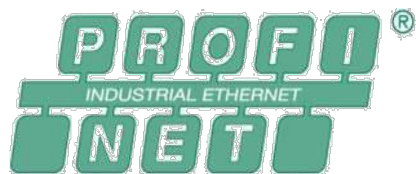


Compact67 I/O Module

----Profinet Manual



Elco (Tianjin) Electronics Co., Ltd.

11/2013
Version 1.0

Perface

1. Scope of application of this manual:

It's for ELCO Compact67 distributed I/O device with Profinet protocol. From the information in the manual, you can operate the Compact67 module on the Profinet bus as a distributed I/O device connection controller (PLC, DCS, etc.).

2. Basic knowledge required:

This manual assumes that you have a basic knowledge of electrical and automation engineering. This manual describes each component based on valid data at the time of release. New components and parameter adjustments are updated in the new manual.

3. Guide:

This manual describes the hardware and use of the Compact67 distributed I/O device under the Profinet protocol. Coverage includes:

- Installation and wiring
- Debugging and diagnosis
- Components
- Ordering data
- Technical parameters

4. Technical support:

This manual describes the product features and usage of the Compact67 distributed I/O device as fully as possible. If you have any questions or other questions about this product, please contact your local ELCO office or call the service hotline at 400-608-4005. You can also find more automation products on the ELCO website: <http://www.elco-holding.com.cn/>

5. Liability exemption:

We have checked the consistency of the content and hardware and software described in the manual. However, the possibility of deviation is not excluded, and the content cannot be guaranteed to be completely consistent with the hardware and software. The data parameters have been tested as required, and the necessary modifications will be improved in the new version.

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1. Product Overview

1.1 Definition

The Compact67 distributed I/O device is a compact Profinet IO device with IP67 protection.

1.2 Product Introduction

The standard Compact67 bus I/O provides a reliable, trusted solution for connecting field controllers and fieldbus I/O systems in harsh field environments.

The Compact67 module based on a 60mm wide IP67 enclosure allows for standardized installation and safe and reliable operation in harsh working environments where water, dust and vibration can occur. These features make them suitable for a wide range of applications, such as material handling systems, automated assembly systems, and more.

Other features include support for multiple signal inputs and outputs, and embedded high-brightness LED diagnostics to help maintainers easily determine I/O, module and network status.

1.3 Features

- Compact design saves space for installation of mechanical equipment
- Fast and reliable connector connection, MiniChange (7/8”), MicroChange (M12)
- Support multiple input and output of signals
- Configurable I/O combination
- LED status indication
- Online diagnosis of modules and channels

1.4 Product Model List

No.	Model	Description
1	FCPN-1600P-M12	16-point PNP input or passive contact Short circuit protection, diagnosis
2	FCPN-0808P-M12	8-point PNP input or passive contact 8-point active output Short circuit protection, diagnosis
3	FCPN-16UP-M12	16-point input and output, configurable Short circuit protection, diagnosis

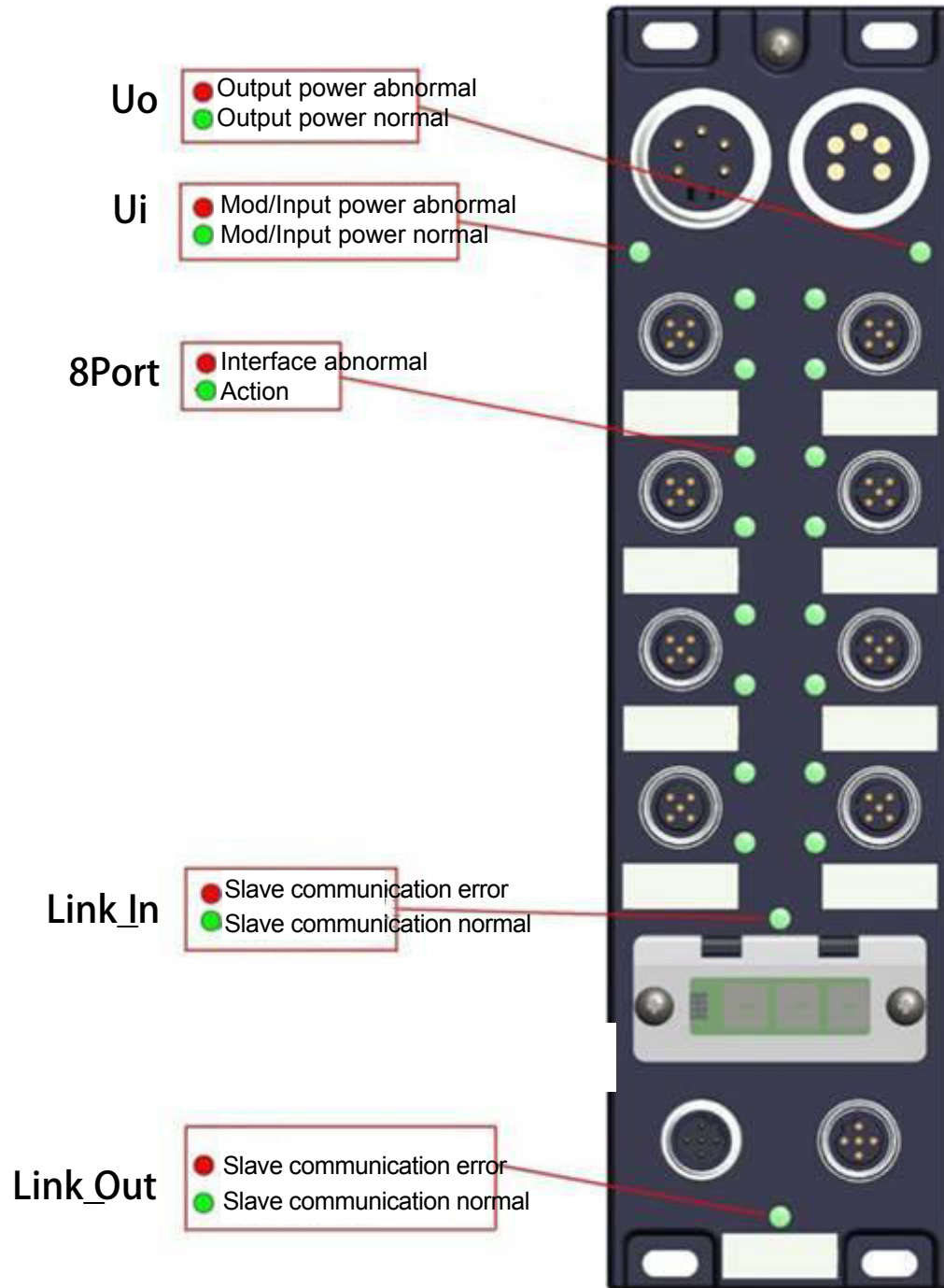
2. Technical Parameters

2.1 Hardware parameter

Item	FCPN-1600P-M12	FCPN-0808P-M12	FCPN-16UP-M12
Input points	16	8	User configuration
Output points	0	8	User configuration
Profinet bus input	D-Code M12 (Male)		
Profinet bus output	D-Code M12 (Female)		
I/O input and output	A-Code M12 (Female)		
Power input	7/8" (Male)		
Power output	7/8" (Female)		
Normal Mod/Input voltage	24VDC (18~30V)		
Normal Output voltage	24VDC (18~30V)		
Maximum output current	N/A	2A per channel, 8A modules in total	
Output short circuit current	N/A	20mA per channel	
Max. switching frequency	N/A	200Hz	
Out output voltage	N/A	Supply voltage -0.7V	
Output type	N/A	PNP	
Input signal "0"	Low level: 0~5V		
Input signal "1"	High level: 10~30V		
Input delay	0.5ms		
Input current	6.4mA		
Input supply current	Hold current 200mA, operating current 400mA		
Normal input voltage	24VDC (10~30V)		
Input type	PNP		
Address range	1~125		
Operating temperature	-25 °C ... 70 °C		
Storage temperature	-25 °C ... 90 °C		
Vibration resistance grade	In accordance with IE068-2-6		
Anti-interference EMC	EN 61000-6-2		
Protection level	IP67		
life span	100,000 hours		

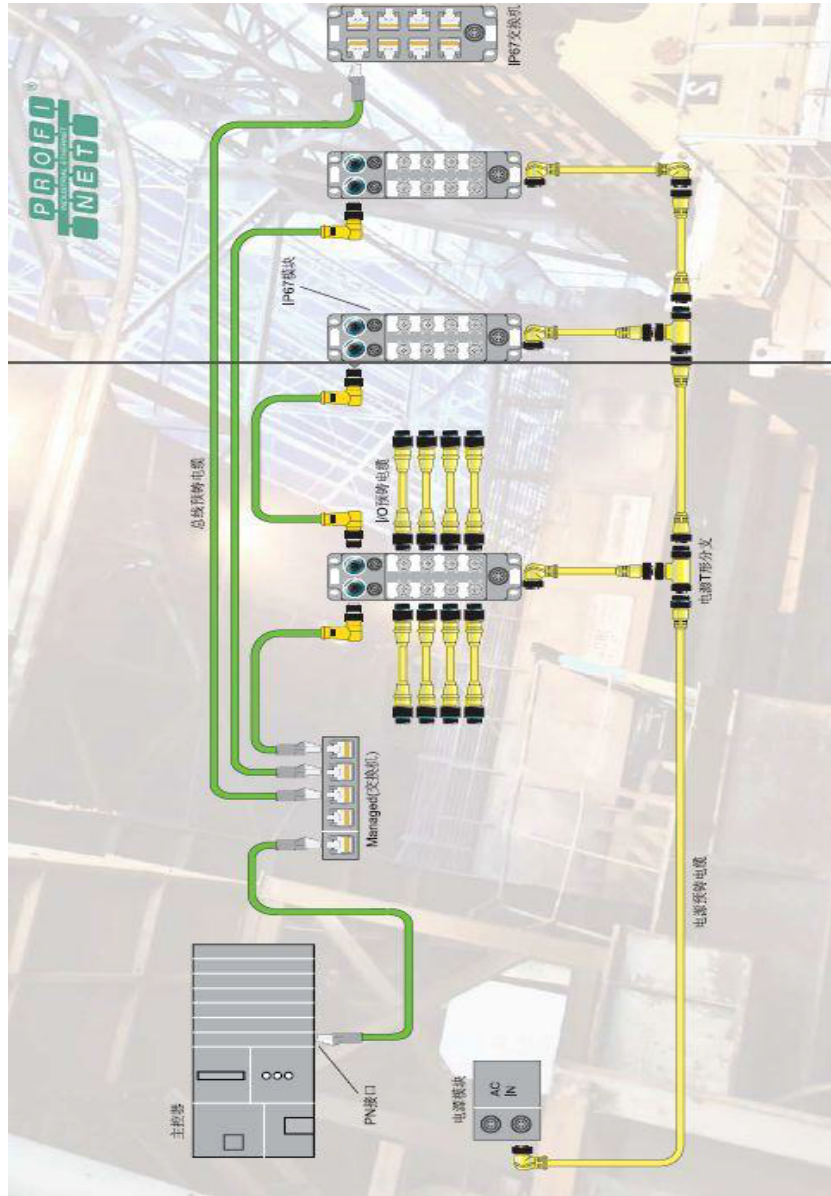
2.2 LED Indication Function

The operating status of the module can be indicated by the indicator that comes with the module.



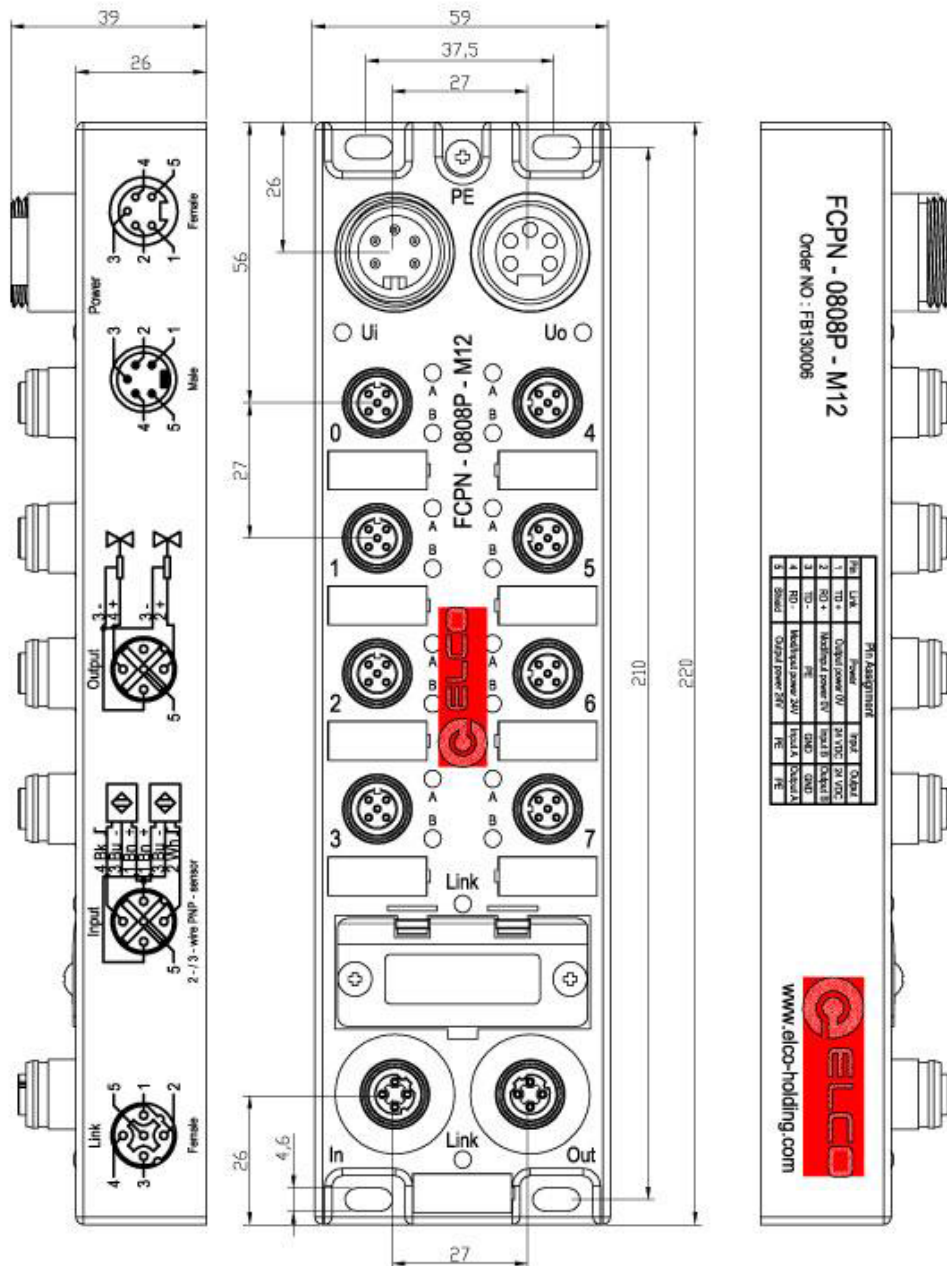
2.3 Conventional System Layout

The following figure shows the conventional Profinet system module connection by an example. The 24VDC power supply supplies three modules respectively. The Profinet network connects the modules through switches or cascades. The farther modules can also be extended by using more switches. Connection distance.



3. Installation wiring

3.1 Installation dimension drawing



3.2 Installation position and dimension

Thanks to the high degree of protection of IP67 and excellent resistance to vibration and interference, the Compact67 can be installed in almost any position. The Compact67 module has a uniform dimensions and the table below shows the module's mounting dimensions:

	Size
Mounting width	60mm
Installation height	220mm
Installation depth	39mm(No connector)

3.3 Set the Profinet IO device name

Each Profinet protocol Compact67 distributed I/O device is assigned a unique device ID (ie MAC address) at the factory, and each Compact67 device needs to be addressed based on the device name during configuration and in the user program. Therefore, you need to assign a device name to each I/O device before configuring the Compact67 module.

Profinet IO devices can be easily assigned information such as device names and IP addresses via Siemens Step7 software. Please follow these steps:

- 1) Provide power to the Compact67 device and place it in the same network as the configuration computer
- 2) In the HW Config of the Step7 software, select "PLC > Ethernet > Edit Ethernet Node"
- 3) In the pop-up window, click the "Browse.." button, select the Compact67 module to which the device name is to be assigned via the MAC address and confirm.



4) In the "Edit Ethernet Node" window, the assigned device name can be assigned to the Compact67 module via the "Assign Name" button.

5) The new IP address can also be assigned directly to the Compact67 module via the "Assign IP Configuration" button. (Assignment of the IP address can also be done during device configuration)

6) It is now possible to configure and debug the newly assigned device name as the identifier of the Compact67 module in the program.

Note: The MAC address of the Compact67 module is marked on the side of the module in the form of laser engraving or labeling. The device name of the Compact67 module will scroll through the LED display of the module (the newly assigned device name may need to be powered back on to display correctly) .



3.4 Compact67 wiring guide

Please connect according to the basic electrical specifications. For personal and equipment safety, we recommend disconnecting the power supply during the wiring operation.

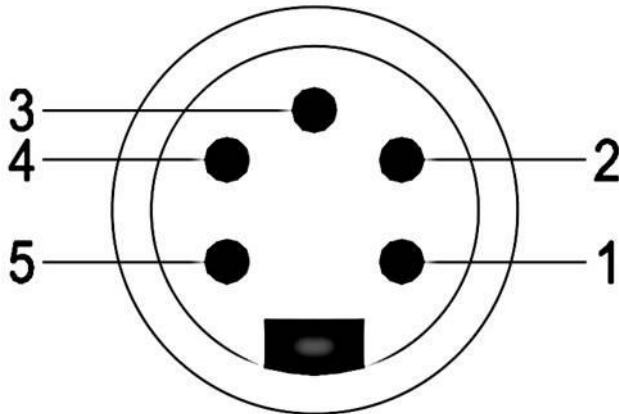
3.4.1 Compact67 Protective grounding (PE)

- A grounding screw PE is provided on the upper part of each module.
- Connecting the module to a protective ground can release the interference current to the ground and ensure module safety and EMC compatibility.
- Be sure to ensure a low impedance connection to the protective ground

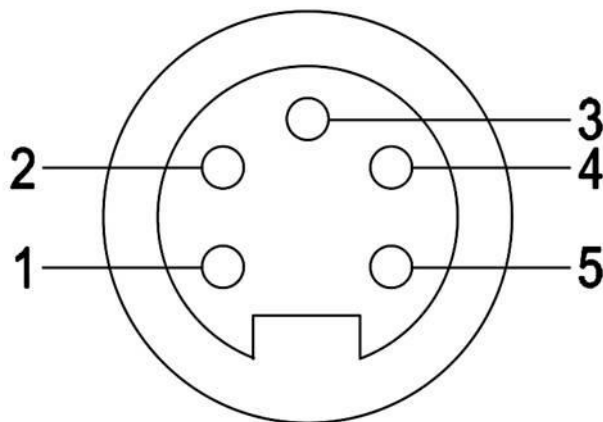
3.4.2 Compact67 power supply connection

All Compact67 modules are powered by standard 24VDC power supply with an input voltage range of 18~30VDC and are connected using standard 7/8" connectors. The power supply is divided into two parts: module and input signal power U_i (1L+, 1M), and output load power U_o (2L+, 2M). The positive poles of the two power sources are electrically isolated from 1L+ and 2L+, and the common points are internally connected between 1M and 2M.

1) Power access connector view (Male)



2) Power outlet connector view (Female)



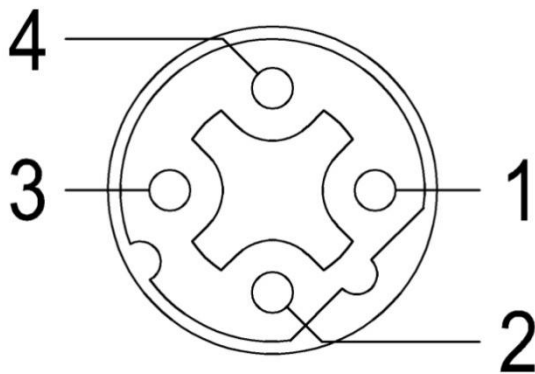
3) Power interface definition

Interface terminal number	Interface function	Voltage
1	Output load power supply 2M	0V
2	Module and input signal power supply 1M	0V
3	Protected ground PE	
4	Module and input signal power 1L+	24V
5	Output load power 2L+	24V

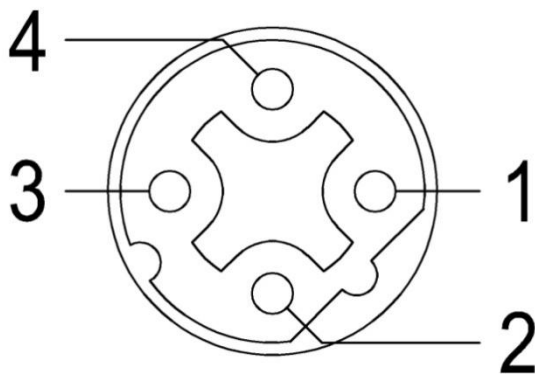
3.4.3 Compact67 bus cable connection

The Compact67 module supporting the Profinet protocol transmits signals via a standard shielded twisted pair Profinet cable and is connected using the D-Code type M12 connector.

1) Bus Access BUS In Connector View (Male)



2) BUS Out Connector View (Female)



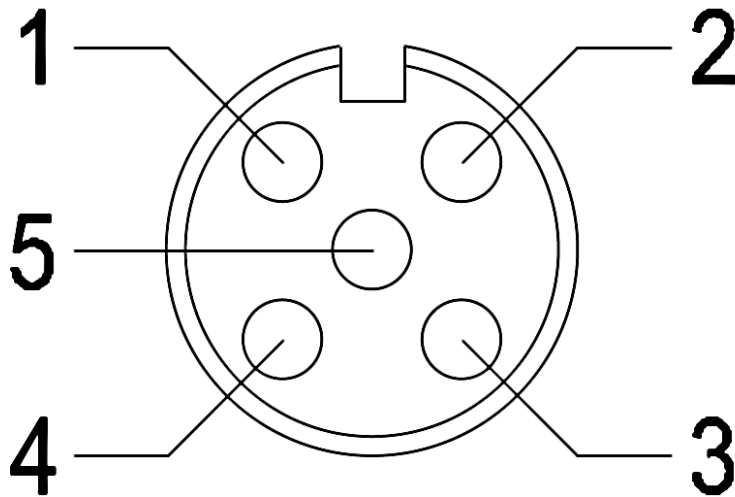
3) Bus interface definition

Interface terminal number	Interface function	Cable color
1	Emitter TD+	Yellow
2	Receiver RD+	White
3	Emitter TD-	Orange
4	Receiver RD-	Blue

3.4.4 Compact67 I/O cable connection

All Compact67 module I/O signals are connected via a standard 5-pin M12 connector with up to two signals (input or output) per port.

1) Signal Receiver I/O Connector View (Female)

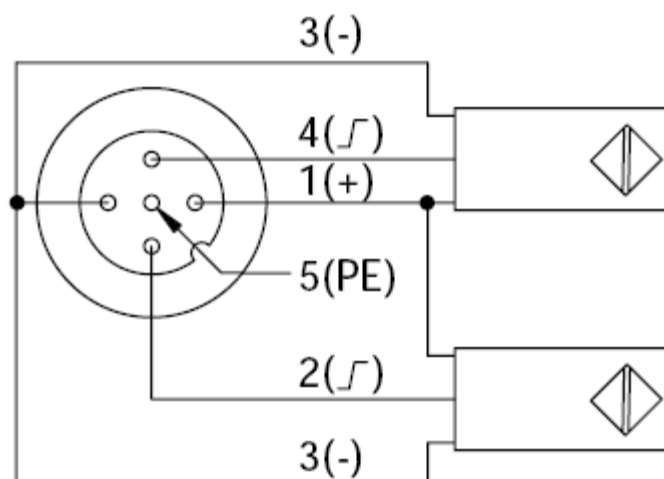


2) Bus interface definition

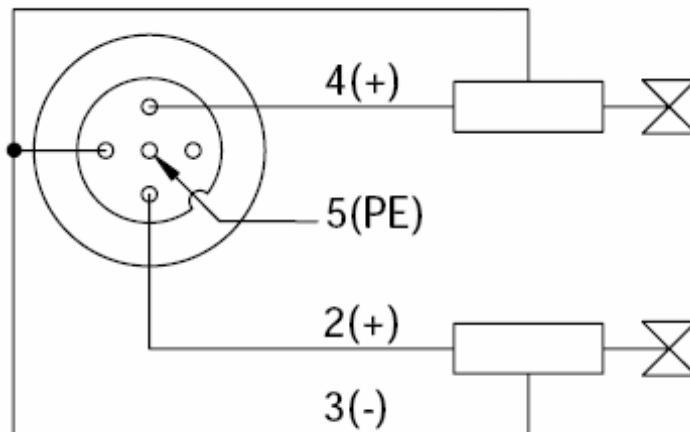
Interface terminal No.	Interface function	Remarks
1	Signal power supply 24V+	
2	Signal input B	Second signal
3	Signal power supply GND	
4	Signal input A	First signal
5	Shield grounding PE	

3) Wiring example

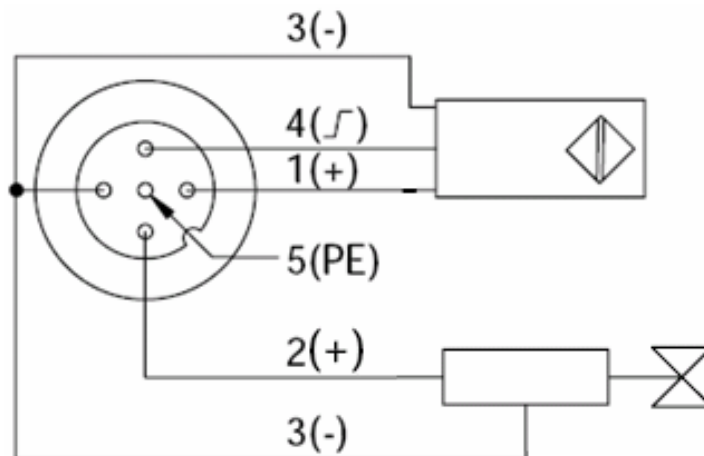
a) Dual input signal - that is, one connector is connected to two digital input signals. , FCPN-1600P-M12, FCPN-0808P-M12, FCPN-16UP-M12 support this type of connection.



b) Dual output signal - that is, 1 connector is connected to 2 digital output signals, FCPN-0808P-M12, FCPN-16UP-M12 support this form of connection.



c) Input and output signals - 1 connector for 1 digital input plus 1 digital output signal, FCPN-16UP-M12 supports this form of connection.



4. Configuration Commissioning

4.1 GSD file

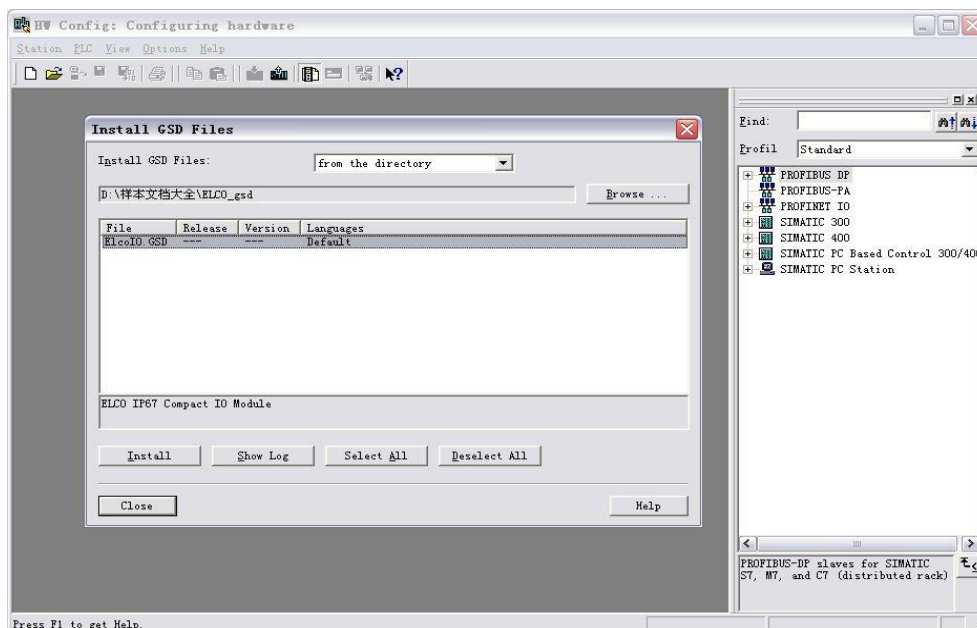
Using GSD files (XML format) to configure Compact67 distributed I/O devices, GSD files are used to integrate Compact67 into your system as a standard Profinet IO. You can visit ELCO's website to get the latest GSD files or call the customer service hotline to contact technicians.

Integrating GSD files into the system depends on the configuration software you use. In general, Step7 programming software of Siemens used in Profinet system integrates GSD files according to the following steps:

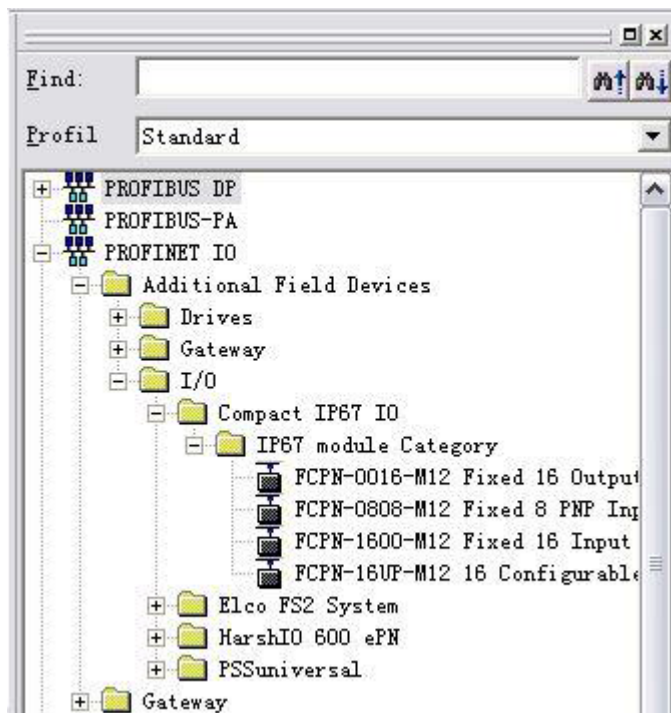
- 1) Run Step7, then select “Options>Install New GSD File” in HW Config.



- 2) On the next dialog box, select the GSD file to install, and confirm with “OK”.



3) Newly installed Compact67 module appears in the hardware catalog of the "Additional Field Devices > I/O > Compact IP67 IO > IP67 module Category" folder.



4) Users can configure Compact67 module in Step7 according to the actual situation.

4.2 Signal address assignment

Each Compact67 module has 8 connectors (Con0-Con7) for connecting signals, Each connector has five pins (Pin1-Pin5). The following table indicates the matchup between signal status and bytes transmitted of Profinet.

1) 16-bit input module FCPN-1600P-M12

Byte	Bit	Connector	e. g.
Input Byte 0	Bit 0	Con0.Pin4	I 0.0
	Bit 1	Con0.Pin2	I 0.1
	Bit 2	Con1.Pin4	I 0.2
	Bit 3	Con1.Pin2	I 0.3
	Bit 4	Con2.Pin4	I 0.4
	Bit 5	Con2.Pin2	I 0.5
	Bit 6	Con3.Pin4	I 0.6
	Bit 7	Con3.Pin2	I 0.7
Input Byte 1	Bit 0	Con4.Pin4	I 1.0
	Bit 1	Con4.Pin2	I 1.1
	Bit 2	Con5.Pin4	I 1.2
	Bit 3	Con5.Pin2	I 1.3
	Bit 4	Con6.Pin4	I 1.4
	Bit 5	Con6.Pin2	I 1.5
	Bit 6	Con7.Pin4	I 1.6
	Bit 7	Con7.Pin2	I 1.7

2) 8-bit input 8-bit output module FCPN-0808P-M12

Byte	Bit	Connector	e. g.
Input Byte 0	Bit 0	Con0.Pin4	I 0.0
	Bit 1	Con0.Pin2	I 0.1
	Bit 2	Con1.Pin4	I 0.2
	Bit 3	Con1.Pin2	I 0.3
	Bit 4	Con2.Pin4	I 0.4
	Bit 5	Con2.Pin2	I 0.5
	Bit 6	Con3.Pin4	I 0.6
	Bit 7	Con3.Pin2	I 0.7
Output Byte 0	Bit 0	Con4.Pin4	Q 0.0
	Bit 1	Con4.Pin2	Q 0.1
	Bit 2	Con5.Pin4	Q 0.2
	Bit 3	Con5.Pin2	Q 0.3
	Bit 4	Con6.Pin4	Q 0.4
	Bit 5	Con6.Pin2	Q 0.5
	Bit 6	Con7.Pin4	Q 0.6
	Bit 7	Con7.Pin2	Q 0.7

3) 16-bit input/output configurable module FCPN-16UP-M12

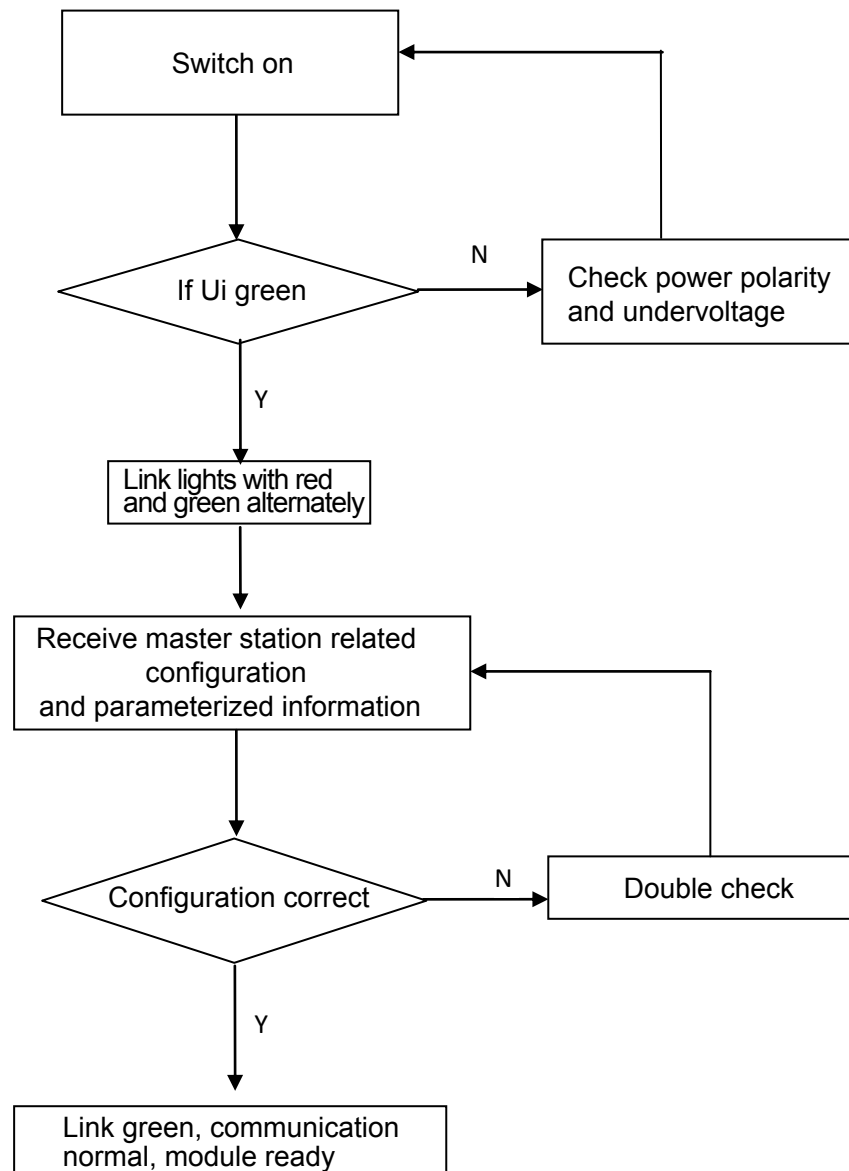
Byte	Bit	Connector	e. g.
Input/Output Byte 0	Bit 0	Con0.Pin4	I 0.0 Q 0.0
	Bit 1	Con0.Pin2	I 0.1 Q 0.1
	Bit 2	Con1.Pin4	I 0.2 Q 0.2
	Bit 3	Con1.Pin2	I 0.3 Q 0.3
	Bit 4	Con2.Pin4	I 0.4 Q 0.4
	Bit 5	Con2.Pin2	I 0.5 Q 0.5
	Bit 6	Con3.Pin4	I 0.6 Q 0.6
	Bit 7	Con3.Pin2	I 0.7 Q 0.7
Input/Output Byte 1	Bit 0	Con4.Pin4	I 1.0 Q 1.0
	Bit 1	Con4.Pin2	I 1.1 Q 1.1
	Bit 2	Con5.Pin4	I 1.2 Q 1.2
	Bit 3	Con5.Pin2	I 1.3 Q 1.3
	Bit 4	Con6.Pin4	I 1.4 Q 1.4
	Bit 5	Con6.Pin2	I 1.5 Q 1.5
	Bit 6	Con7.Pin4	I 1.6 Q 1.6
	Bit 7	Con7.Pin2	I 1.7 Q 1.7

4.3 Module Startup Process

Check whether the following requirements for startup Compact67 distributed I/O module system are met:

- Compact67 module is power, bus and signal wired.
- The device address of module is set by dial switch.
- Compact67 module is configured in software and downloaded into the controller.
- Supply voltage for controller is switched on.

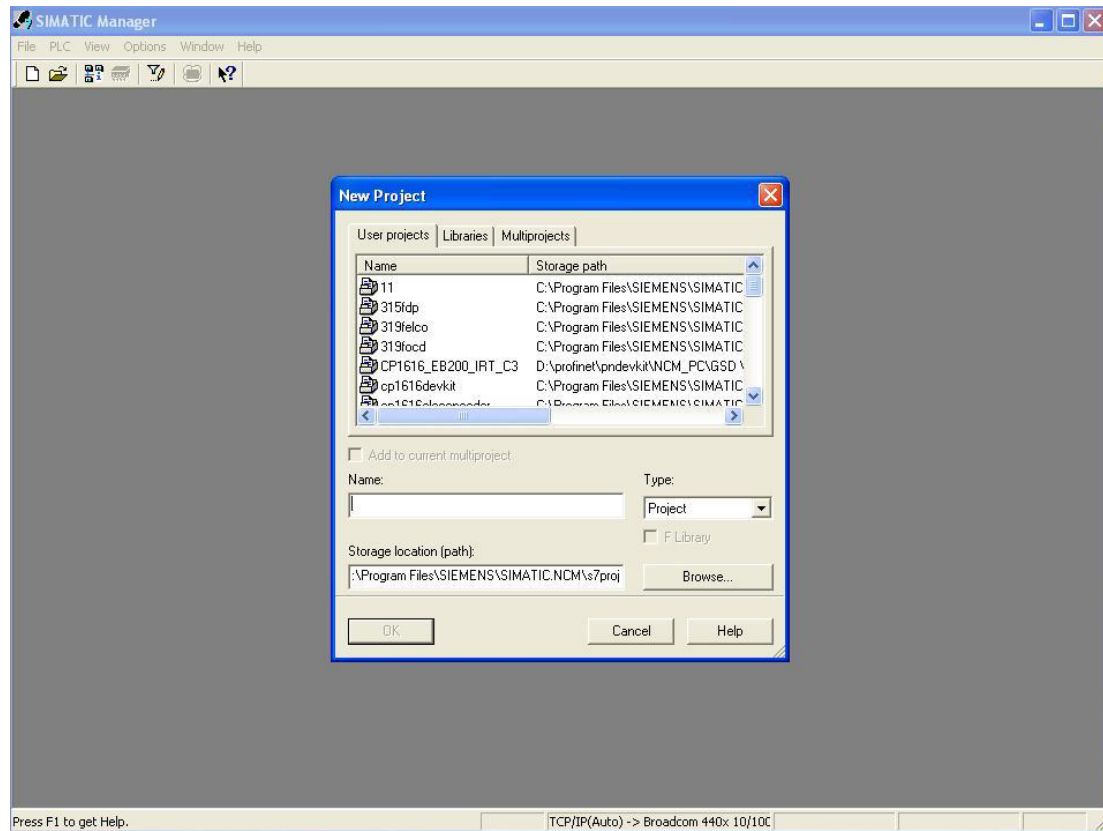
Startup of Compact67:



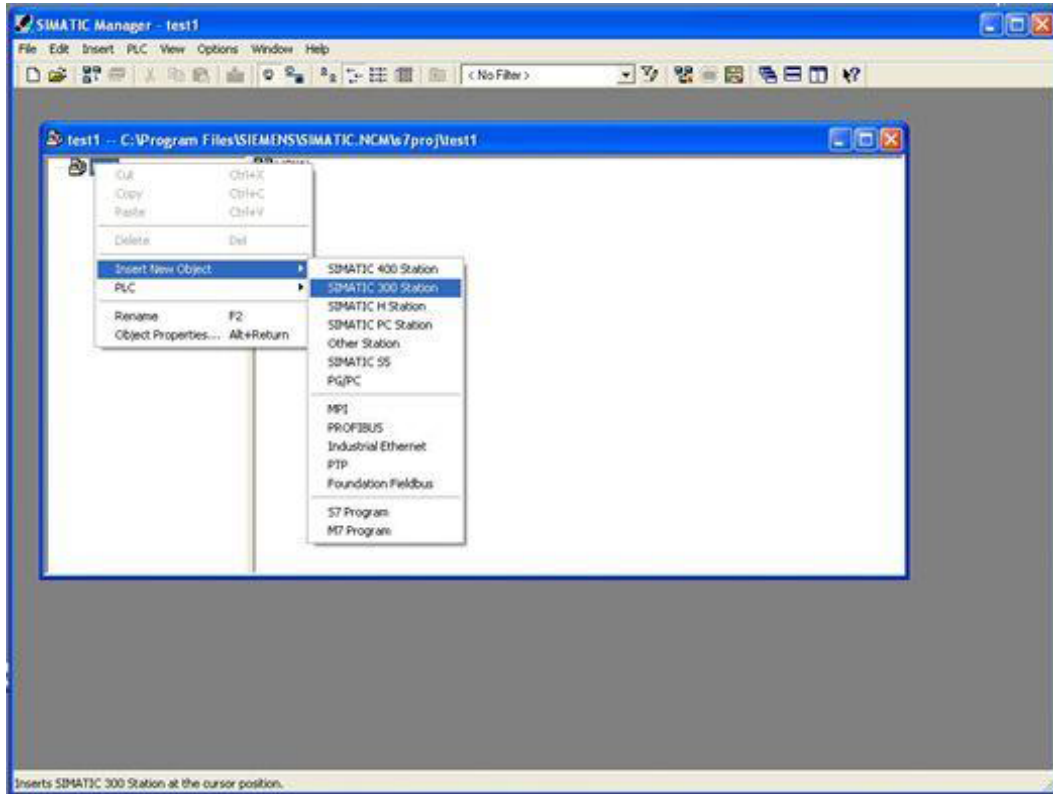
4.4 Module Configuration

This chapter makes users realize Compact67 distributed I/O module through configuration operation. In the example, ELCO FCPN-16UP-M12, as DP slave, connects Profinet controller CPU315-2PN/DP of Siemens. We assume that power and bus are wired. The device name of Compact67 module is set to elco67. We show the specific software configuration and debugging process in the form of pictures.

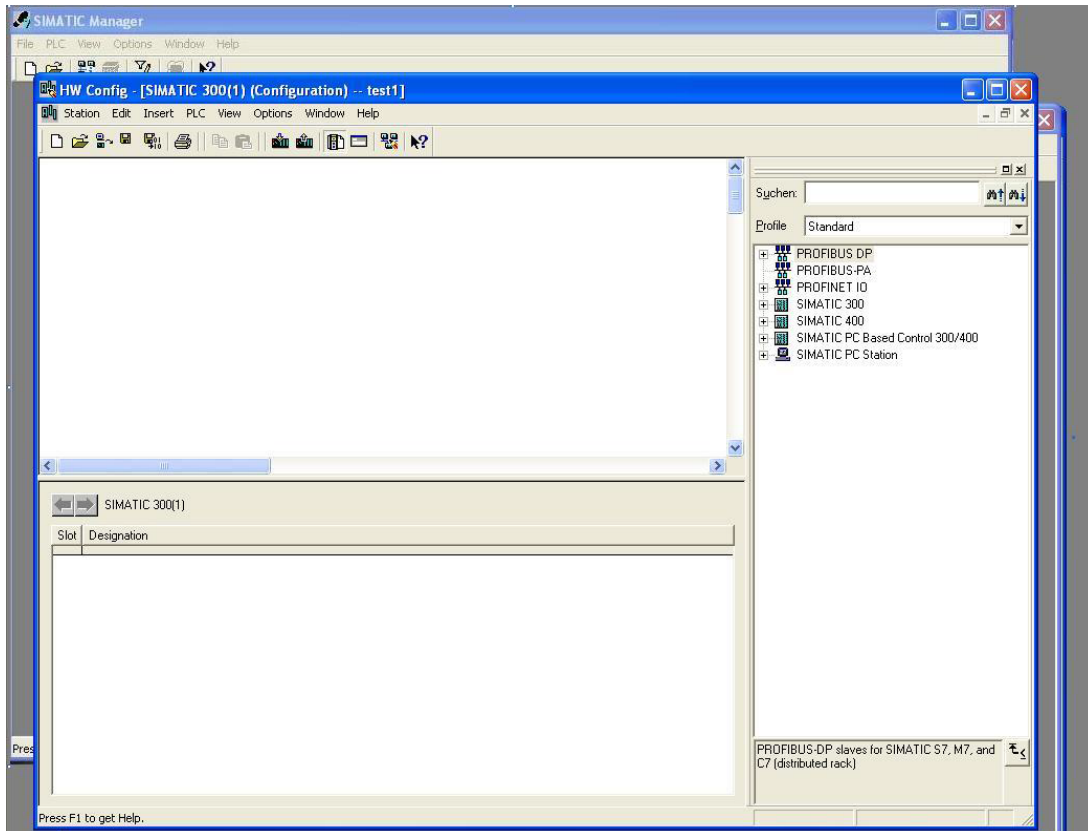
1) Create a new Step7 project



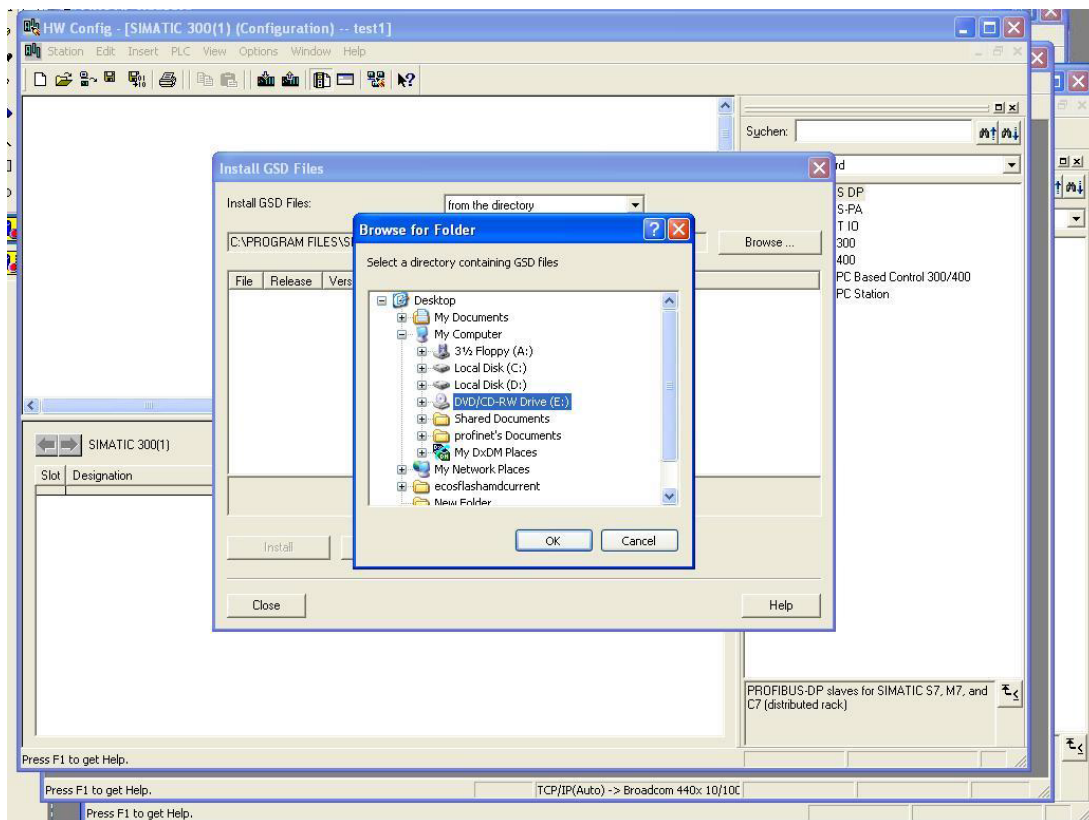
2) Insert a new SIMATIC 300 Station



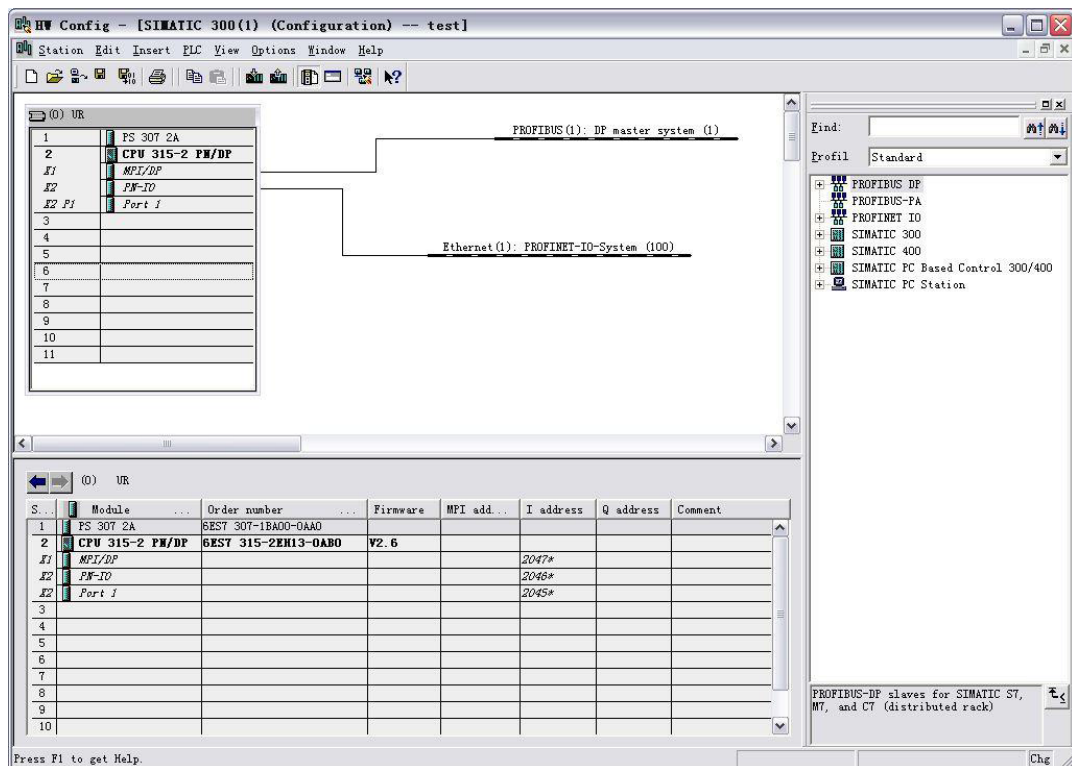
3) Double click “Hardware” button to start the hardware configuration tool.



4) Install the GSD files (XML format) according to section 4.1



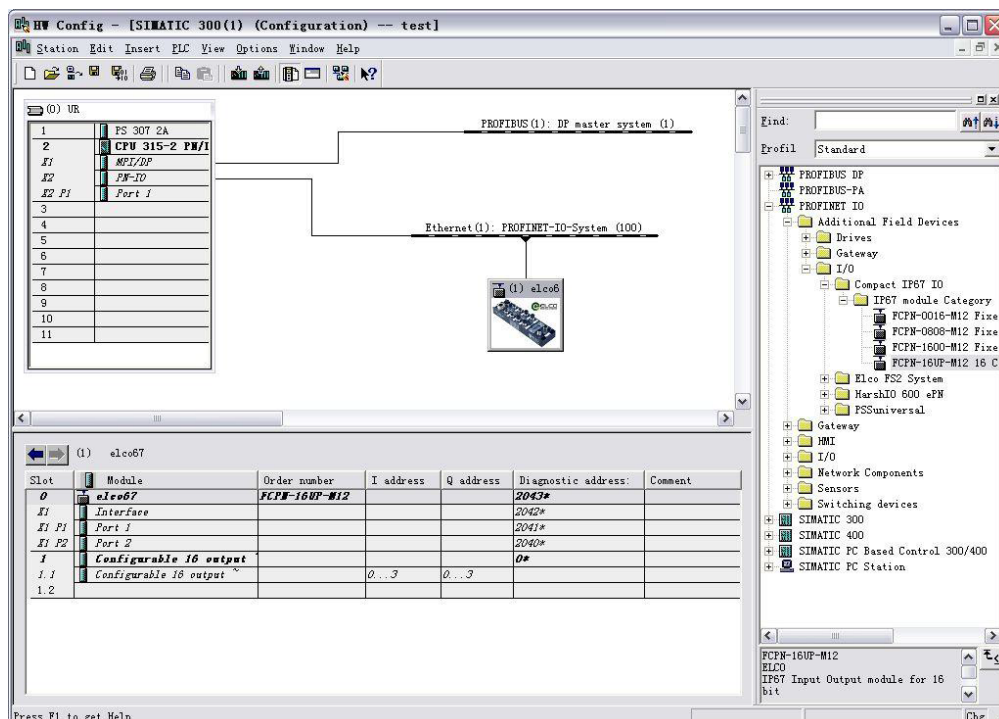
5) Change hardware configuration, select suitable slot, power and CPU in Catalog dialog box, and set CPU, bus, etc



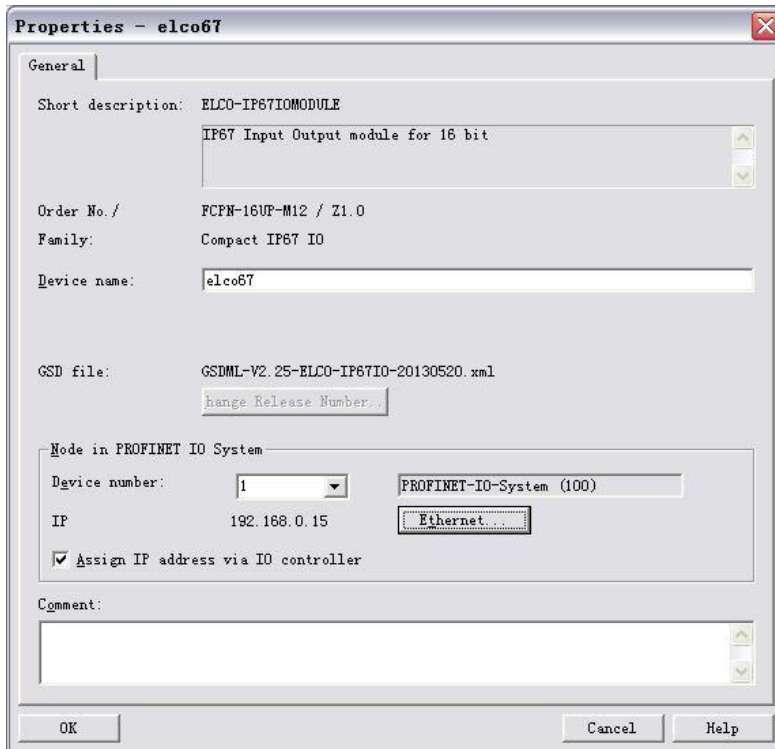
6) According to Section 3.3 user guide, select "PLC > Ethernet > Edit Ethernet Node", assign the Compact67 module the name of elco67 in the pop-up window .



7) In the Catalog window, the catalog of "Profinet IO>Additional Field Devices>I/O>Compact IP67 IO>IP67 module Category", select the "FCPN-16UP-M12" and add it to the PROFINET network. IO input and output addresses are assigned as required.



8) Double click on the newly added Compact67 module, fill in the previously setting device name elco67 in the pop-up "Properties" window, and assign IP address to this module via the "Ethernet.." button: 192.168.0.15. Be sure to click the option "Assign IP via IO controller" .



9) Save the compilation and download configuration to the PLC, until now the configuration is completed.

5. Alarm

5.1 LED display

Users can realize the status of module by LED display of Compact67 distributed I/O.

LED indication				Meaning	Solution
Ui	Uo	Link (In)	Link (Out)		
OFF	-	-	-	Wrong module power supply connection	Check module power supply
-	OFF	-	-	Wrong output auxiliary power supply connection	Check auxiliary power supply
Red	-	-	-	Power supply of module low than 18V	Replace module power supply
-	Red	-	-	Output auxiliary power supply low than 18V	Replace auxiliary power supply
-	-	Red	-	Bus inlet network connection failure	Check inlet Profinet cable
Green	Green	red and green alternately	-	The power supply is normal, the bus inlet network is connected, but the communication has not been established correctly.	Check Profinet device name and IP address assignment Check module configuration
-	-	-	Red	Bus outlet network connection failure	Check outlet Profinet cable
Green	Green	-	red and green alternately	The power supply is normal, the bus inlet network is connected, but the communication has not been established correctly.	Check Profinet device name and IP address assignment Check module configuration
Green	Green	Green	-	Module ready, exchange data through bus inlet	-
Green	Green	-	Green	Module ready, exchange data through bus outlet	-

5.2 Diagnostic information

Profinet supports integrated diagnosis concept, each individual error or some errors occurred at the same time are transferred from IO devices to the IO controller. The following steps can be carried out for the diagnosis: response to the error (for interrupt event-driven diagnosis and evaluation), check the current status of automation system (status-driven diagnosis). Users can access to SFB/SFC in Step7 to evaluate the diagnostic information:

1) Diagnosis with the SFB52 in the OB1

The diagnostic data record in the system offer a diagnostic capability with additional detailed information, and the system function block SFB52 ("RDREC") is used for reading these data records.

When called, the system function block addresses the diagnosed station ID and indicated the data record to be read as the INDEX parameters. If there is no diagnostic information, the system function block is executed without output. Because SFB52 is an asynchronously executed SFB, it can only be used in loop operations, not in diagnosing OB or interrupting OB. Except the exact location of the error, the SFB52 diagnostic data record also contains the type information of the error, which can be evaluated.

In MLEN, specify the maximum number of bytes to read, and the selected length of RECORD in the target area should be at least equal to the length of MLEN bytes. If the output parameter VALID is TRUE, it indicates that the data record has been successfully transferred to the target area RECORD. At this point, the output parameter LEN contains the length of the data obtained. The output parameter ERROR is used to indicate whether a data record transmission error has occurred, and if an error occurs, the output parameter STATUS contains error information.

2) Diagnosis with the SFB54 in the OB82

SFB54 ("RALARM") receives interrupt data and all corresponding information from peripheral modules or Profinet devices, and then the information is provided to the output parameters.

The information in the output parameter with additional detail contains the startup information of the called OB and the information of the interrupt source. To check for peripheral device interrupts, SFB54 can only be invoked in interrupt OB initiated by CPU operating system. Interrupting calls outside OB does not capture important information about diagnostic status. In TINFO and AIFO data caching, information such as station number, slot number, channel and error type can be quickly obtained.