comment
Power Module					
CPU Module	CPU Module	AS332T	X0.0 ~ X0.15	Y0.0 ~ Y0.15	
Function Card1					
Function Card2					

Offline | USB Driver, [USB: COM6]

Users can configure the hardware according to the information above. After users type “SPW PLC Control Station”, the project can be shared.



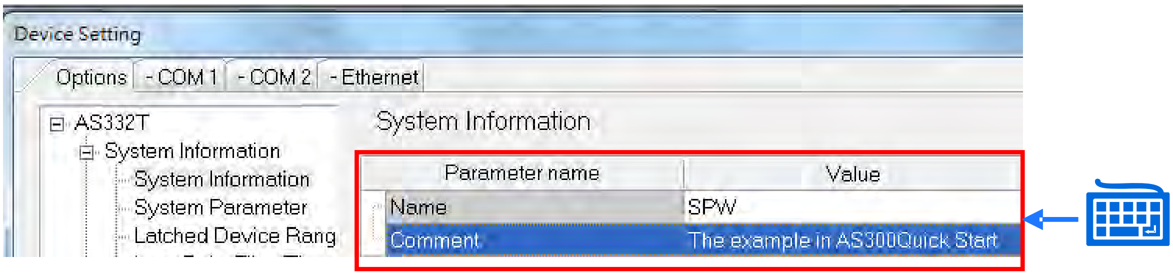
Double-click the CPU module to open the **Device Setting** window.



System Information

Parameter name	Value	Unit	Default	Min	Max
Name	SPW		Untitled	-	-
Comment				-	-

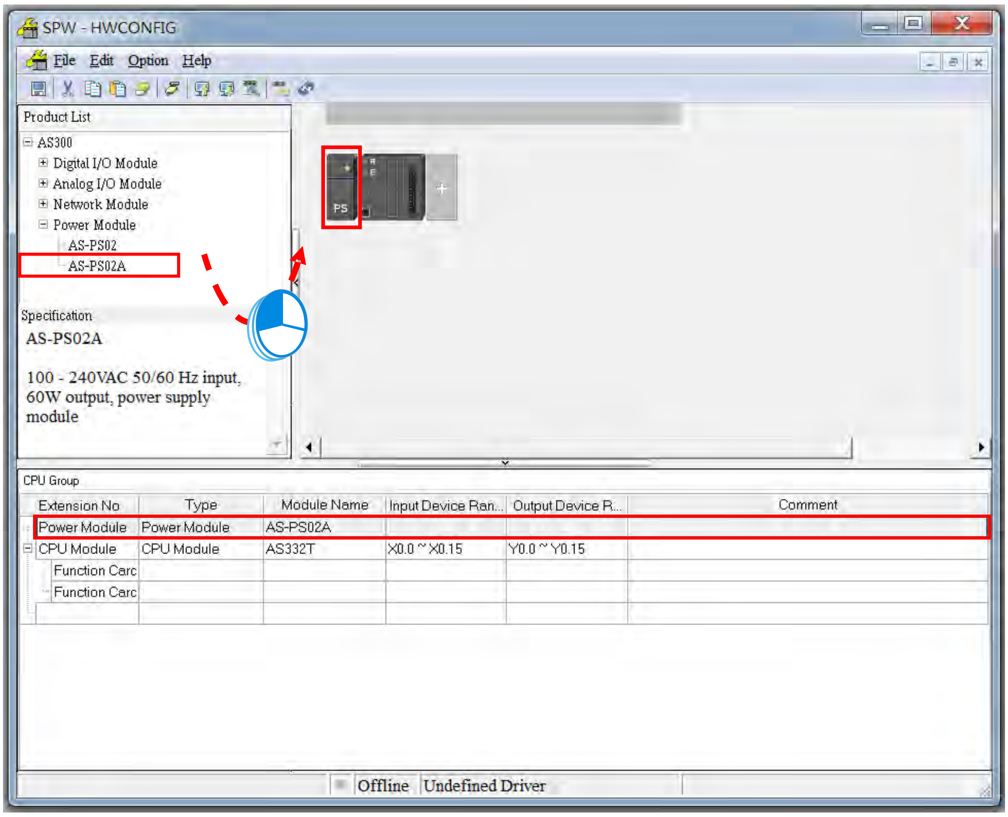
Type "SPW PLC" in the **Name** box, and then type "The example in AS300 Quick Start" in the **Comment** box. Finally, click **OK**, and close the window.



System Information

Parameter name	Value
Name	SPW
Comment	The example in AS300Quick Start

User can begin to place the modules. First, find the power module which is needed from the product list. Then, drag the module to the left of the CPU module and drop it.



Specification

AS-PS02A

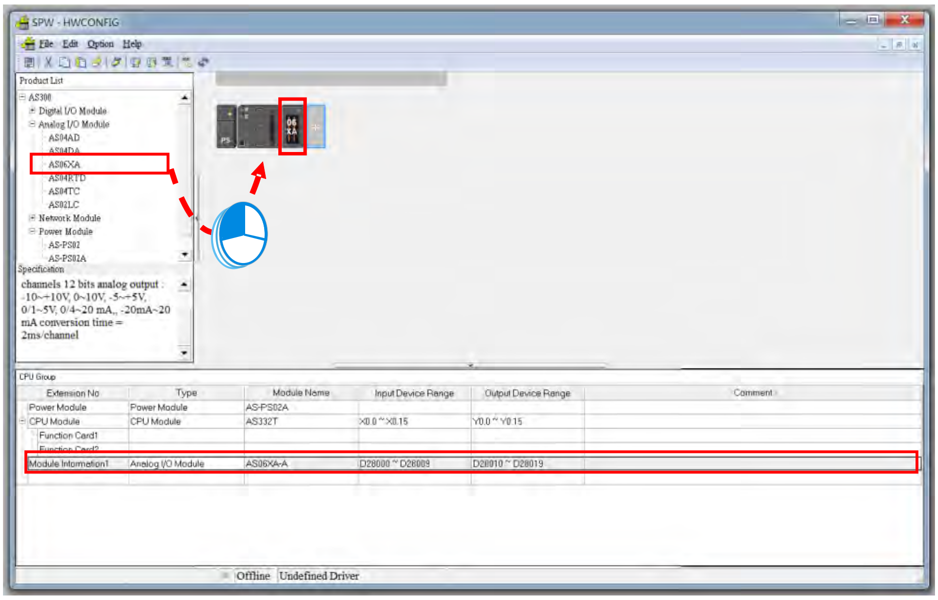
100 - 240VAC 50/60 Hz input, 60W output, power supply module

CPU Group

Extension No	Type	Module Name	Input Device Ran...	Output Device R...	Comment
Power Module	Power Module	AS-PS02A			
CPU Module	CPU Module	AS332T	X0.0 ~ X0.15	Y0.0 ~ Y0.15	
Function Carc					
Function Carc					

After the module is placed in the appropriate position, the system automatically distributes the addresses to the module. The default addresses are IN: D28000~D28009 / OUT: D28010~D28019. (IN: D28000 is the module state; D28002~D28003 is the device range for channel 1AD, D28004~D28005 for channel 2AD; D28006~D28007 for channel 3AD; D28008 ~ D28009 for channel 4AD.) (OUT: D28010~D28011 is the device range for channel 1DA; D28012~D28013 for channel 2DA)

Use the drag and drop method to add modules in, for example AS06XA to right side of the CPU.



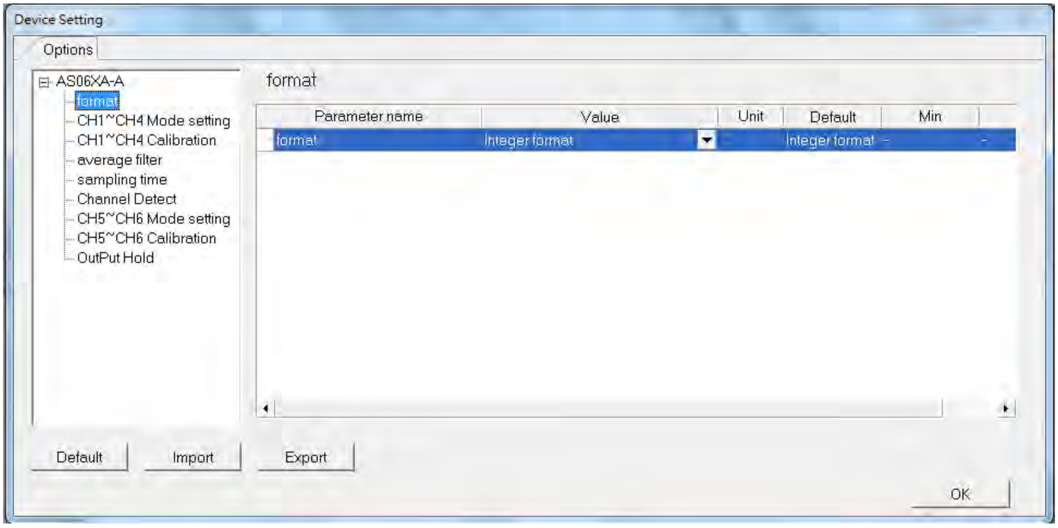
Specification

channels 12 bits analog output : -10~+10V, 0~10V, -5~+5V, 0/1~5V, 0/4~20 mA,, -20mA~20 mA conversion time = 2ms/channel

CPU Group

Extension No	Type	Module Name	Input Device Range	Output Device Range	Comment
Power Module	Power Module	AS-PS02A			
CPU Module	CPU Module	AS332T	X0.0 ~ X0.15	Y0.0 ~ Y0.15	
Function Card1					
Function Card2					
Module Information1	Analog I/O Module	AS06XA-A	D28000 ~ D28009	D28010 ~ D28019	

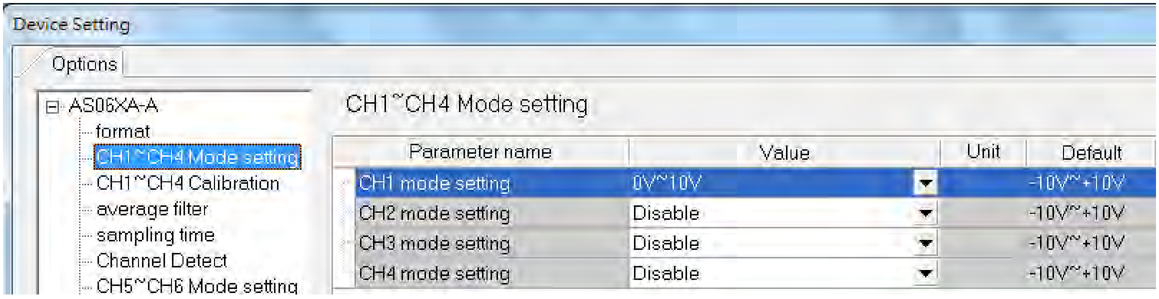
In order to complete the basic setting, users need to set the relation between the signals and the conversion values for the analog module. Double-click the module to open the **Device Setting** window.



format

Parameter name	Value	Unit	Default	Min
format	Integer format		Integer format	-

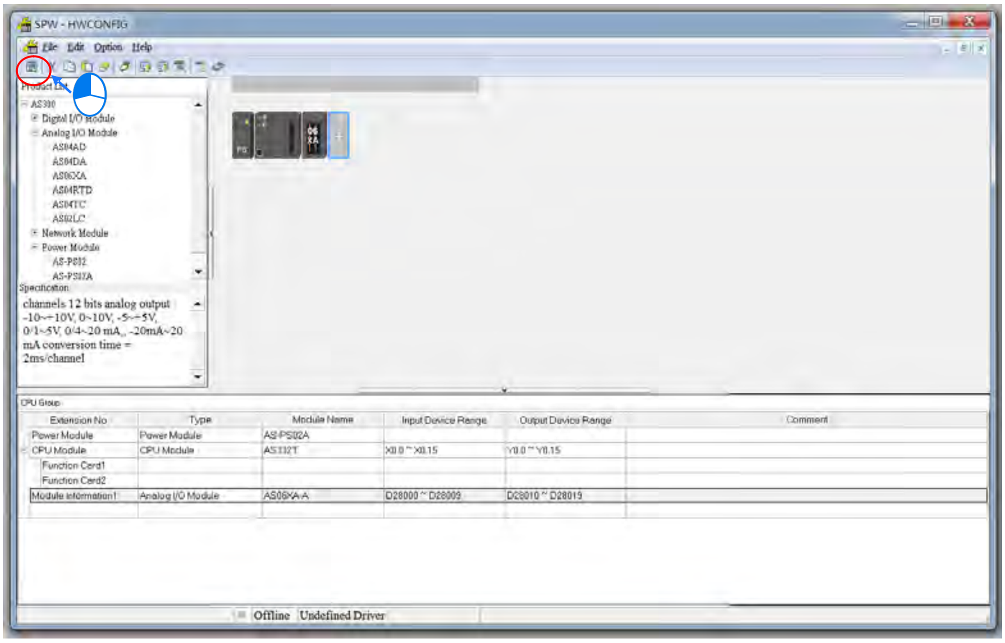
The voltages of the signals are 0 V~10 V.



CH1~CH4 Mode setting

Parameter name	Value	Unit	Default
CH1 mode setting	0V~10V		-10V~+10V
CH2 mode setting	Disable		-10V~+10V
CH3 mode setting	Disable		-10V~+10V
CH4 mode setting	Disable		-10V~+10V

After the hardware configuration is complete, please save the file and exit.



Specification

channels 12 bits analog output
-10~+10V, 0~10V, -5~+5V,
0/1~5V, 0/4~20 mA,, -20mA~20
mA conversion time =
2ms/channel

CPU Group

Extension No	Type	Module Name	Input Device Range	Output Device Range	Comment
Power Module	Power Module	AS-PS02A			
CPU Module	CPU Module	AS332T	X0.0 ~ X0.15	Y0.0 ~ Y0.15	
Function Card1					
Function Card2					
Module information1	Analog I/O Module	AS06XA-A	D28000 ~ D28009	D28010 ~ D28019	

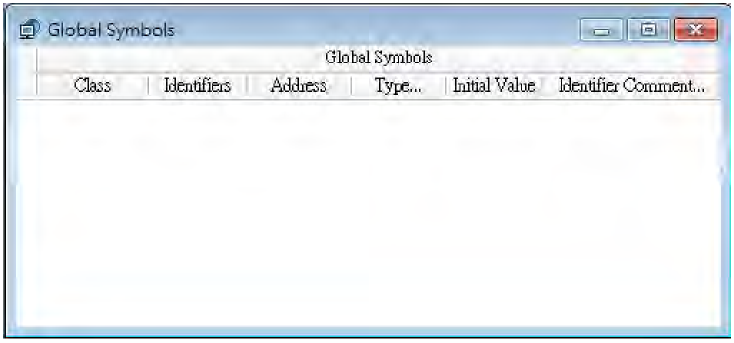
2.7 Creating Global Symbols

In order to make the program more readable and the connection with the SCADA system more convenient, the I/O addresses are accompanied with the global symbols. Users can use the symbols when they write the program. The global symbol table also supports import and export. As to the system equipped with many inputs and outputs, users can use Microsoft Excel to make the editing more convenient.

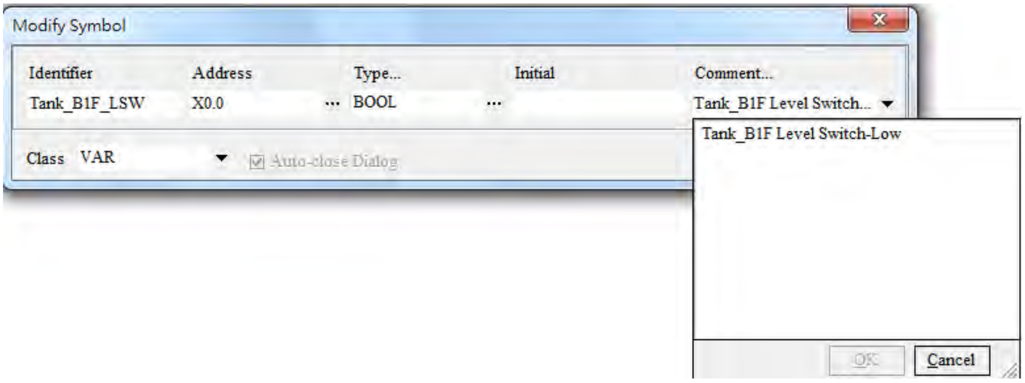
The global symbols created are as follows.

Global symbol table		
Bit (for the I/O on the PLC)		
Identifier	**Address**	**Data type**
Tank_B1F_LSW	X0.0	BOOL
Tank_RF_LSW	X0.2	BOOL
Tank_RF_HSW	X0.3	BOOL
SPP01_Remote	X0.5	BOOL
SPP01_Run	X0.6	BOOL
SPP01_Trip	X0.7	BOOL
SPP01_Start	Y0.0	BOOL
Tank_B1F_LT	D0	REAL
Bit (for the SCADA system)		
SPP01_Auto	M0	BOOL
SPP01_Man_SW	M1	BOOL

With the information above, users can create the global symbols. Double-click Global Symbols in the window at the left side of the main screen of the software to open the **Global Symbols** window.



Double-click the blank to open the **Add Symbol** window. Type “X0.0” in the **Address** box. The default values in the **Type…** box, the **Initial** box, and the **Comment…** box remain unchanged. Click **OK** to complete the typing.



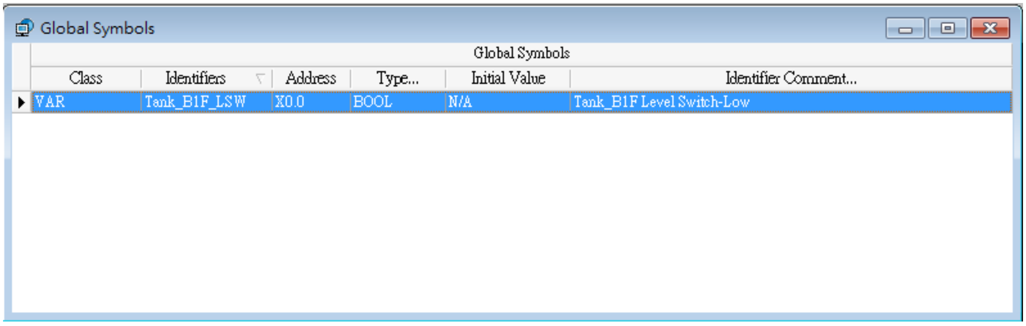
Identifier	Address	Type...	Initial	Comment...
Tank_B1F_LSW	X0.0	BOOL		Tank_B1F Level Switch...

Class VAR

☑ Auto-close Dialog

Tank_B1F Level Switch-Low

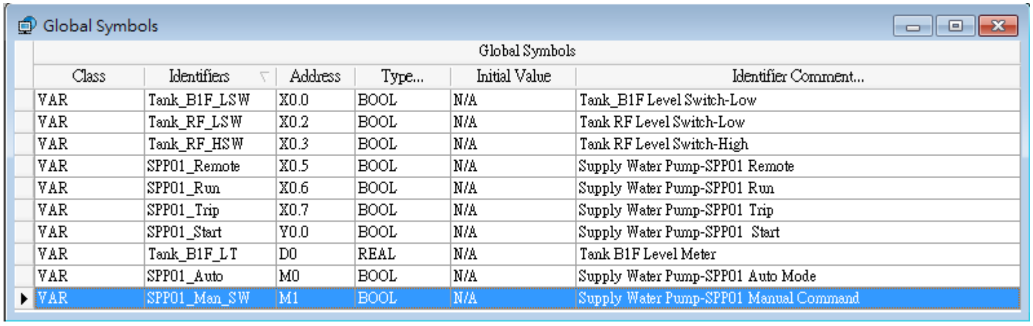
Users can see a new piece of data.



Global Symbols

Class	Identifiers	Address	Type...	Initial Value	Identifier Comment...
VAR	Tank_B1F_LSW	X0.0	BOOL	N/A	Tank_B1F Level Switch-Low

Users can create the global symbols for the data in the table above in the same way. (For the analog module, the data type is a real floating-point number. Therefore, the symbol occupies two data registers, and the address in the **Address** box is the initial address.)



Global Symbols

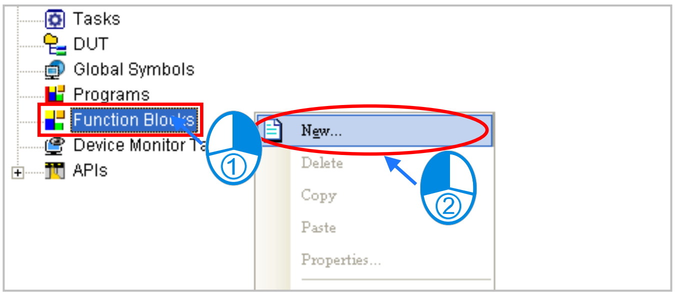
Class	Identifiers	Address	Type...	Initial Value	Identifier Comment...
VAR	Tank_B1F_LSW	X0.0	BOOL	N/A	Tank_B1F Level Switch-Low
VAR	Tank_RF_LSW	X0.2	BOOL	N/A	Tank RF Level Switch-Low
VAR	Tank_RF_HSW	X0.3	BOOL	N/A	Tank RF Level Switch-High
VAR	SPP01_Remote	X0.5	BOOL	N/A	Supply Water Pump-SPP01 Remote
VAR	SPP01_Run	X0.6	BOOL	N/A	Supply Water Pump-SPP01 Run
VAR	SPP01_Trip	X0.7	BOOL	N/A	Supply Water Pump-SPP01 Trip
VAR	SPP01_Start	Y0.0	BOOL	N/A	Supply Water Pump-SPP01 Start
VAR	Tank_B1F_LT	D0	REAL	N/A	Tank B1F Level Meter
VAR	SPP01_Auto	M0	BOOL	N/A	Supply Water Pump-SPP01 Auto Mode
VAR	SPP01_Man_SW	M1	BOOL	N/A	Supply Water Pump-SPP01 Manual Command

2.8 Creating Function Blocks

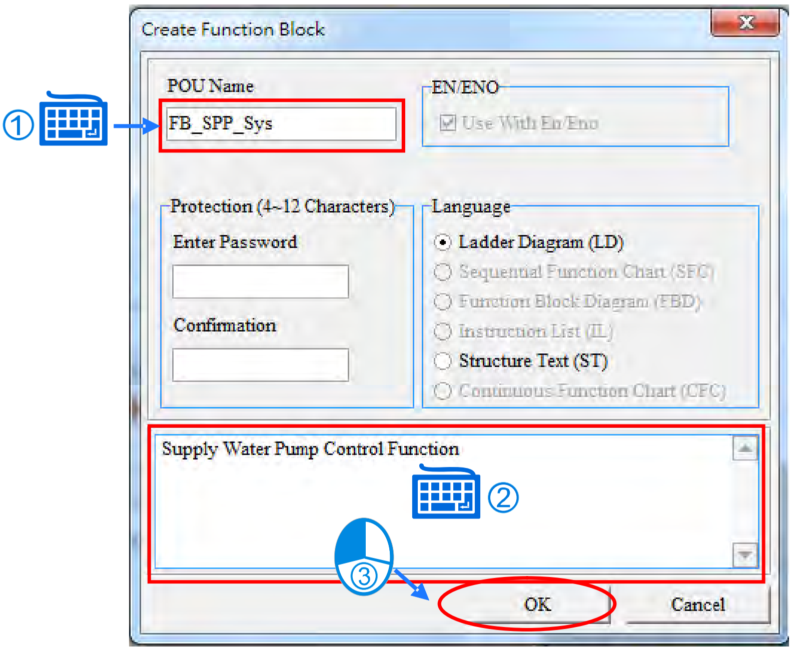
The procedure in this example is to create a function block first. Users also can create the main program first. There is no absolute relation between the function block and the main program. They are actually executed alternately. However, users are recommended to create a function first when the function is used repeatedly.

The control relation among the underground pool, the water tower, and the pump can be represented by a function block. There are usually two water systems in a multi-storey building. If users create the function blocks, they only need to change the variables of the input pins and those of the output pins to complete the second water system.

Users can create a function block which contains the relation among the underground pool, the water tower, and the pump. Right-click Function Blocks in the window at the left side of the main screen of the software to add a new POU.



Type “FB_SPP_Sys” in the **POU Name** box, and then type “Supply Water Pump Control Function” in the **POU Comment** box. Finally, click **OK**.



Create Function Block

① POU Name: FB_SPP_Sys

EN/ENO: ☑ Use With En/Eno

Protection (4~12 Characters)

Enter Password

Confirmation

Language

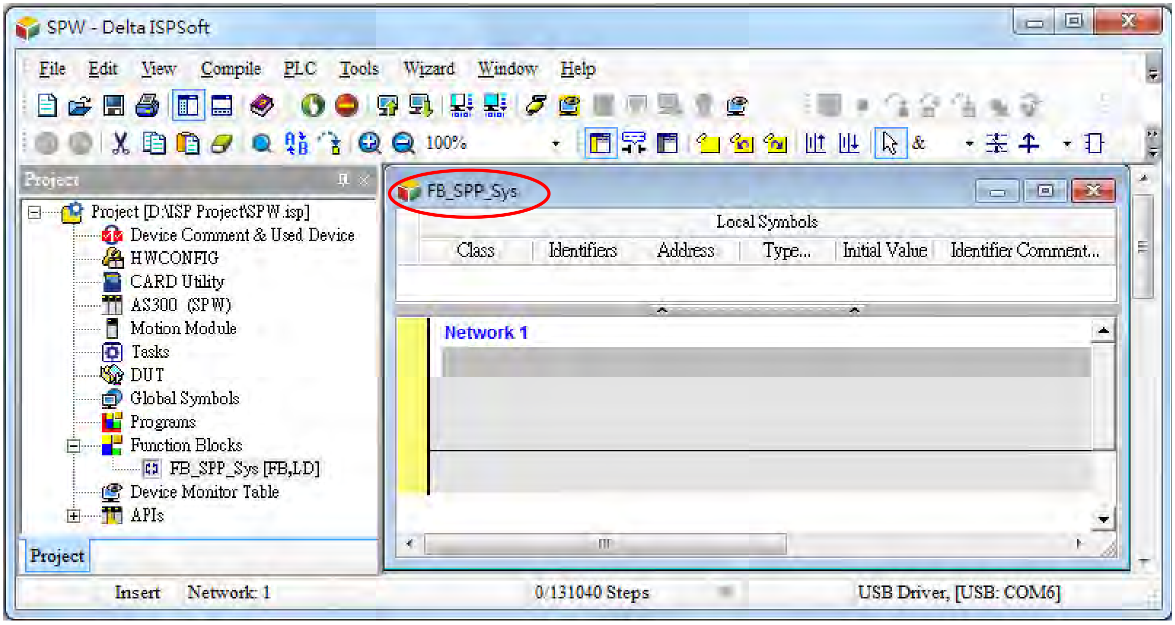
● Ladder Diagram (LD)
○ Sequential Function Chart (SFC)
○ Function Block Diagram (FBD)
○ Instruction List (IL)
○ Structure Text (ST)
○ Continuous Function Chart (CFC)

② Supply Water Pump Control Function

③ OK

Cancel

Users can see the **FB_SPP_Sys** window on the main screen.



SPW - Delta ISPSoft

File Edit View Compile PLC Tools Wizard Window Help

Project

- Project [D:\ISP Project\SPW.isp]
  - Device Comment & Used Device
  - HWCONFIG
  - CARD Utility
  - AS300 (SPW)
  - Motion Module
  - Tasks
  - DUT
  - Global Symbols
  - Programs
  - Function Blocks
    - FB_SPP_Sys [FB,LD]
  - Device Monitor Table
  - APIs

FB_SPP_Sys

Local Symbols

Class	Identifiers	Address	Type...	Initial Value	Identifier Comment...

Network 1

Insert Network: 1 0/131040 Steps USB Driver, [USB: COM6]

Users need to create the local symbols. In order to make the use of the function block more convenient, the system automatically distributes the addresses to the module, and users are not allowed to type the addresses by themselves. Users surely can use the addresses and the global symbols in the internal program. However, the use of the addresses or the uses of the global symbols will decrease the convenience of using the function block. (If a local symbol is the same as a global symbol, the local symbol used in the function block has high priority.)

The local symbols created are as follows.

Declaration type	Identifier	Data type
VAR_INPUT	Tank_B_LSW	BOOL
VAR_INPUT	Tank_R_LSW	BOOL
VAR_INPUT	Tank_R_HSW	BOOL
VAR_INPUT	Pump_Remote	BOOL
VAR_INPUT	Pump_Run	BOOL
VAR_INPUT	Pump_Trip	BOOL
VAR_IN_OUT	Pump_Auto	BOOL
VAR_IN_OUT	Pump_Man_SW	BOOL
VAR_OUTPUT	Pump_Start	BOOL
VAR	Pump_Out	BOOL

VAR_INPUT

When the program is executed, the value of the external variable is brought into the internal variable. If the value of the corresponding internal variable is altered, it is not transmitted to the external variable. VAR_INPUT is often used if the value of the external variable should not be modified. Most of inputs in this example are digital inputs, and these inputs should not be modified. The modification of the values of these variables affects the execution of the program or the use of the function block. In order to prevent the values of these variables from being modified in the program, the declaration type should be VAR_INPUT.

VAR_IN_OUT

When the program is executed, the value of the external variable is brought into the internal variable. After the program comes to an end, the value is transmitted to the external variable. VAR_IN_OUT is often used if the value of the variable should be modified. Generally speaking, Pump_Auto and Pump_Man_SW in this example are used in the SCADA system to set the control mode of the pump. It seems that VAR_INPUT meets the need. However, users need to switch the control mode of the pump from the automatic mode to the manual mode to stop the command from being outputted when the pump trips. Therefore, the declaration type for these two variables should be VAR_IN_OUT.

VAR_OUTPUT

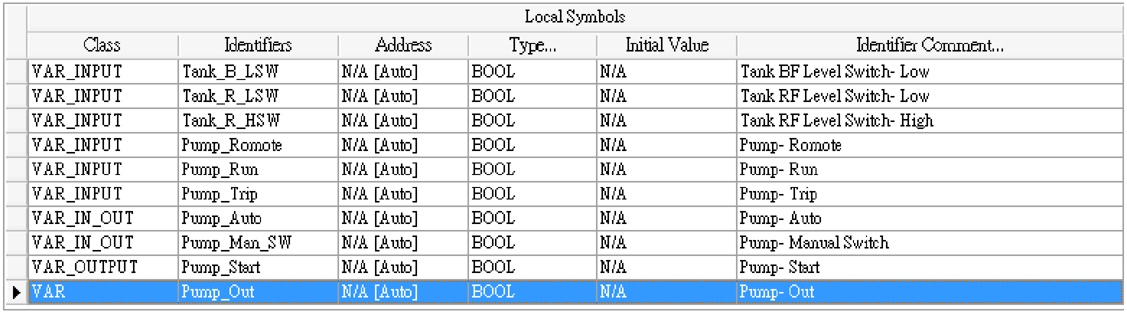
When the program is executed, the value of the external variable is not brought into the internal variable, but the value memorized before is used instead. After the program comes to an end, the value is transmitted to the external variable. Generally speaking, the variable appears at the output of the instruction.

VAR

When the program is executed, VAR is regarded as an internal variable, and the value memorized before is used. Generally speaking, the variable is used as a register when it is used in the program.

If the same variable (function block type) is assigned to the function blocks which are called many times in the program, the initial value of VAR_OUTPUT and that of VAR are not necessarily the same as those used last time.

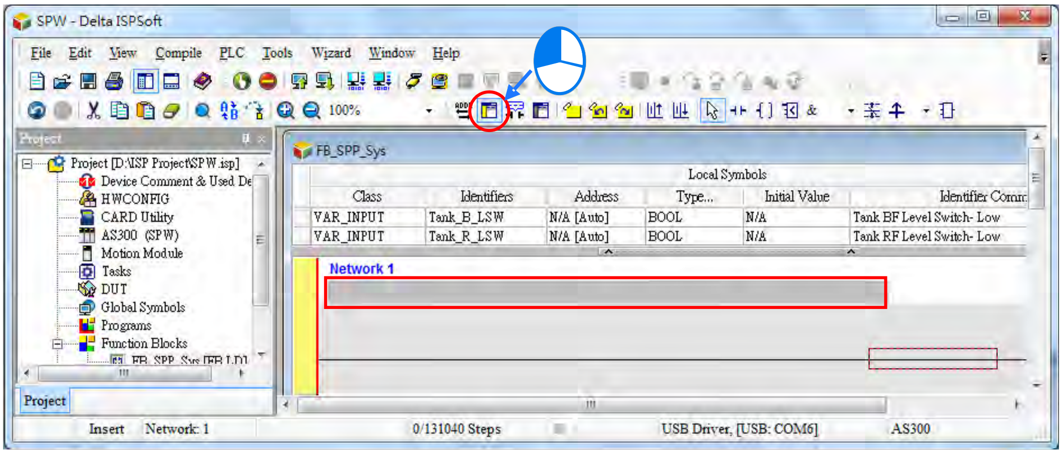
Users can create the local symbols as follows.



Local Symbols

Class	Identifiers	Address	Type...	Initial Value	Identifier Comment...
VAR_INPUT	Tank_B_LSW	N/A [Auto]	BOOL	N/A	Tank BF Level Switch- Low
VAR_INPUT	Tank_R_LSW	N/A [Auto]	BOOL	N/A	Tank RF Level Switch- Low
VAR_INPUT	Tank_R_HSW	N/A [Auto]	BOOL	N/A	Tank RF Level Switch- High
VAR_INPUT	Pump_Romote	N/A [Auto]	BOOL	N/A	Pump- Romote
VAR_INPUT	Pump_Run	N/A [Auto]	BOOL	N/A	Pump- Run
VAR_INPUT	Pump_Trip	N/A [Auto]	BOOL	N/A	Pump- Trip
VAR_IN_OUT	Pump_Auto	N/A [Auto]	BOOL	N/A	Pump- Auto
VAR_IN_OUT	Pump_Man_SW	N/A [Auto]	BOOL	N/A	Pump- Manual Switch
VAR_OUTPUT	Pump_Start	N/A [Auto]	BOOL	N/A	Pump- Start
VAR	Pump_Out	N/A [Auto]	BOOL	N/A	Pump- Out

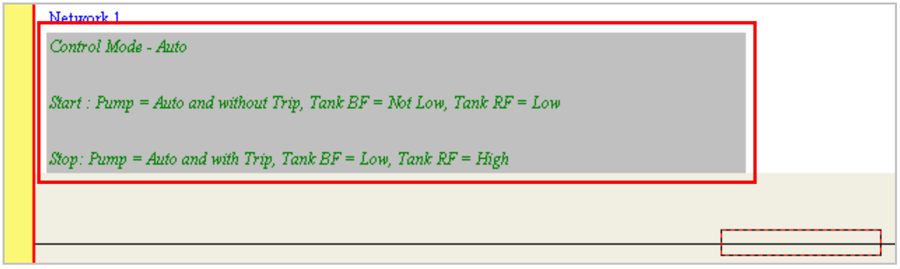
Users can begin to write the program in the function block. In order to improve the convenience of scanning the program, users are recommended to write the comments. If users want to write the network comments, they have to click ▣ .



Local Symbols

Class	Identifiers	Address	Type...	Initial Value	Identifier Comm
VAR_INPUT	Tank_B_LSW	N/A [Auto]	BOOL	N/A	Tank BF Level Switch- Low
VAR_INPUT	Tank_R_LSW	N/A [Auto]	BOOL	N/A	Tank RF Level Switch- Low

Type the following description as the comment on network 1. If users want to start a new line of text at a specific point, they can press Alt+Enter on the keyboard.

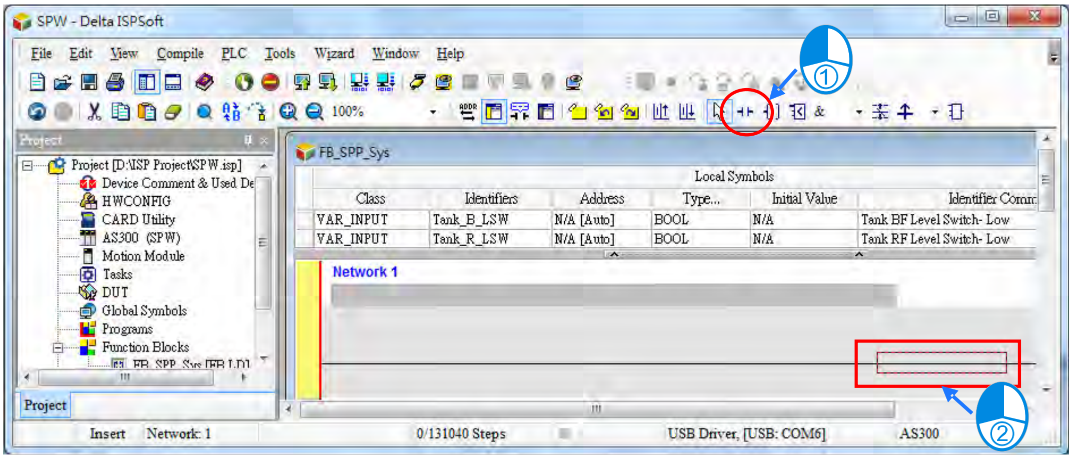


Control Mode - Auto

Start : Pump = Auto and without Trip, Tank BF = Not Low, Tank RF = Low

Stop: Pump = Auto and with Trip, Tank BF = Low, Tank RF = High

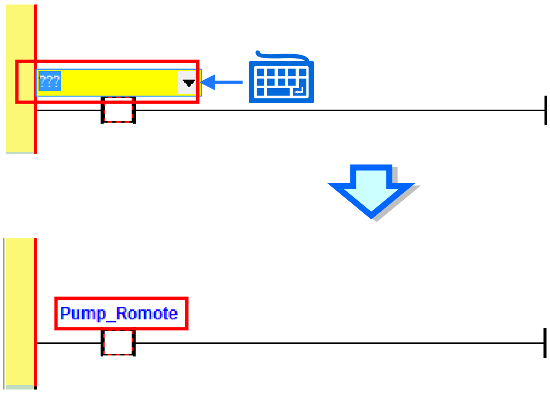
Users can begin to edit the program code. The programming language used here is the ladder diagram. Please click ⊣⊢ , and then move the mouse to the red frame. If the cursor becomes ┤├, users can click the left mouse button.



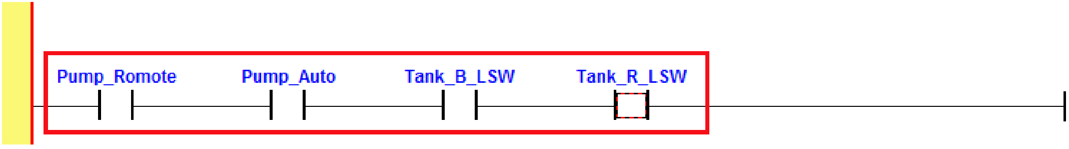
Local Symbols

Class	Identifiers	Address	Type...	Initial Value	Identifier Comm
VAR_INPUT	Tank_B_LSW	N/A [Auto]	BOOL	N/A	Tank BF Level Switch- Low
VAR_INPUT	Tank_R_LSW	N/A [Auto]	BOOL	N/A	Tank RF Level Switch- Low

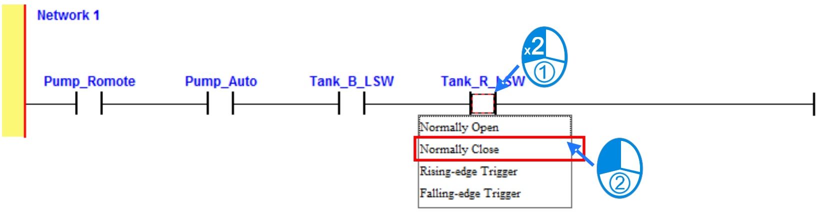
Click ???, and type “Pump_Remote”. When “Pump_Remote” is typed, the drop-down list appears. Users can select the item directly, or type the words by themselves. After “Pump_Remote” is typed, press the enter key. (If the address appears, users can click ADDR to switch the mode. In either mode, users can use the words or the addresses when they write the program.)

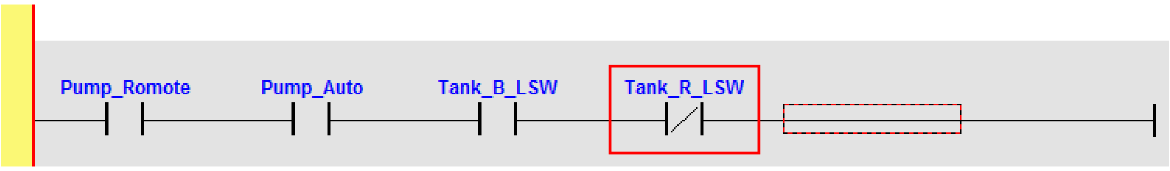


Users can write the following program in the same way.

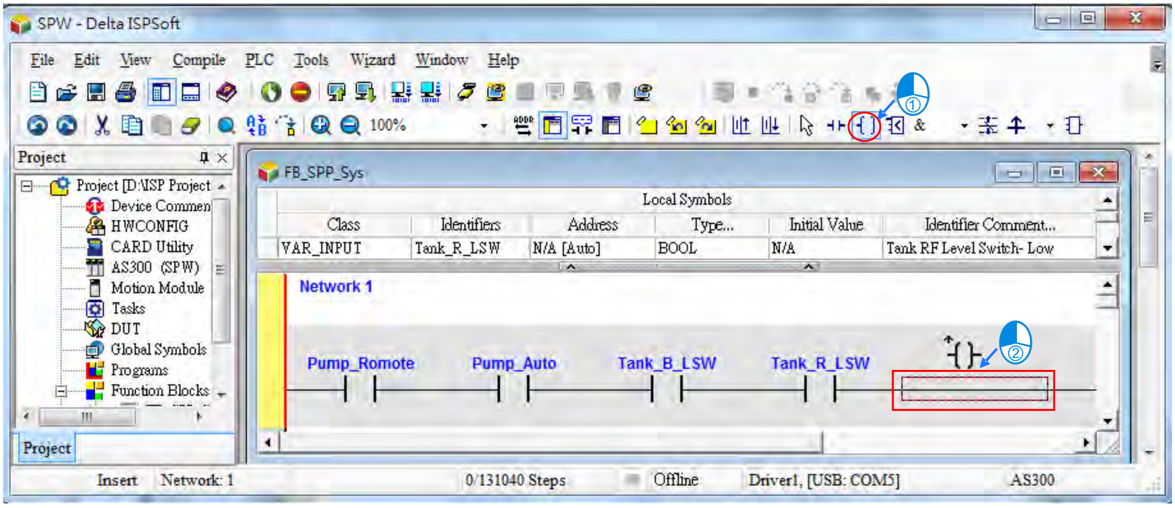


To meet the condition that there is water in the underground pool and no water in the water tower, the state of Tank_R_LSW should be OFF. Users can double-click the contact marked “Tank_R_LSW”, and the drop-down list appears. Select “Normally Closed”.



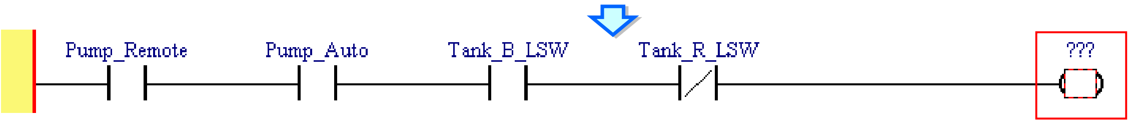


Please click { }, and then move the mouse to the red frame.

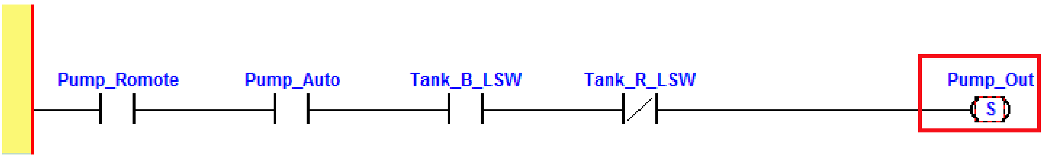


Local Symbols

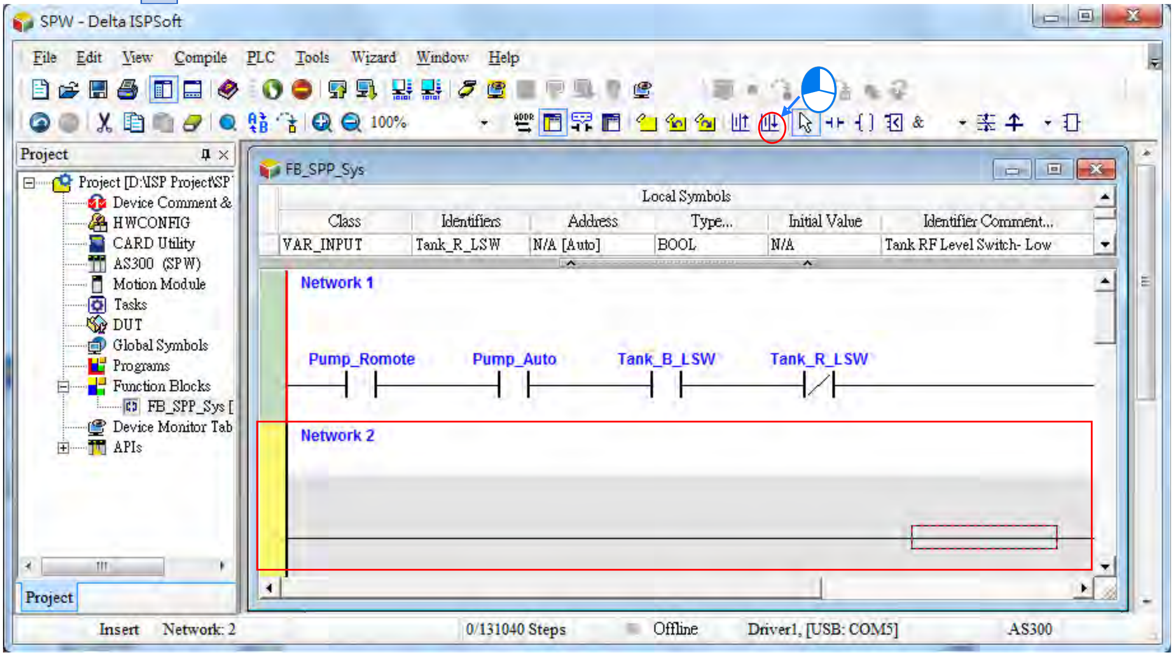
Class	Identifiers	Address	Type...	Initial Value	Identifier Comment...
VAR_INPUT	Tank_R_LSW	N/A [Auto]	BOOL	N/A	Tank RF Level Switch- Low



Click ???, and type “Pump_Out”. Users can double-click the coil marked “Pump_Out”, and the drop-down list appears. Select “Set”.



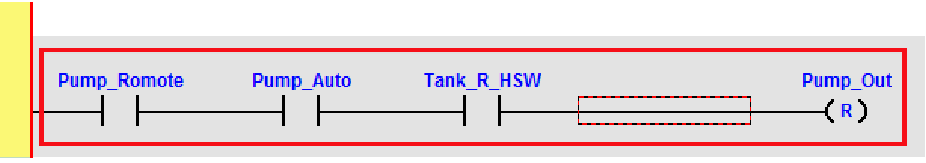
Please click , to add a new network.



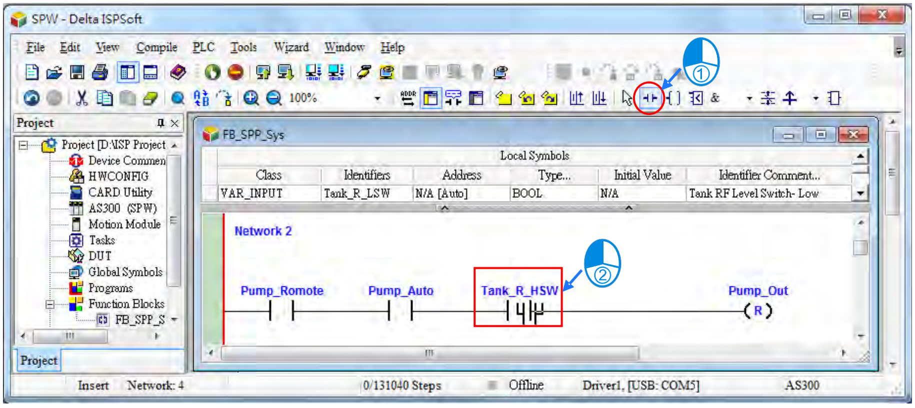
Local Symbols

Class	Identifiers	Address	Type...	Initial Value	Identifier Comment...
VAR_INPUT	Tank_R_LSW	N/A [Auto]	BOOL	N/A	Tank RF Level Switch- Low

Users can write the following program in the same way.

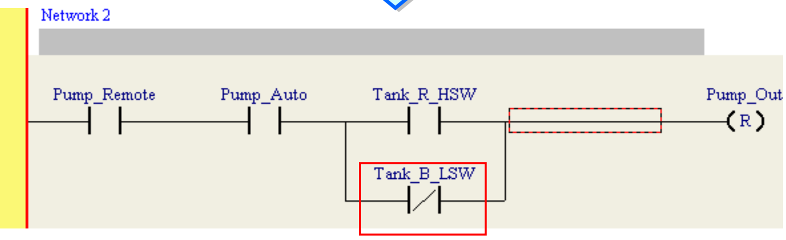


To meet the condition that there is no water in the underground pool, or the condition that the pump trips, users need to click ⊣⊢, and move the mouse to the position under a contact. When ┤ ├ appears, users can click the left mouse button. Then, users need to click ???, and type “Tank_B_LSW”. Finally, users can double-click the coil marked “Tank_B_LSW”. When the drop-down list appears, select “Set”.

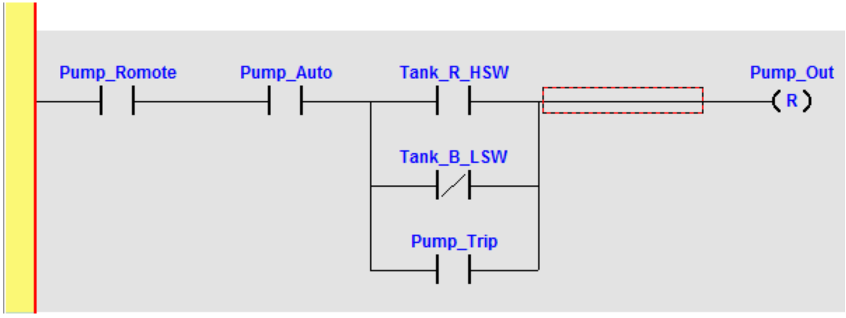


Local Symbols

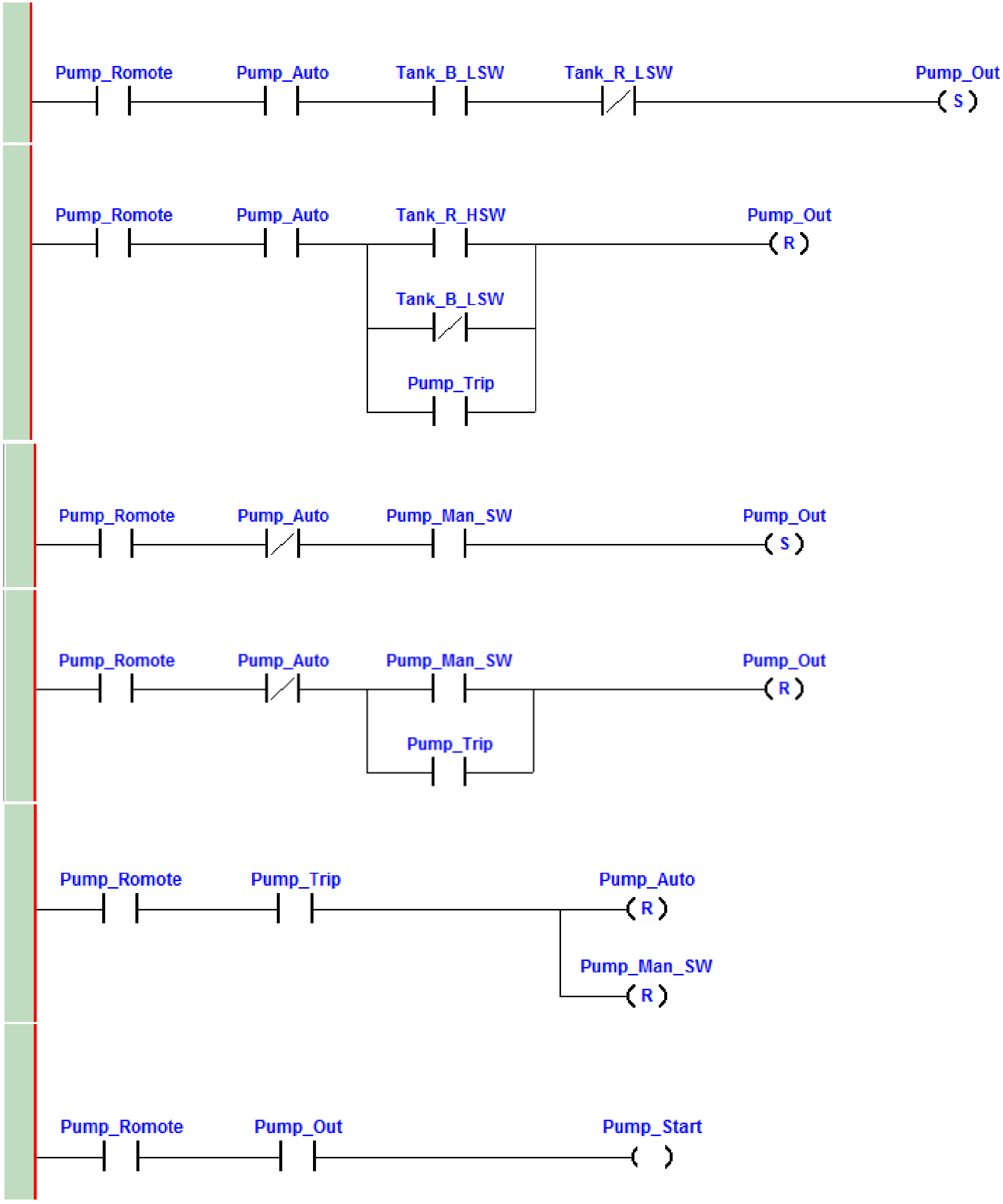
Class	Identifiers	Address	Type...	Initial Value	Identifier Comment...
VAR_INPUT	Tank_R_LSW	N/A [Auto]	BOOL	N/A	Tank RF Level Switch- Low



Users can write the following program in the same way.



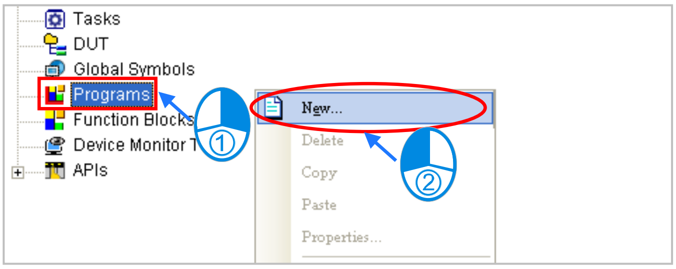
So far the automatic program control is complete. Please write the following program in the same way.



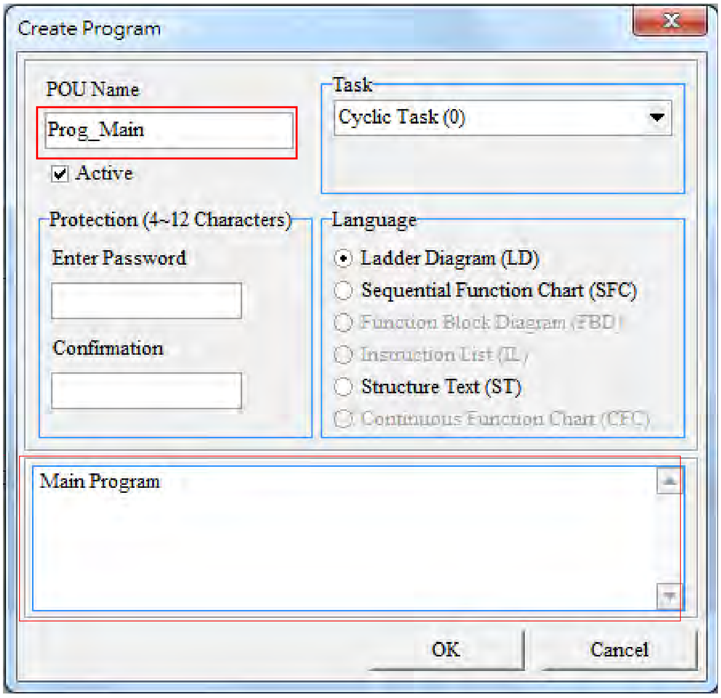
Finally, users need to save the file, and the function block is created.

2.9 Creating Main Programs

After the function block is created, users can create the main program. Right-click Programs in the window at the left side of the main screen of the software to add a new POU.



Type “Prog_Main” in the **POU Name** box, and then type “Main program” in the **POU Comment** box. Finally, click **OK**.


Create Program

POU Name

Prog_Main

☑ Active

Task

Cyclic Task (0)

Protection (4~12 Characters)

Enter Password

Confirmation

Language

● Ladder Diagram (LD)

○ Sequential Function Chart (SFC)

○ Function Block Diagram (FBD)

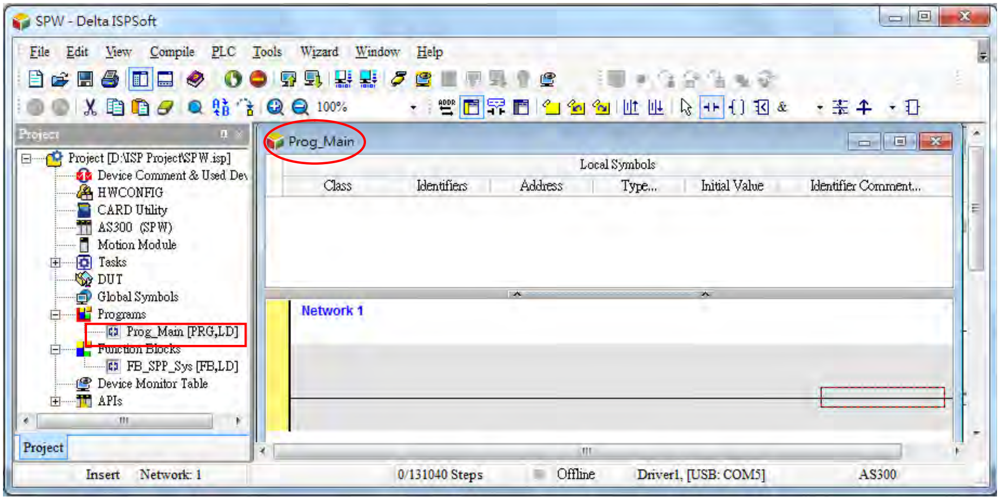
○ Instruction List (IL)

○ Structure Text (ST)

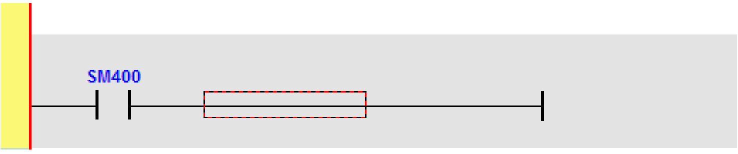
○ Continuous Function Chart (CFC)

Main Program

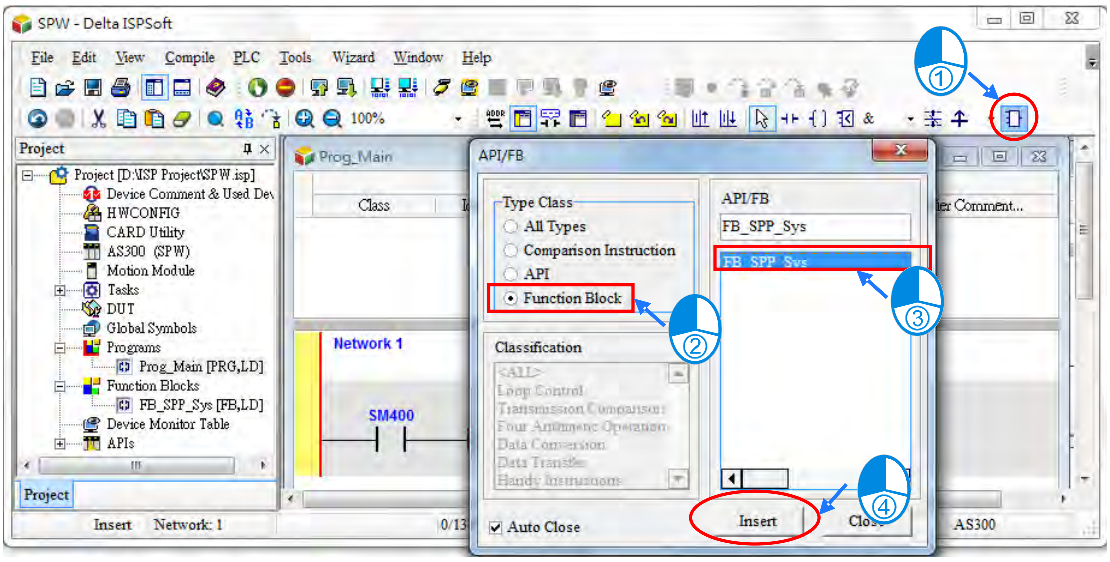
Users can see the **Prog_Main** window on the main screen.



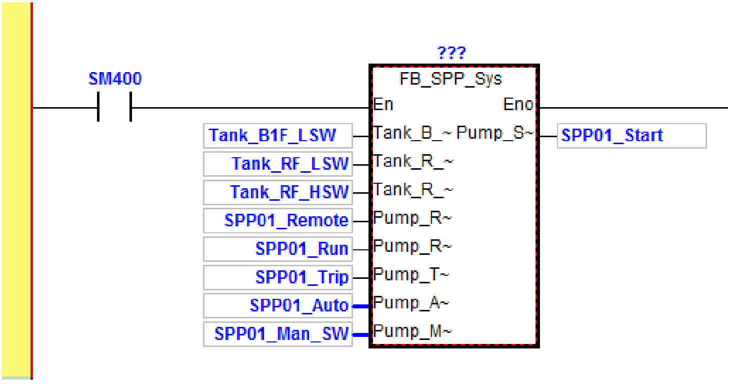
The difference between the function block and the main program is that the function block has to be called before it is executed while the main program is executed directly. The creation of the local symbols for the main program is omitted in this example. Please write the following program by means of the skills learned previously.



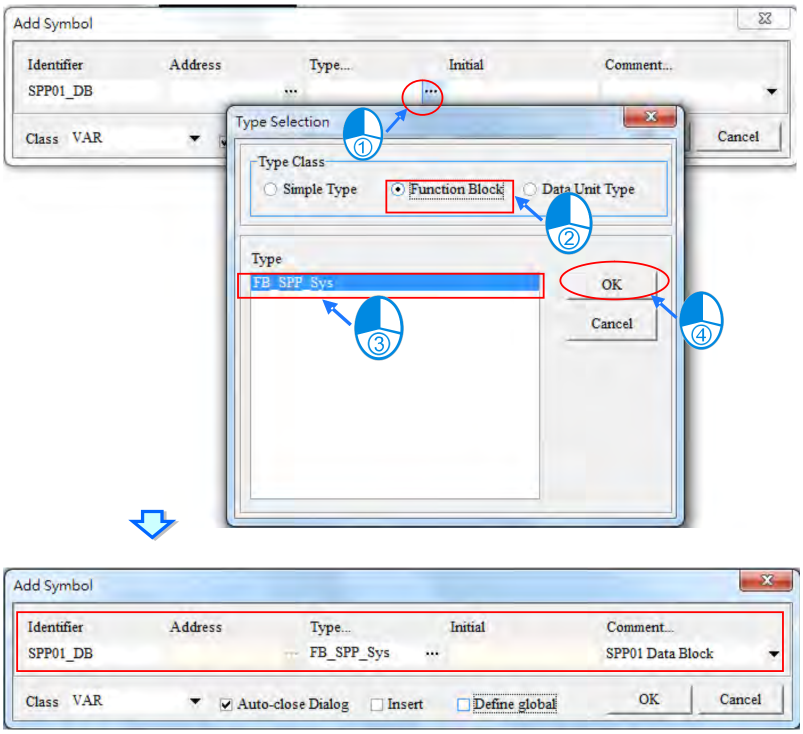
Users can prepare to call the function block. First, click to open the **API/FB** window. Then, select **Function Block** in the **Type Class** box, and select “FB_SPP_Sys” in the **API/FB** box. Finally, click **Insert**.



After the function block interface appears, type the identifiers as shown below.



Users need to create a data block for the function block. The data block can be created as a global symbol or a local symbol, but it is created as a local symbol in the main program here. Notice that users need to select **Function Block** in the **Type Class** box, and select “FB_SPP_Sys” in the **Type** box. Please type “SPP01_DB” in the **Identifier** box, and type “SPP01 Data Block” in the **Comment…** box, as show below.



Add Symbol

Identifier	Address	Type...	Initial	Comment...
SPP01_DB				

Class VAR

Type Selection

Type Class: ○ Simple Type ● Function Block ○ Data Unit Type

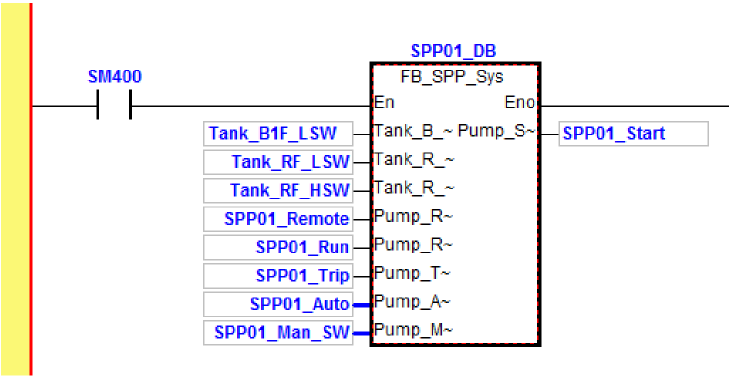
Type: FB_SPP_Sys

Add Symbol

Identifier	Address	Type...	Initial	Comment...
SPP01_DB		FB_SPP_Sys		SPP01 Data Block

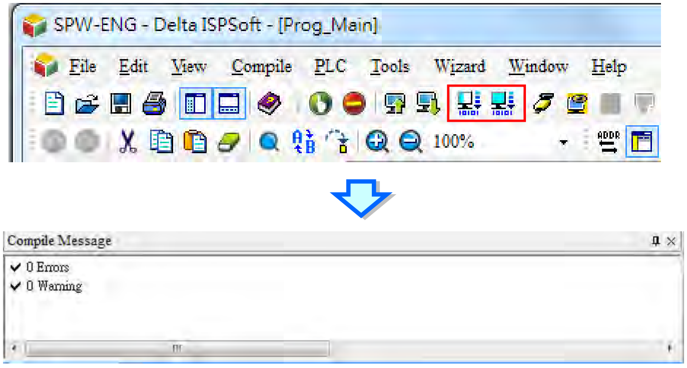
Class VAR ☑ Auto-close Dialog □ Insert □ Define global

After the local symbol is created, the identifier can be given to the function block. (The data type should be the same with the name of the function block.)



After the file is saved, the writing of the program is complete.

Users can click to check the syntax of the current program, and click to compile the project. The compiling of the project is different from the checking of the syntax in that the former involves not only the function of checking the syntax, but also the function of compiling all programs and the contents of the function block.

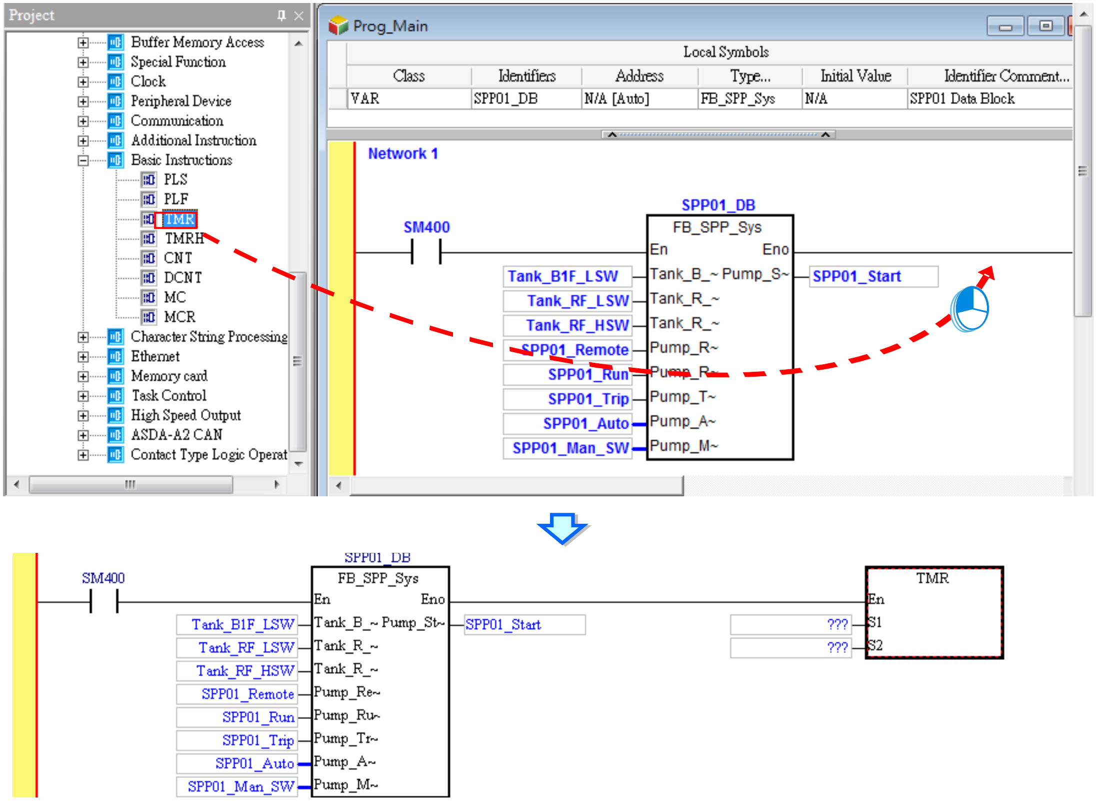


SPW-ENG - Delta ISPSoft - [Prog_Main]

Compile Message

✓ 0 Errors
✓ 0 Warning

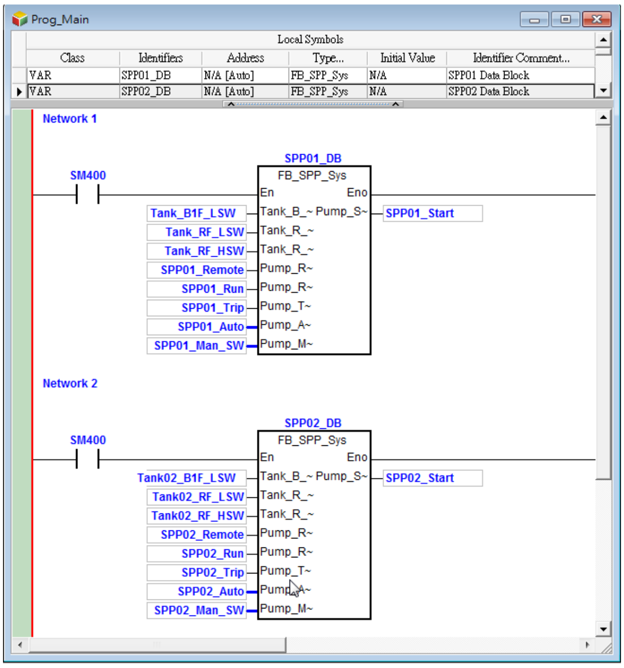
Note: In order to help users understand the control program, the example provided here is simple. The actual control program is much more complex because the functions related to judging the start failure and the conversion from the local control to the remote control have to be taken into account. Users need to use the applied instructions in the window at the left side of the main screen to write a program for these functions. (Please refer to ISPSoft User Manual for more information.)



Local Symbols

Class	Identifiers	Address	Type...	Initial Value	Identifier Comment...
VAR	SPP01_DB	N/A [Auto]	FB_SPP_Sys	N/A	SPP01 Data Block

If users need to create the second system, they only need to call “FB_SPP_Sys” again, and type the identifier. Please notice that the same data block can not be used in the two systems unless user consider that the value of VAR_OUTPUT and that of VAR of in the first system does not affect those in the second system. Otherwise, please create a new identifier for the second system, as shown below.



Local Symbols

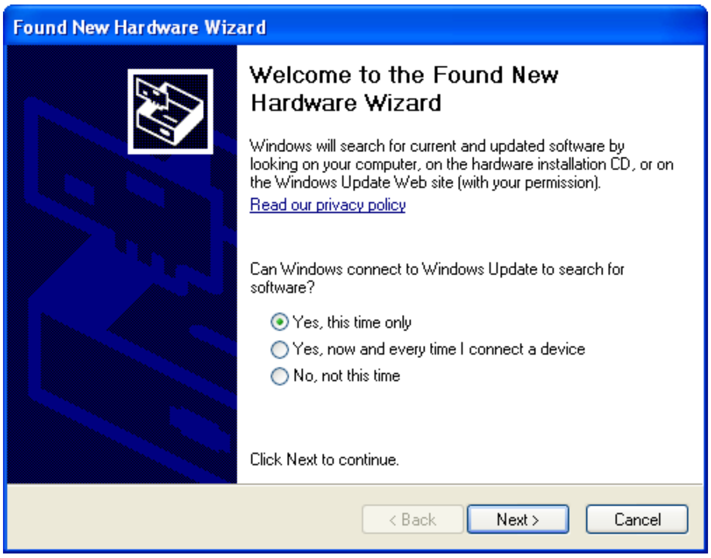
Class	Identifiers	Address	Type...	Initial Value	Identifier Comment...
VAR	SPP01_DB	N/A [Auto]	FB_SPP_Sys	N/A	SPP01 Data Block
VAR	SPP02_DB	N/A [Auto]	FB_SPP_Sys	N/A	SPP02 Data Block

Chapter 3 Downloading and Monitoring the Program

Table of Contents

After the writing of the program is complete, users can prepare to download the program. In order to increase the functions and the convenience, the latest software package is divided into COMMGR and ISPSoft. In addition to preparing the hardware, supplying power to the CPU module, and installing the USB driver, users need to set the communication software to communicate with the CPU module.

If the computer is not connected to the USB port on the CPU module, please connect the CPU module to the computer with an USB cable. The following window will appear.



Found New Hardware Wizard

Welcome to the Found New Hardware Wizard

Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).

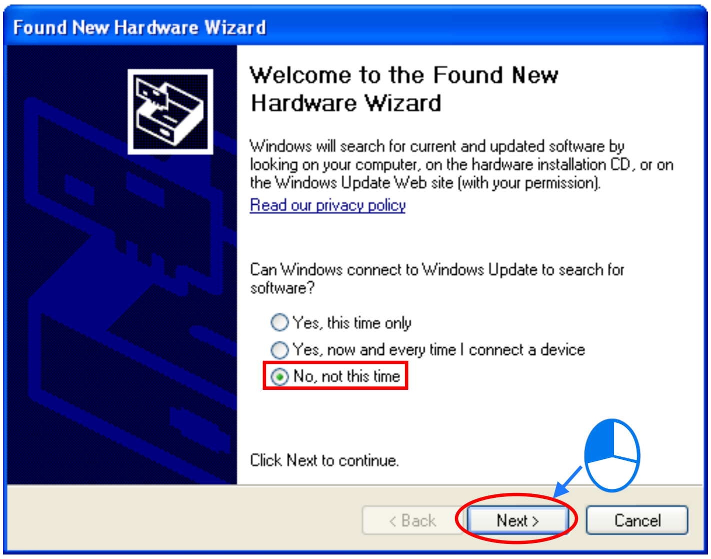
Read our privacy policy

Can Windows connect to Windows Update to search for software?

● Yes, this time only
○ Yes, now and every time I connect a device
○ No, not this time

Click Next to continue.

Please complete the setting according to the steps below.



Found New Hardware Wizard

Welcome to the Found New Hardware Wizard

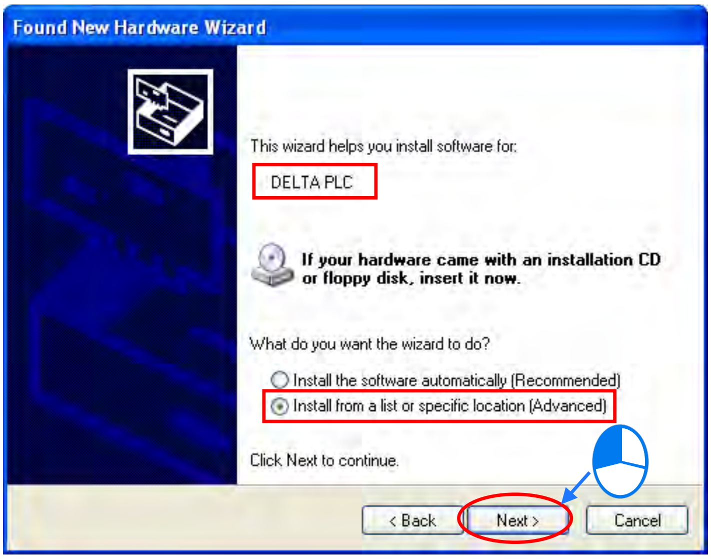
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).

Read our privacy policy

Can Windows connect to Windows Update to search for software?

○ Yes, this time only
○ Yes, now and every time I connect a device
● No, not this time

Click Next to continue.



Found New Hardware Wizard

This wizard helps you install software for:

DELTA PLC

If your hardware came with an installation CD or floppy disk, insert it now.

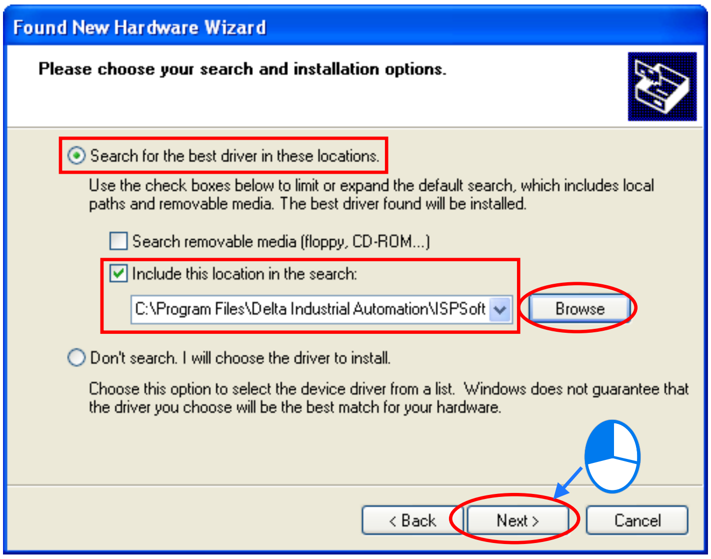
What do you want the wizard to do?

○ Install the software automatically (Recommended)

● Install from a list or specific location (Advanced)

Click Next to continue.

The path C:\Program Files\Delta Industrial Automation\ISPSoftx.xx\drivers\Delta_PLC_USB_Driver shown in the picture below is the folder where the software is installed. If the path is modified, please select the folder where the software will be installed.



Found New Hardware Wizard

Please choose your search and installation options.

● Search for the best driver in these locations.

Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.

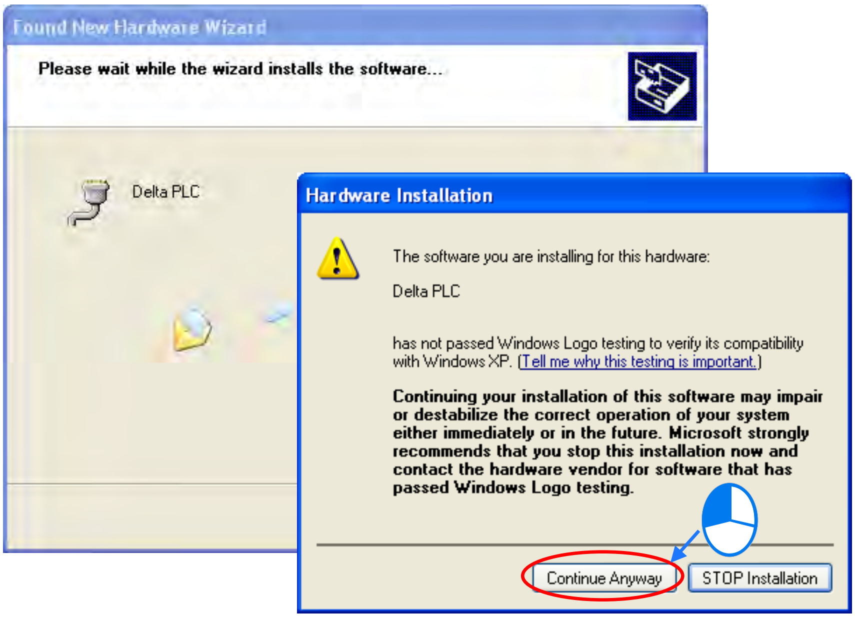
□ Search removable media (floppy, CD-ROM...)

☑ Include this location in the search:

C:\Program Files\Delta Industrial Automation\ISPSoft

○ Don't search. I will choose the driver to install.

Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.



Found New Hardware Wizard

Please wait while the wizard installs the software...

Delta PLC

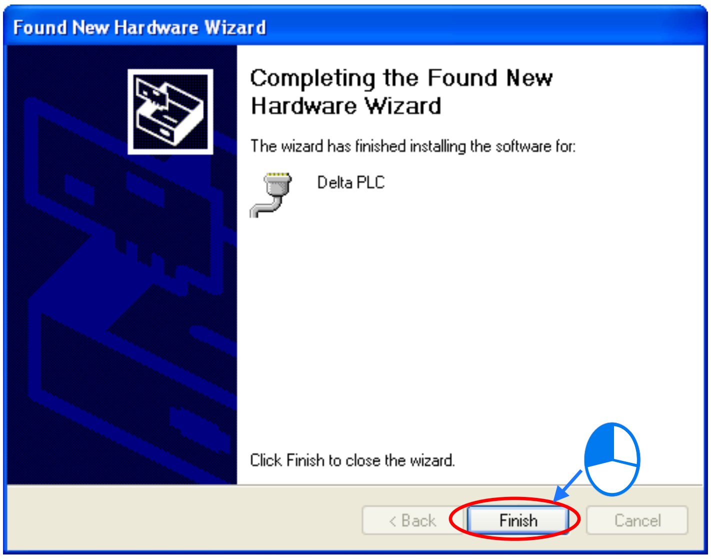
Hardware Installation

The software you are installing for this hardware:

Delta PLC

has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)

Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.



Found New Hardware Wizard

Completing the Found New Hardware Wizard

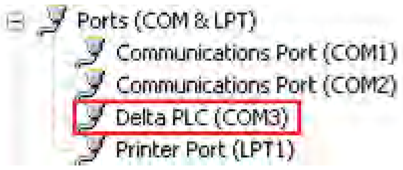
The wizard has finished installing the software for:

Delta PLC

Click Finish to close the wizard.

After the software is installed, users can see the USB driver in the Device Manager window.

(The COM number of the USB may vary from computer to computer.)



Ports (COM & LPT)
Communications Port (COM1)
Communications Port (COM2)
Delta PLC (COM3)
Printer Port (LPT1)

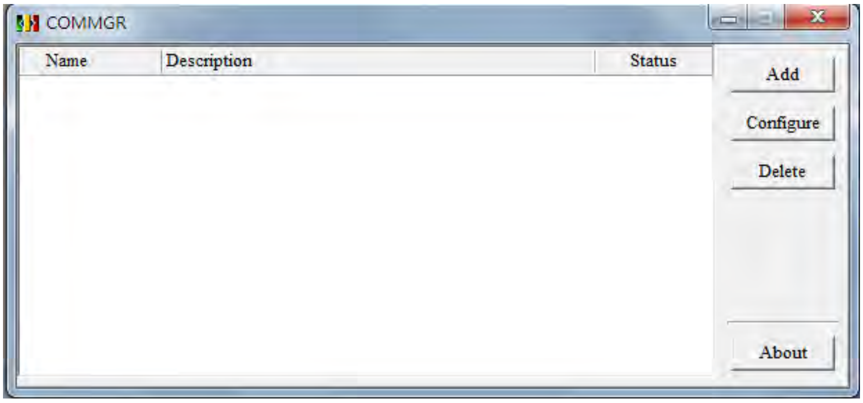
3.1 Setting COMMGR

3.1.1 Enabling COMMGR

After the software is installed, the shortcut for COMMGR automatically appears in the notification area in the operating system. Whenever the computer is turned on, users can see located at the far right of the taskbar. If users do not see the icon, they can enable the software manually. The shortcut to enabling the software is Start→Programs→ Delta Industrial Automation→Communication→COMMGR→COMMGR.

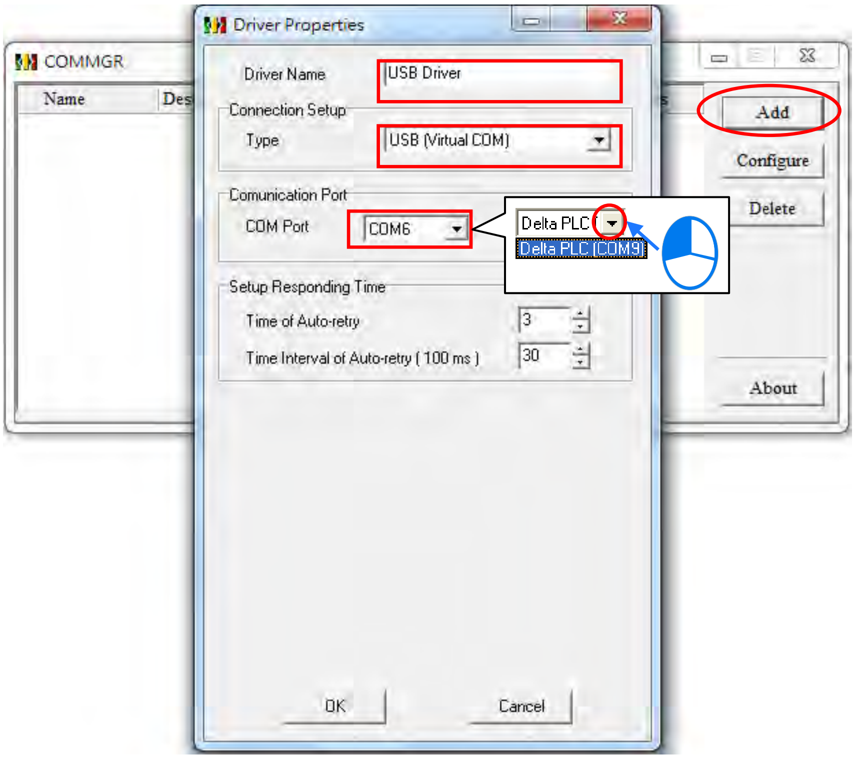
3.1.2 Opening the COMMGR Window

After COMMGR is enabled, users can double-click to open the setting interface below.



3.1.3 Setting the Communication

After the interface is opened, users can begin to set the communication. Owing to the fact that the computer is connected to the CPU module with an USB cable, an USB driver is created. First, click Add. Then, complete the following setting.



Driver Name: USB Driver

Connection Setup

Type: USB (Virtual COM)

Comunication Port

COM Port: COM6

Delta PLC (

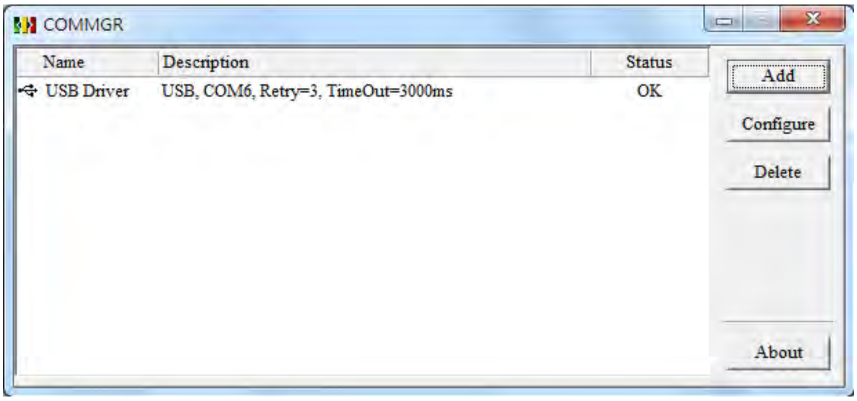
Delta PLC (COM9)

Setup Responding Time

Time of Auto-retry: 3

Time Interval of Auto-retry (100 ms): 30

After the setting is complete, the driver appears in the **COMMGR** window. Please click **Start** to start the driver.



COMMGR

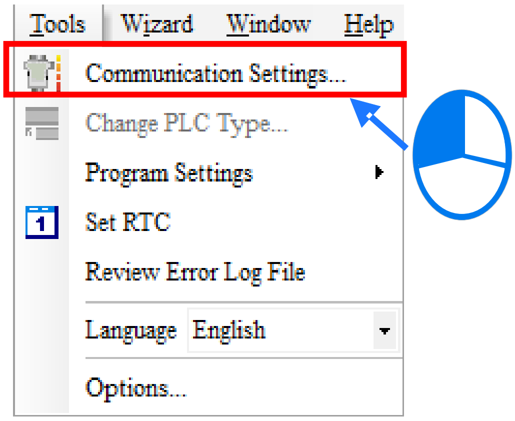
Name	Description	Status
USB Driver	USB, COM6, Retry=3, TimeOut=3000ms	OK

3.2 Downloading the Program

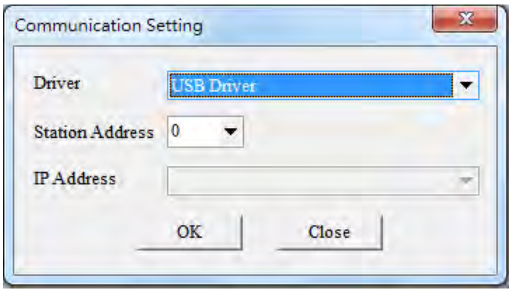
After the editing above is complete, users need to download the parameters and the program to the CPU module. In this example, the data which is downloaded to the PLC is the hardware configuration, the CPU parameters, and the program.

3.2.1 Setting the Communication

After the setting of COMMGR is complete, users can set the communication in ISPSoft. First, find **Communication Settings…** on the **Tools** menu.



After the Communication Setting window appears, please select **USB_Drive** in the **Driver** box, and click **OK**.



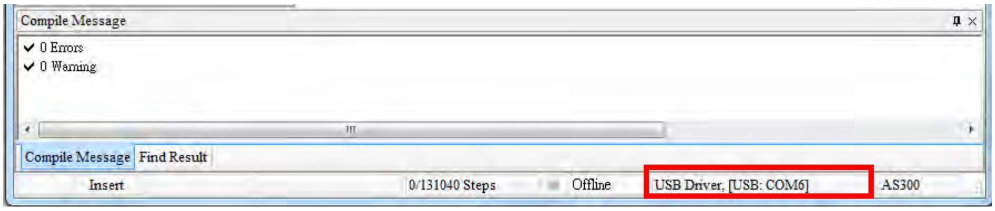
Communication Setting

Driver: USB Driver

Station Address: 0

IP Address:

Users can see the information about the communication setting in the lower right corner of the screen.



Compile Message

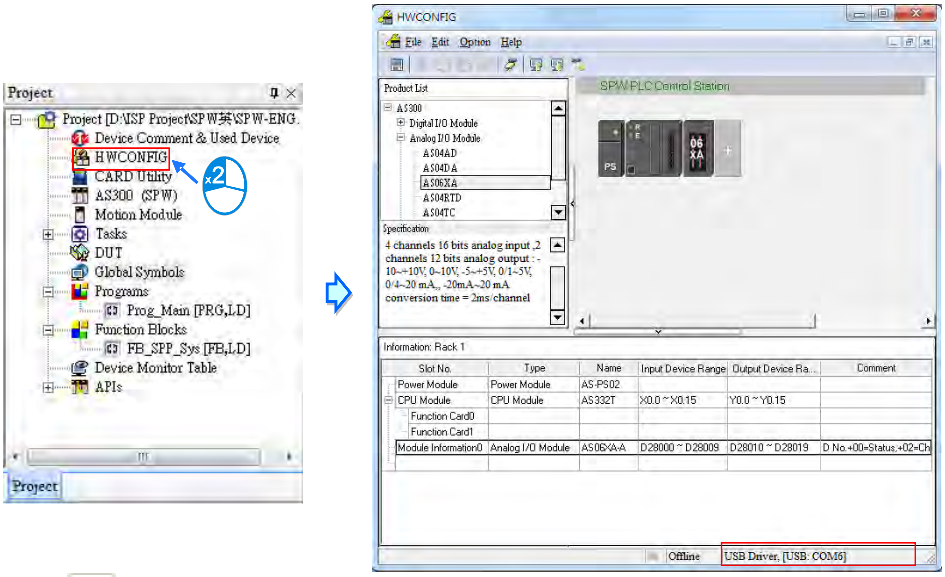
✓ 0 Errors
✓ 0 Warning

Compile Message | Find Result

Insert | 0/131040 Steps | Offline | USB Driver, [USB: COM6] | AS300

3.2.2 Downloading the Hardware Configuration

The hardware configuration is downloaded first. Open the **SPW-HWCONFIG** window as shown below.



Project

- Project [D:\ISP Project\SPW英\SPW-ENG.
  - Device Comment & Used Device
  - HWCONFIG
  - CARD Utility
  - AS300 (SPW)
  - Motion Module
  - Tasks
  - DUT
  - Global Symbols
  - Programs
    - Prog_Main [PRG,LD]
  - Function Blocks
    - FB_SPP_Sys [FB,LD]
  - Device Monitor Table
  - APIs

HWCONFIG

- AS300
  - Digital I/O Module
  - Analog I/O Module
    - AS04AD
    - AS04DA
    - AS06XA
    - AS04RTD
    - AS04TC

Specification

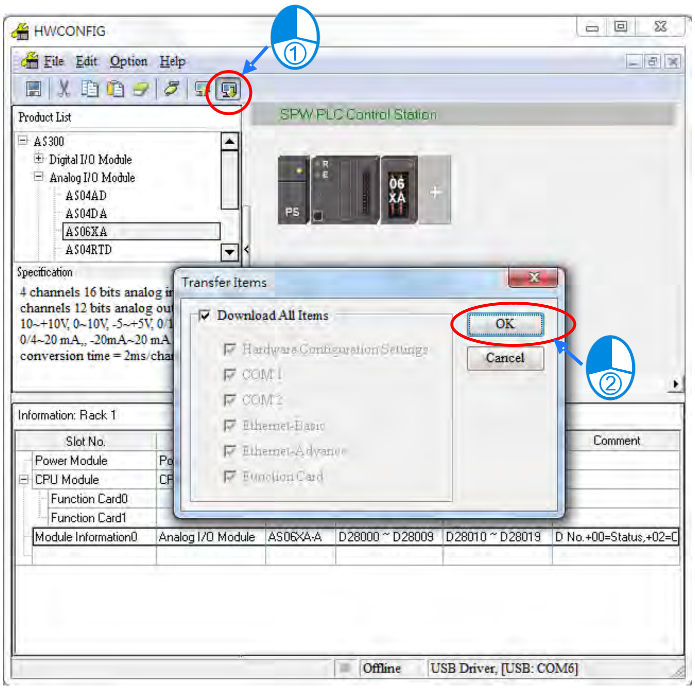
4 channels 16 bits analog input ,2 channels 12 bits analog output : -10~+10V, 0~10V, -5~+5V, 0/1~5V, 0/4~20 mA,, -20mA~20 mA conversion time = 2ms/channel

Information: Rack 1

Slot No.	Type	Name	Input Device Range	Output Device Ra...	Comment
Power Module	Power Module	AS-PS02			
CPU Module	CPU Module	AS332T	X0.0 ~ X0.15	Y0.0 ~ Y0.15	
Function Card0					
Function Card1					
Module Information0	Analog I/O Module	AS06XA-A	D28000 ~ D28009	D28010 ~ D28019	D No.+00=Status,+02=Ch

Offline | USB Driver, [USB: COM6]

After users click , the **Transfer Items** window will appear. After the users click **OK**, the hardware configuration and the CPU parameters will be downloaded to the CPU module.



Transfer Items

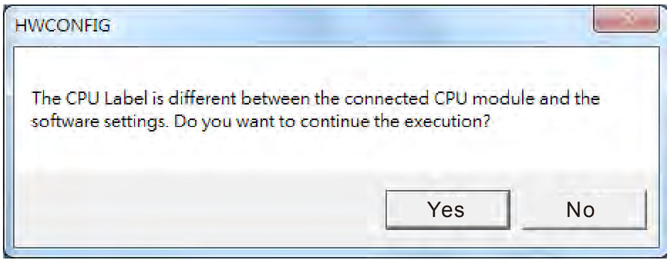
☑ Download All Items

- ☑ Hardware Configuration Settings
- ☑ COM 1
- ☑ COM 2
- ☑ Ethernet-Basic
- ☑ Ethernet-Advance
- ☑ Function Card

OK | Cancel

Offline | USB Driver, [USB: COM6]

If the CPU module which is actually connected is different from the setting in ISPsoft, the **HWCNFIG** window will appear. Users have to make sure that the CPU module which is actually connected is the CPU module to which the hardware configuration and the CPU parameters will be downloaded. After users click **Yes**, the hardware configuration and the CPU parameters will be downloaded to the CPU module. After the hardware configuration and the CPU parameters are downloaded to the CPU module, the error LED indicator on the CPU module will not be ON.



HWCONFIG

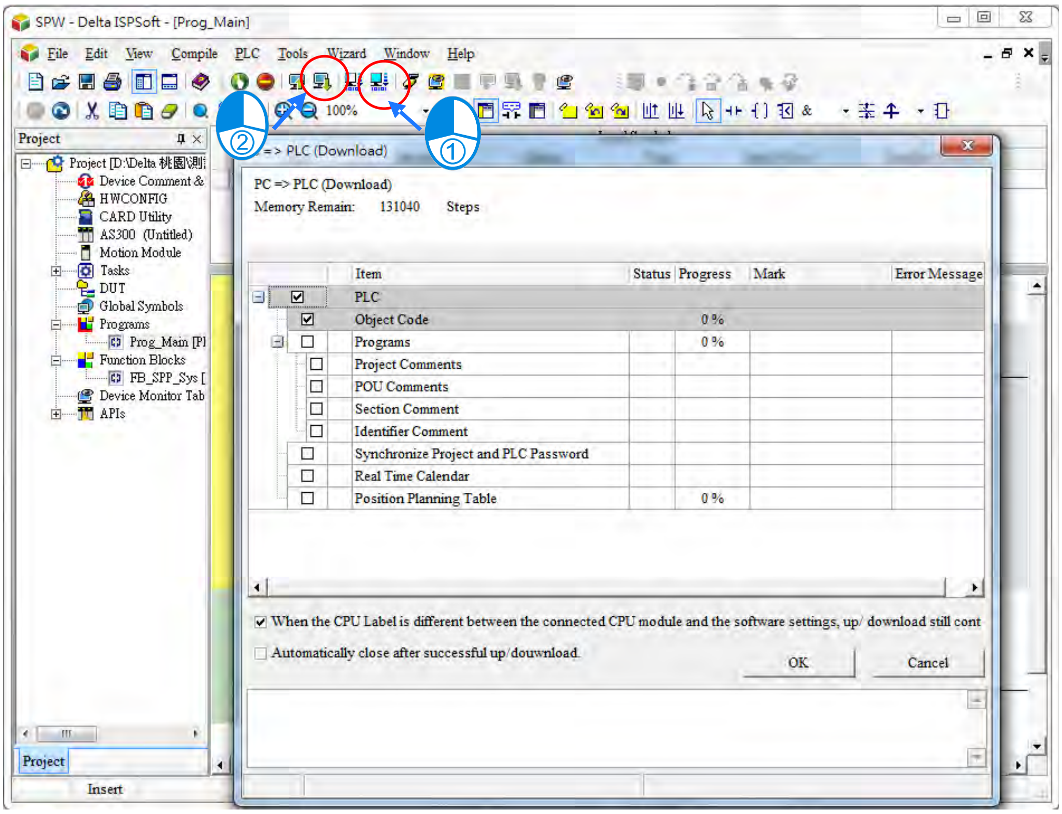
The CPU Label is different between the connected CPU module and the software settings. Do you want to continue the execution?

After the downloading of the parameters is complete, please close the **SPW-HWCONFIG** window.

(If users use a network module or a motion control module, they have to open the corresponding software to download the related parameters.)

3.2.3 Downloading the Program

After the hardware configuration is downloaded, users can begin to download the program. The project has been compiled previously. If the program is modified, users can click ▦ to check the syntax. After the compiling of the program is successful, users can click ▦ to download the program.



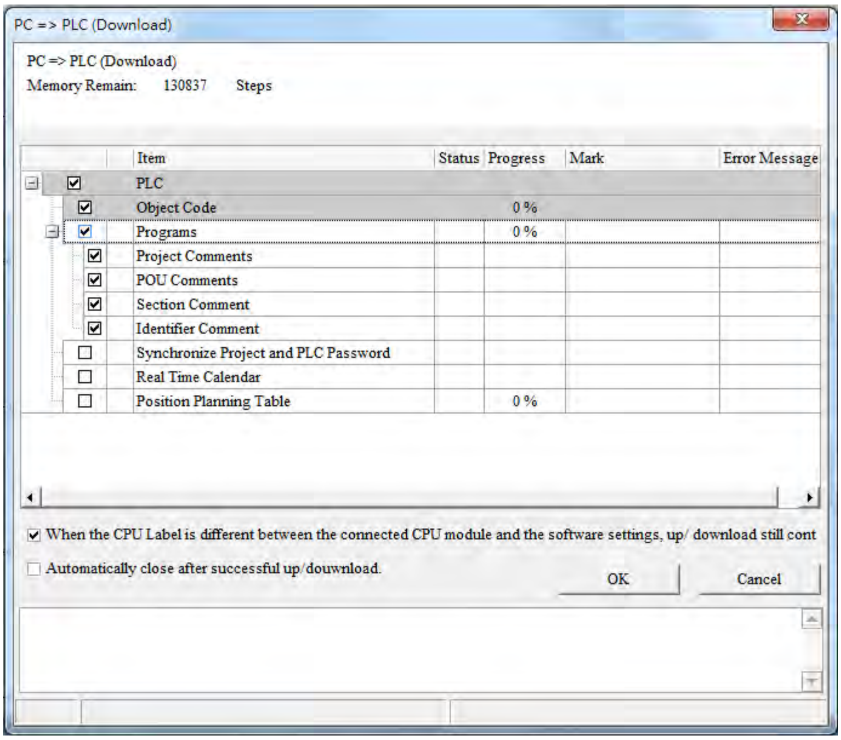
PC => PLC (Download)
Memory Remain: 131040 Steps

	Item	Status	Progress	Mark	Error Message
☑	PLC				
☑	Object Code		0 %		
☐	Programs		0 %		
☐	Project Comments				
☐	POU Comments				
☐	Section Comment				
☐	Identifier Comment				
☐	Synchronize Project and PLC Password				
☐	Real Time Calendar				
☐	Position Planning Table		0 %		

☑ When the CPU Label is different between the connected CPU module and the software settings, up/ download still cont

☐ Automatically close after successful up/douwnload.

There are several transfer options in the **Transfer Setup** window. The object code is the necessary condition for the operation of the CPU module, and therefore the **Object Code** checkbox is selected. In order to maintain the program, the **Program** checkbox and the **Comments** checkbox are selected in this example. The current project will be backed up in the CPU module, and the program will not be lost. Besides, if users want to modify the program on the spot, and forget to bring the original program, they can upload the original program from the CPU module to the computer to modify the program.



PC => PLC (Download)

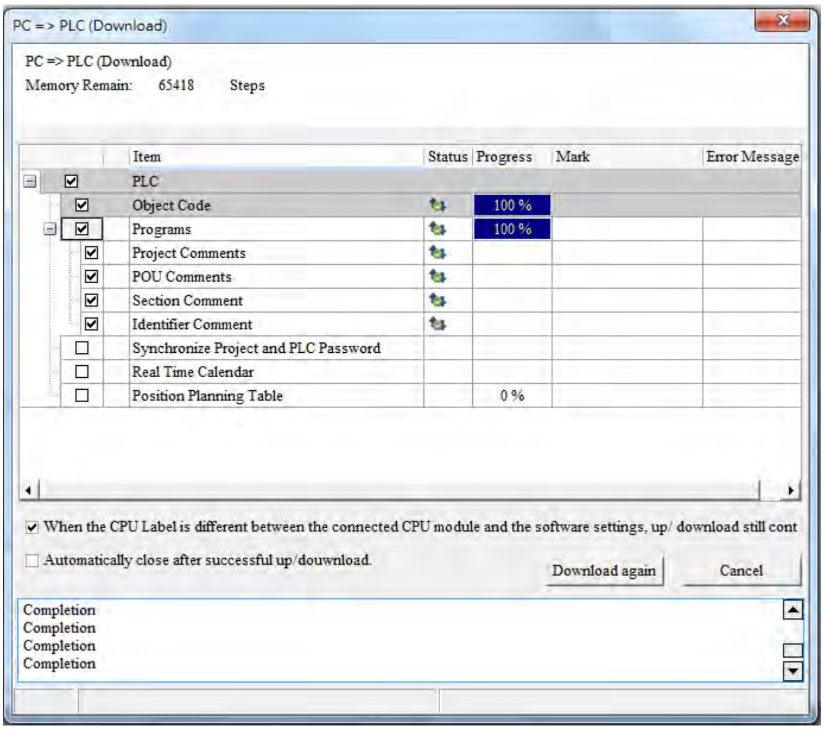
PC => PLC (Download)
Memory Remain: 130837 Steps

	Item	Status	Progress	Mark	Error Message
⊟ ☑	PLC				
☑	Object Code		0 %		
⊟ ☑	Programs		0 %		
☑	Project Comments				
☑	POU Comments				
☑	Section Comment				
☑	Identifier Comment				
☐	Synchronize Project and PLC Password				
☐	Real Time Calendar				
☐	Position Planning Table		0 %		

☑ When the CPU Label is different between the connected CPU module and the software settings, up/ download still cont

☐ Automatically close after successful up/download.

After users click **OK**, the downloading of the program is complete.



PC => PLC (Download)

PC => PLC (Download)
Memory Remain: 65418 Steps

	Item	Status	Progress	Mark	Error Message
⊟ ☑	PLC				
☑	Object Code	✓	100 %		
⊟ ☑	Programs	✓	100 %		
☑	Project Comments	✓			
☑	POU Comments	✓			
☑	Section Comment	✓			
☑	Identifier Comment	✓			
☐	Synchronize Project and PLC Password				
☐	Real Time Calendar				
☐	Position Planning Table		0 %		

☑ When the CPU Label is different between the connected CPU module and the software settings, up/ download still cont

☐ Automatically close after successful up/download.

```
Completion
Completion
Completion
Completion
```

Finally, check the I/O LED indicator on the module and the status of the equipment. After users make sure that the whole system can be tested, they have to switch the CPU module on so that the CPU module starts to run.

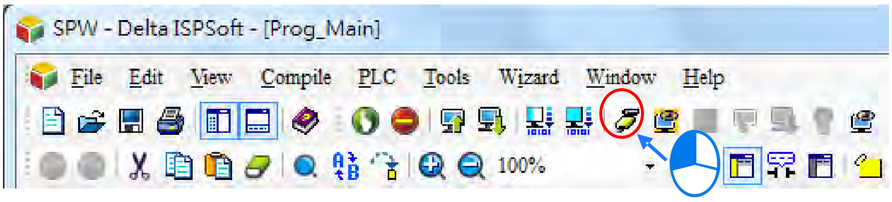
3.3 Monitoring and Debugging the Program

3.3.1 Monitoring the Program

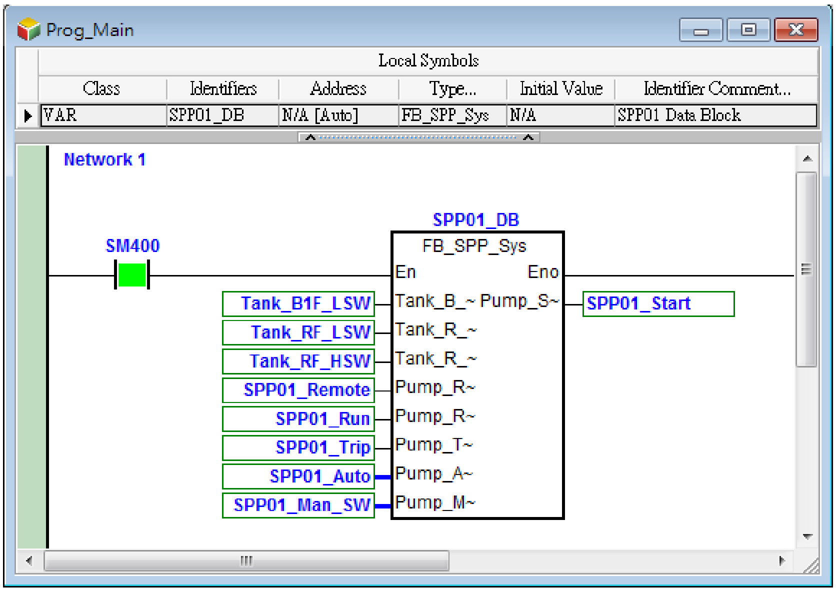
When the program is executed, users can monitor the program to understand the current logical control state, or modify the values in some devices to test the system. The operation of the program monitoring is as follows.

- **Monitoring the program**

  Open the **Prog_Main** window, and click .



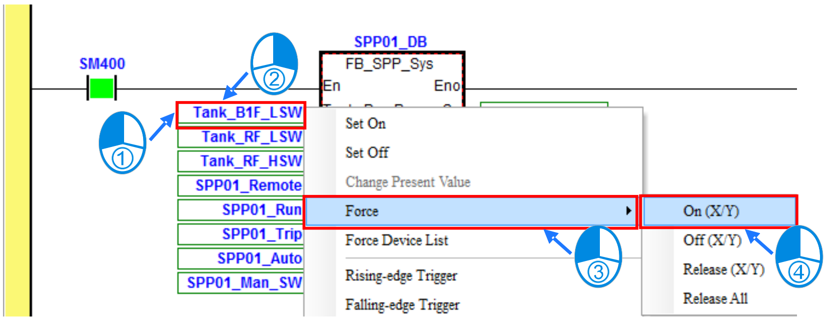
Not only the logic program, but also the information related to the devices is monitored. (If the data type is a Boolean value, the state of the device is represented by green (ON) or white (OFF). If the data type is not a Boolean value, the value in the device is shown.)



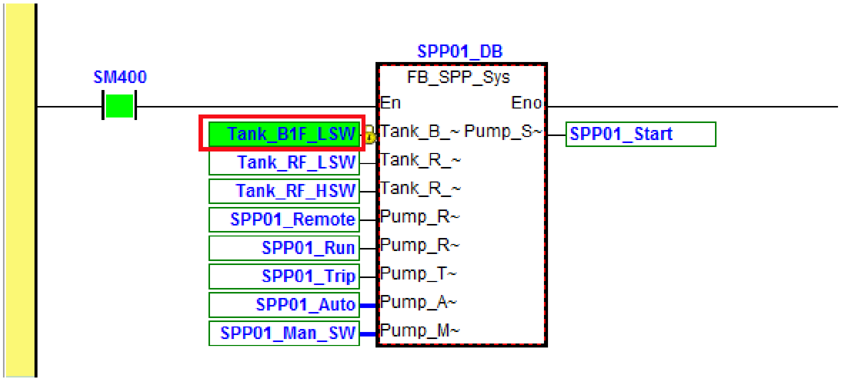
Local Symbols

Class	Identifiers	Address	Type...	Initial Value	Identifier Comment...
VAR	SPP01_DB	N/A [Auto]	FB_SPP_Sys	N/A	SPP01 Data Block

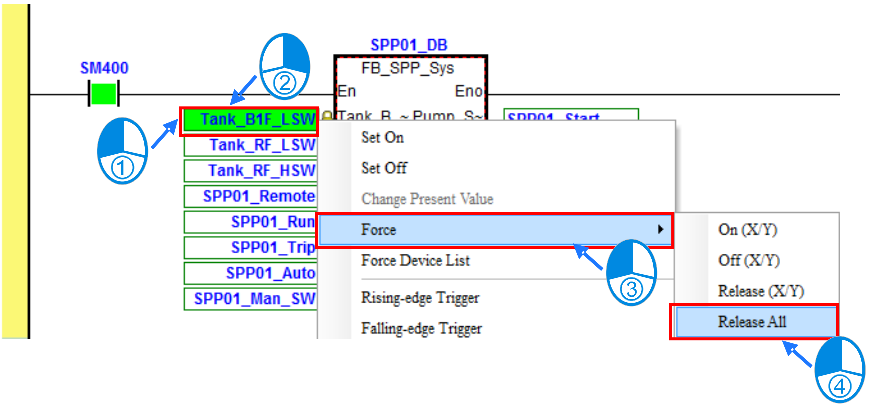
If users want to alter the value in the device, they can click the right mouse button. Tank_B1F_LSW is the device which is modified here. Please notice that the device corresponds to an actual I/O device. Setting the device to ON or OFF is meaningless because the actual I/O value covers the setting value immediately. To alter the value in the device, users need to force the device ON or OFF.



The value in the device is altered, and a lock symbol indicating that the device is forced ON appears.



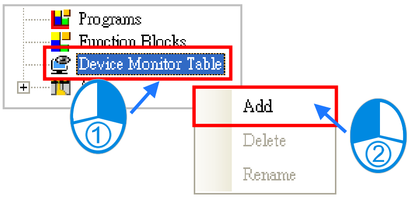
After the system is tested, users have to cancel the setting so that the CPU module can return to normal.



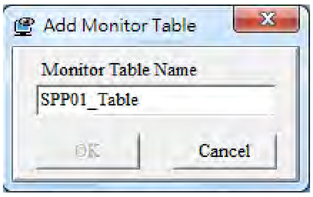
- **Monitoring the device**

  When the logical control is tested, the devices which have to be modified may be used in different programs. It is not convenient to find these devices in the programs and monitor them. Besides, users sometimes do not alter the value in a device for debugging. They alter the value for testing the external device. If users want to alter the value in a device by means of monitoring the program, they will have difficulty in finding the device, and the program has to be uploaded from the CPU module to the computer. In order to solve the difficulty, users can alter the value in a device by means of a device monitoring table. User even can alter the value in a device and monitor the device without the program.

  Right-click Device Monitor Table in the window at the left side of the main screen of the software to add a new device monitoring table.



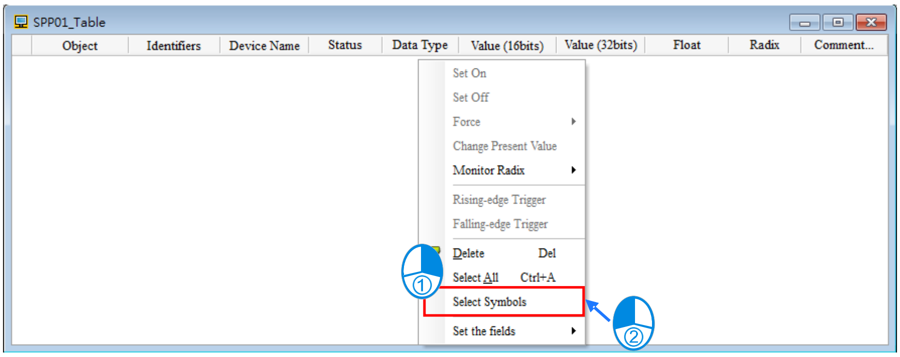
Type “SPP01_Table” in the **Monitor Table Name** box, and click **OK**.



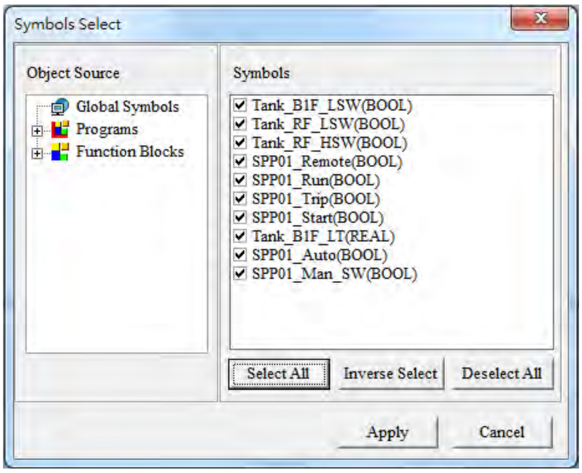
Monitor Table Name
SPP01_Table

Users can right-click a blank area in the **Monitor Table** window, and then click **Select Symbols**. They can also double-click a blank area in the **Monitor Table** window to open the **Device**

Monitor Input window.

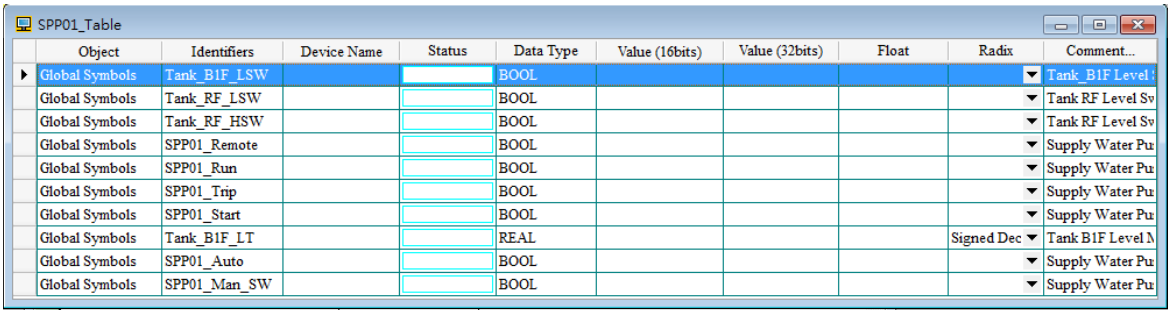


Click **Select All**, and then click **Apply**.



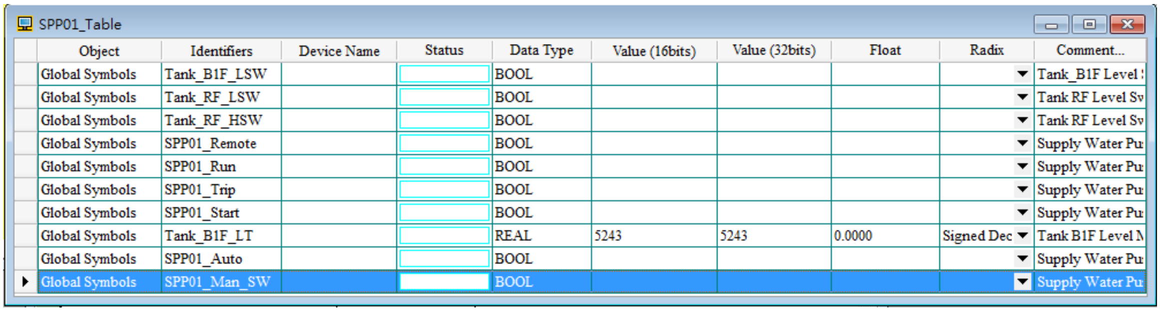
☑ Tank_B1F_LSW(BOOL)
☑ Tank_RF_LSW(BOOL)
☑ Tank_RF_HSW(BOOL)
☑ SPP01_Remote(BOOL)
☑ SPP01_Run(BOOL)
☑ SPP01_Trip(BOOL)
☑ SPP01_Start(BOOL)
☑ Tank_B1F_LT(REAL)
☑ SPP01_Auto(BOOL)
☑ SPP01_Man_SW(BOOL)

Click **Cancel**, and then save the file. The device monitoring table is as follows.


SPP01_Table

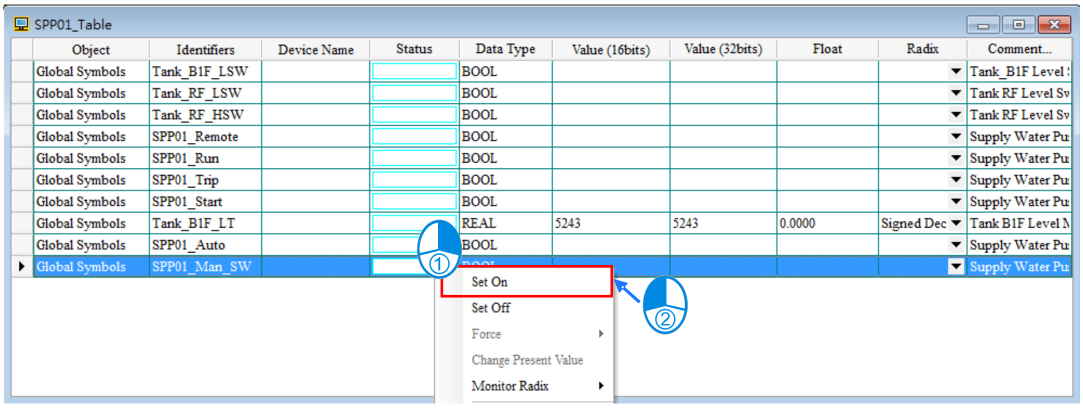
Object	Identifiers	Device Name	Status	Data Type	Value (16bits)	Value (32bits)	Float	Radix	Comment...
Global Symbols	Tank_B1F_LSW			BOOL					Tank_B1F Level :
Global Symbols	Tank_RF_LSW			BOOL					Tank RF Level Sv
Global Symbols	Tank_RF_HSW			BOOL					Tank RF Level Sv
Global Symbols	SPP01_Remote			BOOL					Supply Water Pu
Global Symbols	SPP01_Run			BOOL					Supply Water Pu
Global Symbols	SPP01_Trip			BOOL					Supply Water Pu
Global Symbols	SPP01_Start			BOOL					Supply Water Pu
Global Symbols	Tank_B1F_LT			REAL				Signed Dec	Tank B1F Level N
Global Symbols	SPP01_Auto			BOOL					Supply Water Pu
Global Symbols	SPP01_Man_SW			BOOL					Supply Water Pu

Click . Owing to the fact that only devices are monitored and modified, users do not need a copy of the program.


SPP01_Table

Object	Identifiers	Device Name	Status	Data Type	Value (16bits)	Value (32bits)	Float	Radix	Comment...
Global Symbols	Tank_B1F_LSW			BOOL					Tank_B1F Level :
Global Symbols	Tank_RF_LSW			BOOL					Tank RF Level Sv
Global Symbols	Tank_RF_HSW			BOOL					Tank RF Level Sv
Global Symbols	SPP01_Remote			BOOL					Supply Water Pu
Global Symbols	SPP01_Run			BOOL					Supply Water Pu
Global Symbols	SPP01_Trip			BOOL					Supply Water Pu
Global Symbols	SPP01_Start			BOOL					Supply Water Pu
Global Symbols	Tank_B1F_LT			REAL	5243	5243	0.0000	Signed Dec	Tank B1F Level N
Global Symbols	SPP01_Auto			BOOL					Supply Water Pu
Global Symbols	SPP01_Man_SW			BOOL					Supply Water Pu

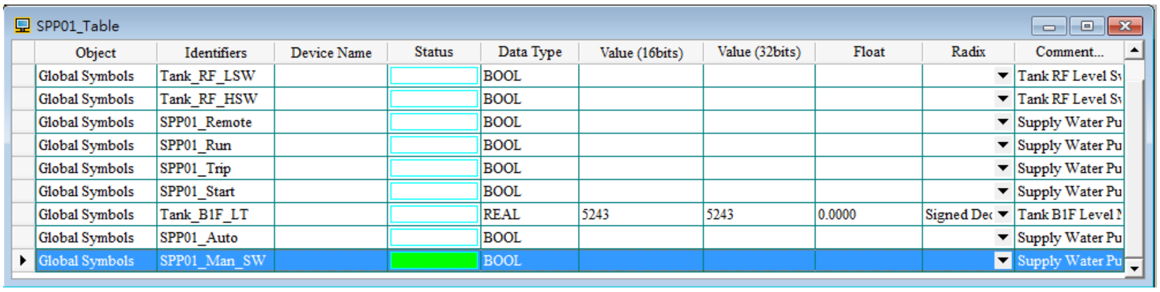
If users want to alter the value in the device, they can click the right mouse button. The state of SPP01_Man_SW is altered here. Owing to the fact that the device does not correspond to an actual I/O device, users can set the device to ON or OFF.



SPP01_Table

	Object	Identifiers	Device Name	Status	Data Type	Value (16bits)	Value (32bits)	Float	Radix	Comment...
	Global Symbols	Tank_B1F_LSW			BOOL					Tank_B1F Level :
	Global Symbols	Tank_RF_LSW			BOOL					Tank RF Level Sv
	Global Symbols	Tank_RF_HSW			BOOL					Tank RF Level Sv
	Global Symbols	SPP01_Remote			BOOL					Supply Water Pu
	Global Symbols	SPP01_Run			BOOL					Supply Water Pu
	Global Symbols	SPP01_Trip			BOOL					Supply Water Pu
	Global Symbols	SPP01_Start			BOOL					Supply Water Pu
	Global Symbols	Tank_B1F_LT			REAL	5243	5243	0.0000	Signed Dec	Tank B1F Level N
	Global Symbols	SPP01_Auto			BOOL					Supply Water Pu
▶	Global Symbols	SPP01_Man_SW			BOOL					Supply Water Pu

After the state of SPP01_Man_SW is altered, users can get the following device monitoring table.



SPP01_Table

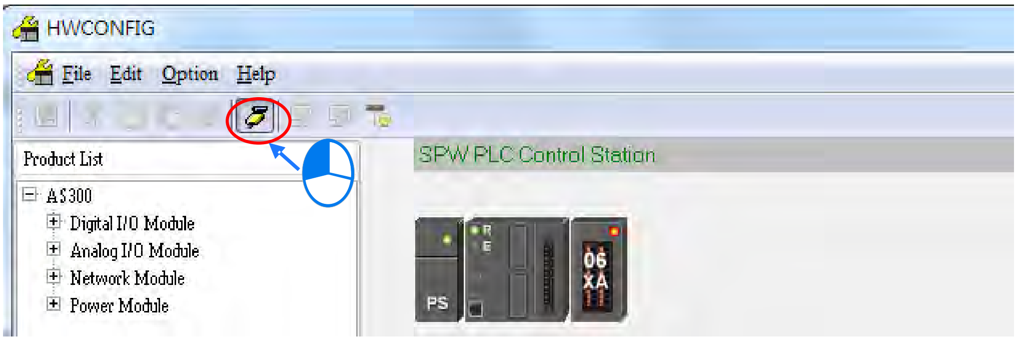
	Object	Identifiers	Device Name	Status	Data Type	Value (16bits)	Value (32bits)	Float	Radix	Comment...
	Global Symbols	Tank_RF_LSW			BOOL					Tank RF Level S
	Global Symbols	Tank_RF_HSW			BOOL					Tank RF Level S
	Global Symbols	SPP01_Remote			BOOL					Supply Water Pu
	Global Symbols	SPP01_Run			BOOL					Supply Water Pu
	Global Symbols	SPP01_Trip			BOOL					Supply Water Pu
	Global Symbols	SPP01_Start			BOOL					Supply Water Pu
	Global Symbols	Tank_B1F_LT			REAL	5243	5243	0.0000	Signed Dec	Tank B1F Level N
	Global Symbols	SPP01_Auto			BOOL					Supply Water Pu
▶	Global Symbols	SPP01_Man_SW		🟩	BOOL					Supply Water Pu

If users do not want to monitor the devices, they can click and close the device monitoring table.

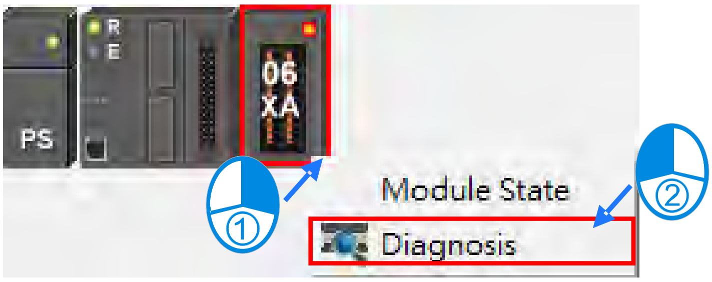
3.3.2 Debugging the Program and the System

When the system operates, an error may occur, and the error LED indicator on a module may be ON. If an error occurs, and the error LED indicator is not ON, the error is a logic program error. If users follow the steps in the example, no error will occur. In order to demonstrate a system error, users are asked to turn off the 24 V DC power supply. After the 24 V DC power supply is turned off, the bus fault LED indicator on the CPU module and the error LED indicator on 06XA are ON.

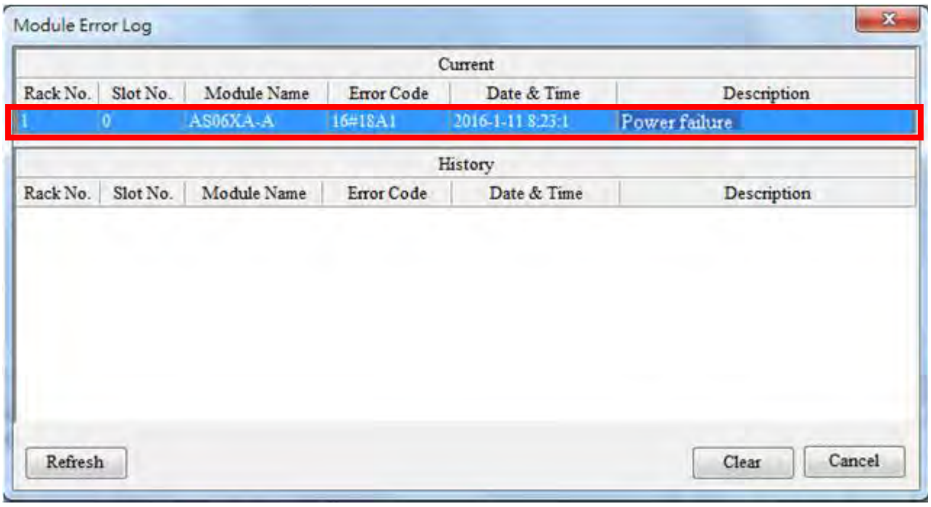
Click HWCONFIG in the window at the left side of the main screen of the software, and then click . The actual statuses of the modules are as follows.



Generally speaking, a hardware configuration error occurs if the BUS FAULT LED indicator on the CPU module is ON. Users can select 06XA, click the right mouse button, and select **Diagnosis**.



The information about the error is shown in the following picture.



Module Error Log

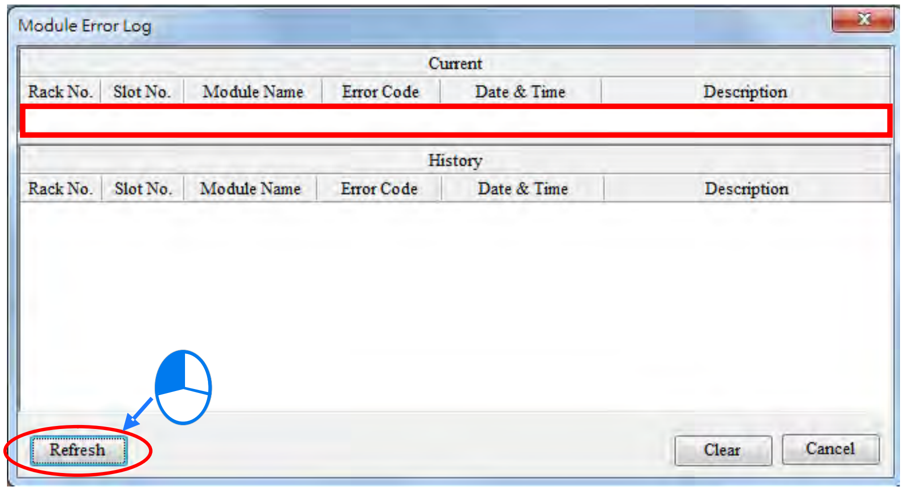
Current

Rack No.	Slot No.	Module Name	Error Code	Date & Time	Description
1	0	AS06XA-A	16#18A1	2016-1-11 8:23:1	Power failure

History

Rack No.	Slot No.	Module Name	Error Code	Date & Time	Description

As the picture above shows, the module is not supplied with power. Please turn on the power supply, and click **Refresh**. The system will check the status of the module again. In this example, the module has been supplied with power. Therefore, the system does not detect any error, and there is no error log in the **Current** box, as shown below. If the system detects a new error, the new error log appears in the **Current** box. Besides, the error log in the **History** box is cleared if users click **Clear**. However, due to the fact that the modules are designed differently, the error logs are not maintained in all modules. In other words, for some modules, there may be no error log in the **History** box.



Module Error Log

Current

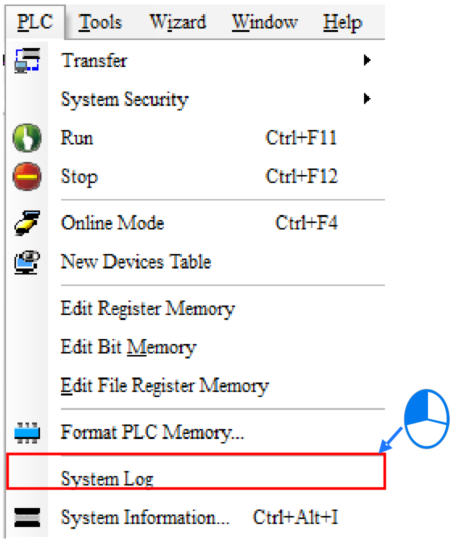
Rack No.	Slot No.	Module Name	Error Code	Date & Time	Description

History

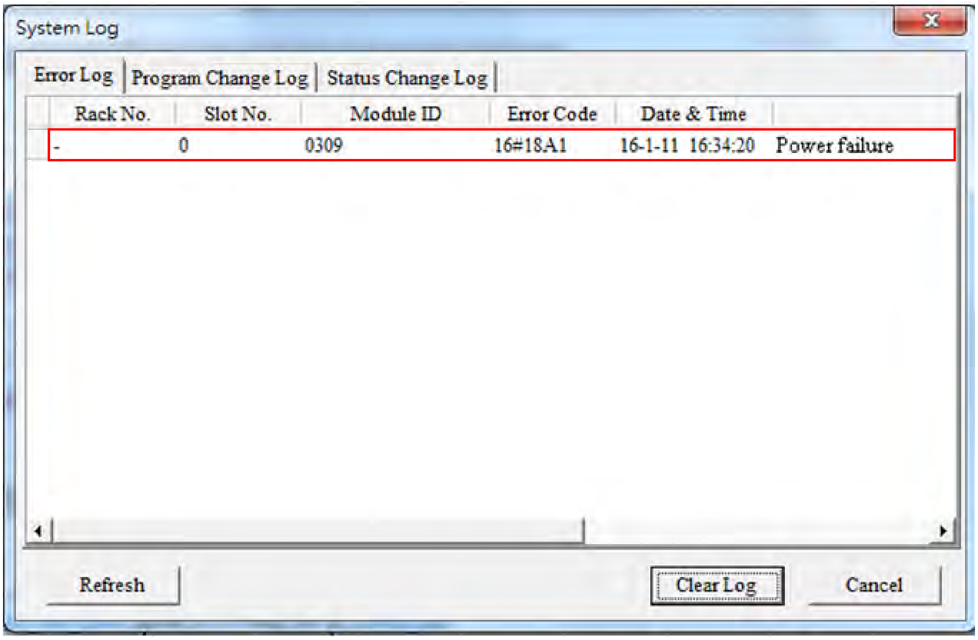
Rack No.	Slot No.	Module Name	Error Code	Date & Time	Description

Since no error occurs, users can close the **Module Error Log** window. Besides, users can find that the whole system returns to normal.

Close the **SPW-HWCONFIG** window, and return to the main screen of ISPSoft. Users can see the error log by selecting **PLC Error Log** on the **PLC** menu.



As the picture below shows, the power supply is abnormal, and an error occurs when the analog data is converted into the digital data.



Rack No.	Slot No.	Module ID	Error Code	Date & Time	
-	0	0309	16#18A1	16-1-11 16:34:20	Power failure

If users want to delete the old error log, they can click **Clear Log**. After closing the software, users complete the operation illustrated in this example.

MEMO