AVCOMM 8000-PN Series
Industrial Managed Ethernet Switch
User Manual

AVCOMM Technologies Inc.

8008TX-PN
8008GX2-PN

User Manual

About This Manual

This user manual is intended to guide a professional installer to install and configure the switch. It includes procedures to assist you in avoiding unforeseen problems.

NOTE:

Only qualified and trained personnel should be involved with installation, inspection, and repairs of this switch.

Disclaimer

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Contents

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1. Overview

8000-PN series switch is a full Gigabit, DIN-Rail/wall mount type Ethernet switch, providing 8 Gigabit Ethernet ports to update the existing network to a full gigabit speed infrastructure. A full Gigabit network provides higher overall throughput than a legacy Fast Ethernet network and reduce the response time for timing sensitive applications that may mix of video, voice and data in its traffic pipe.

The PROFINET, which is the Ethernet, based automation standard of PROFIBUS International and covers all requirements of the automation technology is also implemented in 8000-PN series. The PROFINET overview and how to use 8000-PN series are in the following chapters.

2. PROFINET I/O Introduction

PROFINET is an industrial communication network based on Ethernet for all applications views from PROFIBUS International (PI). It covers the key markets and key technologies in automation both today and in the future. With PROFINET I/O implementation, production and process automation can be easily done. Besides, data exchanges on PROFINET I/O are done between I/O controller (PLC, etc.) and I/O devices (field devices).

2.1 Network Structure Overview

There are three major roles in PROFINET I/O network structure. They are I/O controller, I/O supervisor, and I/O devices. It follows the provider and consumer model for data exchange. The detail descriptions are below.
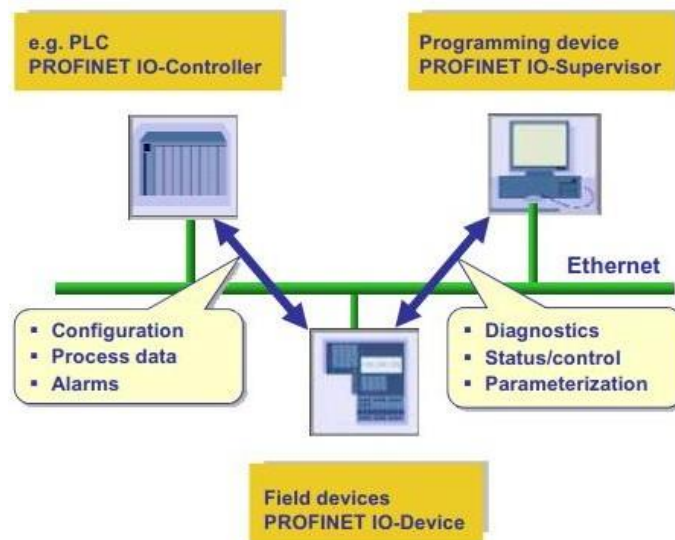
·I/O Controller

I/O Controller is a role to control the I/O device. In PROFINET I/O networking, it may exist exactone controller. However, it allows several controllers to implement system redundancy. The typical controller is the programmable logic controller (PLC) where the automation program runs.

·I/O Supervisor

I/O supervisor may be a programming device which control I/O controller, personal computer, or HMI device for commissioning or diagnostic use.

·I/O Device

I/O device is a distributed field device which connected to one or more I/O controllers via PROFINET I/O. It sends switch data to controller periodically by supported cycle time. 8008TX-PN acts as a PROFINET I/O device. It supports many useful attributes for I/O controller to configure or monitor. The detail attributes are described under GSD file and following subject.

2.2 Device Description–GSD

The GSD file (General Station Description) is an XML based description language for PROFINET I/O Device. It uses to describe the features and functions of the PROFINET device model. Before configuring an I/O controller, the configuration tool needs a GSDML file for each type of device on the network. Find

your GSD file in the CD before start to run PROFINET.
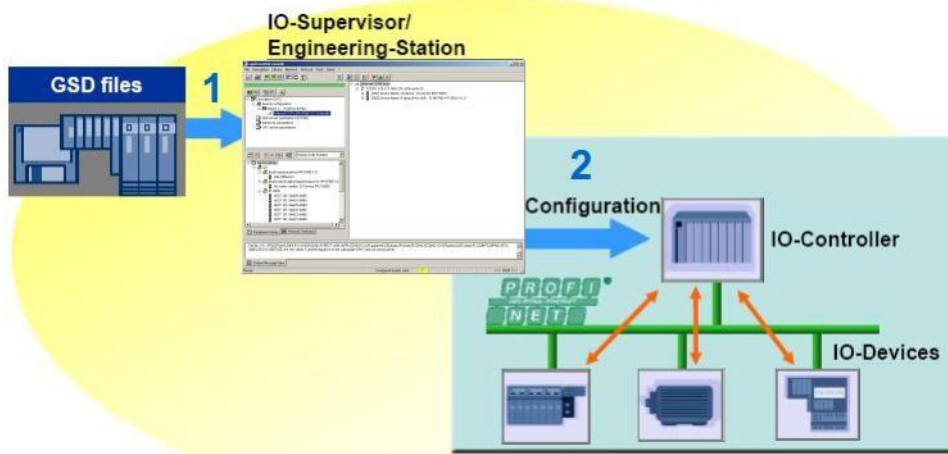

2.3 Media Redundancy—MRP

It introduces Media Redundancy Protocol (MRP) in PROFINET IO to prevent network broken caused by link loss or network device error. MRP is a special protocol for ring network setups. Ring networks are the preferred redundant network setups in the field area of Industrial Ethernet PROFINET networks. MRP guarantees quick network reconfiguration after the loss of a network link.

Within MRP, two device roles are defined: the Media Redundancy Manager (MRM) role, typically taken by either the IO-Controller or a switch in a ring, and the Media Redundancy Client (MRC) role, typically taken by PROFINET IO devices.

Both MRM and MRC have two designated ring ports. The links of these ring ports with other devices ring ports form the ring. See below figure.
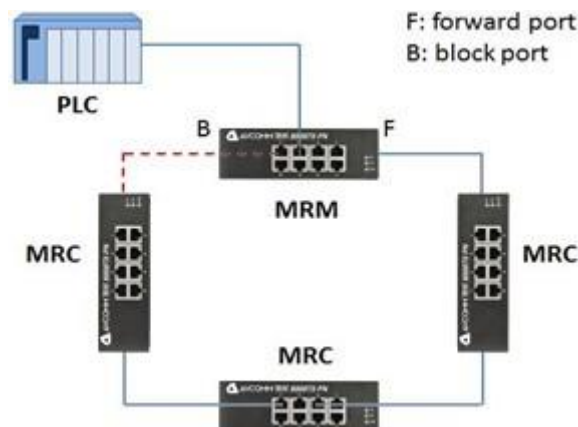
3. PROFINET I/O Command on Switch
3.1 Configuration

─ Enable PROFINET

No command. (PROFINET function always on)

─ Set PROFINET Name

configure terminal
profinet
devname <name>

Example:

```
8008TX-PN# configure terminal
8008TX-PN(config)# profinet
8008TX-PN (profinet-config)# devname IO-Device-01
IO-Device-01(profinet-config)#
```

2.4 Monitor (MRP, LLDP)

─ Device Name

show profinet name

Example:

```
8008TX-PN # show profinet name
Name of Station                            : 8008TX-PN
```

─ PROFINET Status

show profinet status

Example:

```
8008TX-PN # show profinet status
PROFINET    Status                         : Enable
```

─ MRP Status

show profinet mrp all
show profinet mrp group <1,2>

Example:

```
8008TX-PN # show profinet mrp all

MRP Group 1 Info:
=================================================
Role                                : Manager
Ring Port1                          : 1
Ring Port2                          : 2
Vlan                                 : 0
Manager Priority                    : 0xa000
Topology Change Interval            : 1
Topology Change Repeat Count        : 3
Short Test Interval                 : 10
Default Test Interval               : 20
Test Monitoring Count               : 3
Non Blocking MRC Supported           : 0
Test Monitoring Extended Count      : 25
React on Link Change                : 1
Check Media Redundancy              : 1
Domain Name                          : mrpdomain-1
Real Role State                     : 1
Real Ring State                     : 1
Ring Port1 PortState                : FORWARDING
Ring Port2 PortState                : BLOCKED
MRP Group 2 Info:
=================================================
Role                                : Client
Ring Port1                          : 3
Ring Port2                          : 4
Vlan                                : 0
Link Down Interval                  : 20
Link Up Interval                    : 20
Link Change Count                   : 4
Blocked State Supported             : 1
Domain Name                         : mrpdomain-2
Ring Port1 PortState                : FORWARDING
Ring Port2 PortState                : BLOCKED
```

```
8008TX-PN # show profinet mrp group 1


MRP Group 1:
Mode: Enable
Role: MRM
Node 1 : 1
Node 2 : 2
DomainName : mrpdomain-1
```

▬ LLDP Information

```
8008TX-PN # show lldp neighbors
Local Interface               : GigabitEthernet 1/2
----------------------------------------------------------------------------------------
Chassis ID                     : 00-05-65-72-E7-69
Port ID                        : port-001
Port Description               : port-001
System Name                    : 8008TX-PN
System Description             : 8 ports
System Capabilities           : Bridge(+)
Management Address             : 192.168.0.3 (IPv4)
Profinet - Port Status         : RT Class 2 Port Status - OFF
                                 RT Class 3 Port Status - OFF
Profinet - Chassis MAC        : Chassis MAC : 00-05-65-72-E7-69
IEEE 802.3 - MAC/PHY          : Port Auto Negotiation - Enable
                                     Port Auto Capability - 1000BASE-T full duplex mode
                                                        100BASE-TX full duplex mode
                                                        100BASE-TX half duplex mode
                                                         10BASE-T full duplex mode
                                                         10BASE-T half duplex mode
                                 Port MAU type - 1000BaseTFD
Profinet - Port Delay          : Port Rx Delay Local - 0 Port
                                 Rx Delay Remote - 0Port Tx
                                 Delay Local - 0 Port Tx
                                 Delay Remote - 0Port
                                 Cable Delay Local - 0
```

4. PROFINET I/O Attributes Support

4.1 Cyclic I/O Data (RTC)

8000-PN switch provides PROFINET I/O cyclic data which sends information between PROFINET switch and the controller periodically. The default transfer frequency of PROFINET cyclic data is 128 ms. There are 3 available values defined in GSD file: 128, 256, or 512 ms.

The following tables show 8000-PN switch which supports 5 RTC modules. The second byte for module 2 to 5 depends on the port count of device.

Slot1: Device Data

Category	Direction	Byte	Bit	Name	Description
Device	Input	0	0	Alarm Status	0 is No Alarm, 1 is Alarm happened.
			1	Power 1	0 is Fail, 1 is OK
			2	Power 2	0 is Fail, 1 is OK
			3	Ring	0 is disabled, 1 is enabled
			4	Ring Status	0 is Fail, 1 is Normal

Slot 2: Port Status

Category	Direction	Byte	Bit	Name	Description
Port Status	Input	0	0	Port 1 Connection	0 is not connected, 1 is connected
			1	Port 2 Connection	0 is not connected, 1 is connected
			2	Port 3 Connection	0 is not connected, 1 is connected
			3	Port 4 Connection	0 is not connected, 1 is connected
			4	Port 5 Connection	0 is not connected, 1 is connected
			5	Port 6 Connection	0 is not connected, 1 is connected
			6	Port 7 Connection	0 is not connected, 1 is connected
			7	Port 8 Connection	0 is not connected, 1 is connected
		1	0	Port 9 Connection	0 is not connected, 1 is connected
			1	Port 10 Connection	0 is not connected, 1 is connected
			2	Port 11 Connection	0 is not connected, 1 is connected
			3	Port 12 Connection	0 is not connected, 1 is connected
			4	Port 13 Connection	0 is not connected, 1 is connected
			5	Port 14 Connection	0 is not connected, 1 is connected

Slot 3: Port Alarm Setting

Category	Direction	Byte	Bit	Name	Description
Port Setting	Input Output	0	0	Port 1 Alarm	0 is not send Alarm, 1 is send Alarm
			1	Port 2 Alarm	0 is not send Alarm, 1 is send Alarm
			2	Port 3 Alarm	0 is not send Alarm, 1 is send Alarm
			3	Port 4 Alarm	0 is not send Alarm, 1 is send Alarm
			4	Port 5 Alarm	0 is not send Alarm, 1 is send Alarm
			5	Port 6 Alarm	0 is not send Alarm, 1 is send Alarm
			6	Port 7 Alarm	0 is not send Alarm, 1 is send Alarm
			7	Port 8 Alarm	0 is not send Alarm, 1 is send Alarm
		1	0	Port 9 Alarm	0 is not send Alarm, 1 is send Alarm
			1	Port 10 Alarm	0 is not send Alarm, 1 is send Alarm
			2	Port 11 Alarm	0 is not send Alarm, 1 is send Alarm
			3	Port 12 Alarm	0 is not send Alarm, 1 is send Alarm
			4	Port 13 Alarm	0 is not send Alarm, 1 is send Alarm
			5	Port 14 Alarm	0 is not send Alarm, 1 is send Alarm

Slot 4: MRP Group1

Category	Direction	Byte	Bit	Name	Description
MRP Group1	Input	0	0	MRP Group1 Mode	0 is Disable MRP, 1 is Enable MRP
			1	MRP Group1 Role	0 is MRC, 1 is MRM
MRP Group1 Port	Input	1	0	Port1 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			1	Port2 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			2	Port3 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			3	Port4 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			4	Port5 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			5	Port6 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			6	Port7 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			7	Port8 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
		2	0	Port9 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			1	Port10 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			2	Port11 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			3	Port12 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			4	Port13 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port
			5	Port14 is MRP-G1 Ring port	0 is not Ring port, 1 is Ring port

Slot 5: MRP Group2

Category	Direction	Byte	Bit	Name	Description
MRP Group2	Input	0	0	MRP Group2 Mode	0 is Disable MRP, 1 is Enable MRP
			1	MRP Group2 Role	0 is MRC, 1 is MRM
MRP Group2 Port	Input	1	0	Port1 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			1	Port2 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			2	Port3 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			3	Port4 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			4	Port5 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			5	Port6 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			6	Port7 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			7	Port8 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
		2	0	Port9 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			1	Port10 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			2	Port11 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			3	Port12 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			4	Port13 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port
			5	Port14 is MRP-G2 Ring port	0 is not Ring port, 1 is Ring port

4.2 Acyclic I/O Data (RTA)

8000-PN switch also provides PROFINET I/O acyclic data for more flexible settings and monitoring. Thus, it allows to read or to write the supported attributes. It uses PROFINET acyclic data to achieve communication in the network. For writable attributes, a controller, like SIMATIC STEP 7 tool, or engineering deployment software needed to edit it. The following tables show 8000-PN switch which supports 4 RTA modules.

ro: Ready Only
rw: Read and Write

System Data (Slot 0x0, Subslot 0x1, Index 0x1)

Byte	Name	Access	Value	Description
0	Device Status	ro	0	Unavailable (Do not support)
			1	OK (default)
			2	Device bootup fails
1	Alarm Status	ro	0	Unavailable (Do not support)
			1	No Alarm(default)
			2	Alarm happened
2	Power 1 Status	ro	0	Unavailable (Do not support)
			1	OK
			2	Power 1 fails

3	Power 2 Status	ro	0	Unavailable (Do not support)	
			1	OK	
			2	Power 2 fails	
4	Redundant Mode	ro	0	MRP	
			1	RSTP/MSTP	
			2	Ring/Coupling/Dual Homing/Chain/Balancing Chain	
			3	No Redundant	
5	Ring-1 Mode (config value)	ro	0	Unavailable (Do not support)	
			1	Enabled	
			2	Disabled	
6	Ring-1 Role	ro	0	Unavailable (Do not support)	
			1	Ring Master	
			2	Ring Slave	
7	Ring-1 State	ro	0	Unavailable (Do not support)	
			1	Disabled	
			2	Normal	
			3	Fail	
8	Ring-2 Mode (config value)	ro	0	Unavailable (Do not support)	
			1	Enabled	
			2	Disabled	
9	Ring-2 Role	ro	0	Unavailable (Do not support)	
			1	Ring Master	
			2	Ring Slave	
			3	Coupling Primary	
			4	Coupling Backup	
			5	Dual Homing	
10	Ring-2 State	ro	0	Unavailable (Do not support)	
			1	Disabled	
			2	Normal	
			3	Fail	
11	Ring-3 Mode (config value)	ro	0	Unavailable (Do not support)	
			1	Enabled	
			2	Disabled	
12	Ring-3 Role	ro	0	Unavailable (Do not support)	
			1	Chain Head	
			2	Chain Tail	
			3	Chain Member	

			4	Balancing Chain Terminal 1
			5	Balancing Chain Terminal 2
			6	Balancing Chain Central Block
			7	Balancing Chain Member
13	Ring-3 State	ro	0	Unavailable (Do not support)
			1	Disabled
			2	Normal
			3	Fail

Port Data (Slot 0x0, Subslot 0x8001~0x800e, Index 0x1)

Byte	Name	Access	Value	Description
0	Port Alarm	ro	0	Do not send alarm
			1	Send alarm when port link down
1	Port Admin State	ro	0	Unavailable (Do not support)
			1	Off
			2	On
2	Port Link State	ro	0	Unavailable (Do not support)
			1	Link is up
			2	Link is down
3	Port Speed	ro	0	Unavailable (Link down show Unavailable)
			1	10 Mbps
			2	100 Mbps
			3	1G bps
4	Port Duplex	ro	0	Unavailable (Link down show Unavailable)
			1	Half
			2	Full
5	Port Auto-negotiation	ro	0	Unavailable (Do not support)
			1	Off
			2	On

MRP Group 1 (Slot 0x0, Subslot 0x1, Index 0x3)

Byte	Name	Access	Value	Description
0	MRP Mode	rw	0	Disable MRP (Default)
			1	Enable MRP
1	MRP Role	rw	0	MRC (Default)
			1	MRM

Byte	Name	Access	Value	Description
2	Ring Port1 of MRP	rw	0~13	Port ID of Ring port1, 0 is Default value. (0 is meaning port1, 1 is meaning port2 ...etc,)
3	Ring Port2 of MRP	rw	0~13	Port ID of Ring port1, 1 is Default value. (0 is meaning port1, 1 is meaning port2 ...etc,)

MRP Group 2 (Slot 0x0, Subslot 0x1, Index 0x3)

Byte	Name	Access	Value	Description
0	MRP Mode	rw	0	Disable MRP (Default)
			1	Enable MRP
1	MRP Role	rw	0	MRC (Default)
			1	MRM
2	Ring Port1 of MRP	rw	0~13	Port ID of Ring port1, 2 is Default value. (0 is meaning port1, 1 is meaning port2 ...etc,)
3	Ring Port2 of MRP	rw	0~13	Port ID of Ring port1, 3 is Default value. (0 is meaning port1, 1 is meaning port2 ...etc,)

5. Integration in I/O Controller (Use Simatic S7)
5.1 Operation Procedure
This chapter shows how to use 8000-PN switch in a PROFINET network. At first, it needs an I/O controller in the network and integrates the I/O device into the controller. The following steps show the integration procedures.

1. Create a new project for PROFINET I/O in S7.
Create a deploying environment to start PROFINET network building.
2. Install a GSD file into the Controller.
GSD file describes the features of the PROFINET device model.
Get the corresponding GSD file from manufacturer.
3. Configure I/O device parameters.
Parameters can be configured including IP address, Name, port alarm, MRP group, etc.
4. Compile and load the project.
Load the project into the PLC to start PROFINET operation.
5. Monitor the I/O Switch from the controller.
Use SETP 7 to monitor I/O device's attributes.

5.2 Create a new project for PROFINET I/O in S7
After installed SIMATIC Step 7 software in a PC, open the management interface.
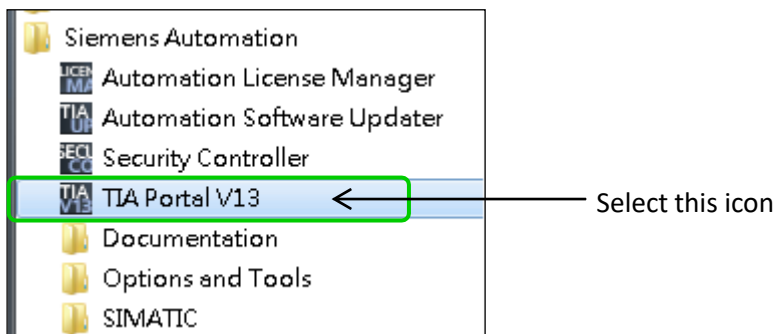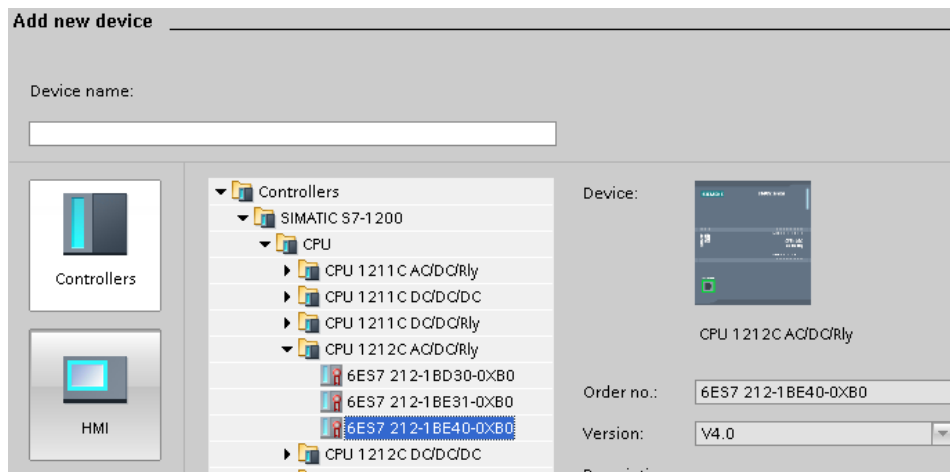
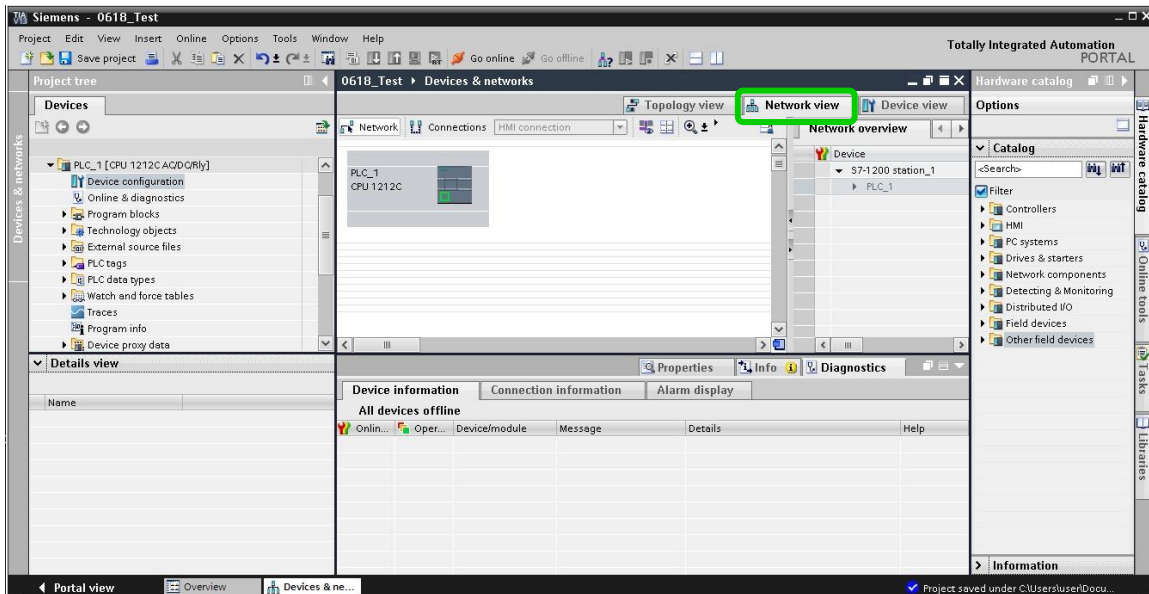Create a new project, and name your new project name, ex: 0618_Test.
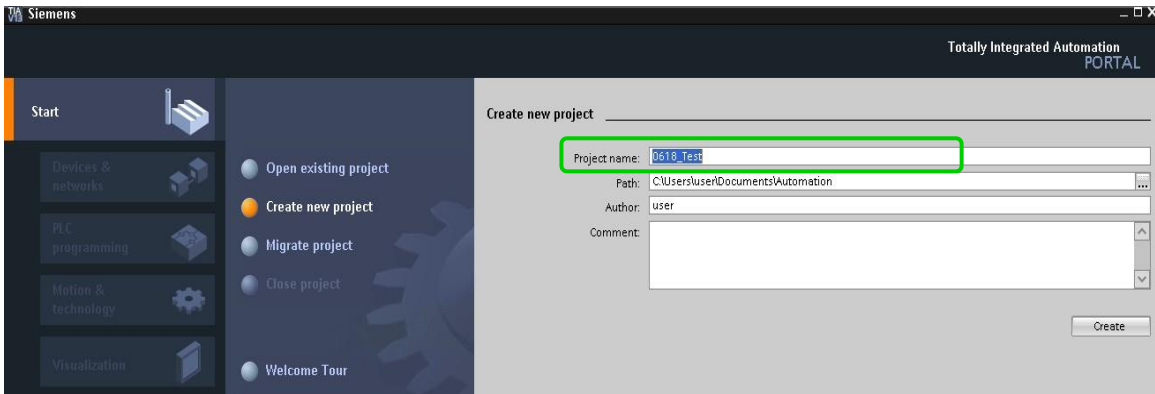
After new project created, configure the test device. (I/O Controller)
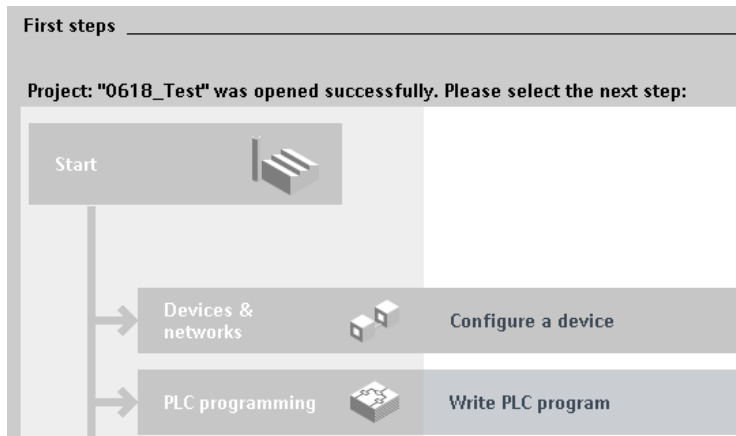
Select the type of used I/O Controller. (ex: 6ES7 212-1BE40-0XB0)

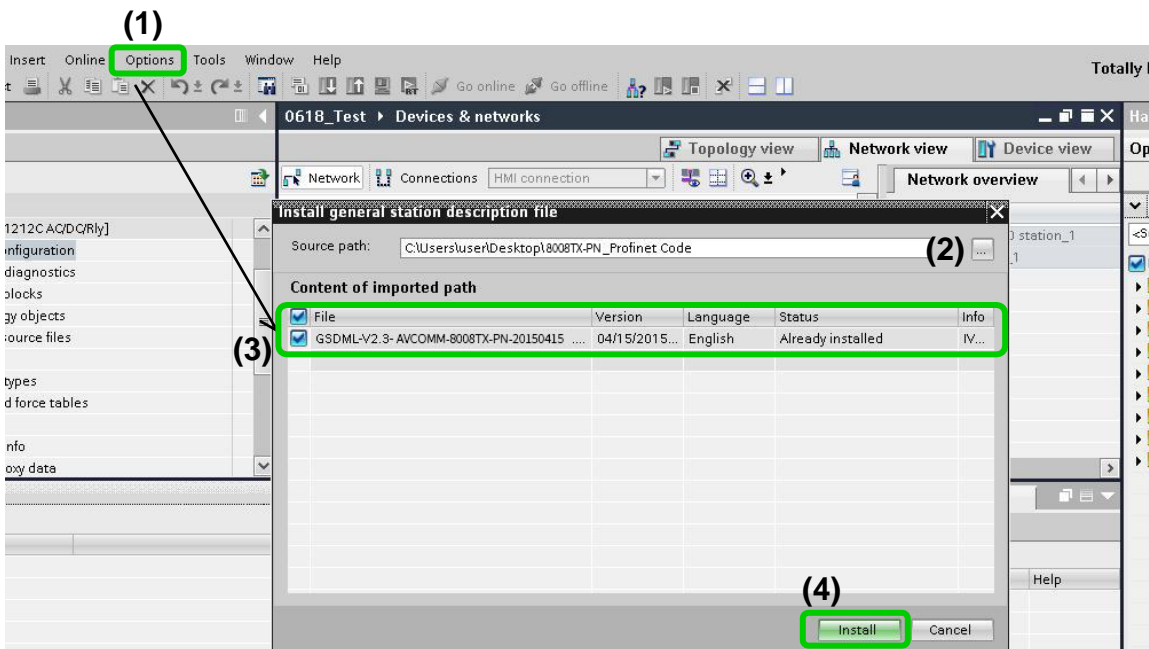After selected the corresponding controller, the figure is shown in "network view" sheet.

5.3 Install a GSD File

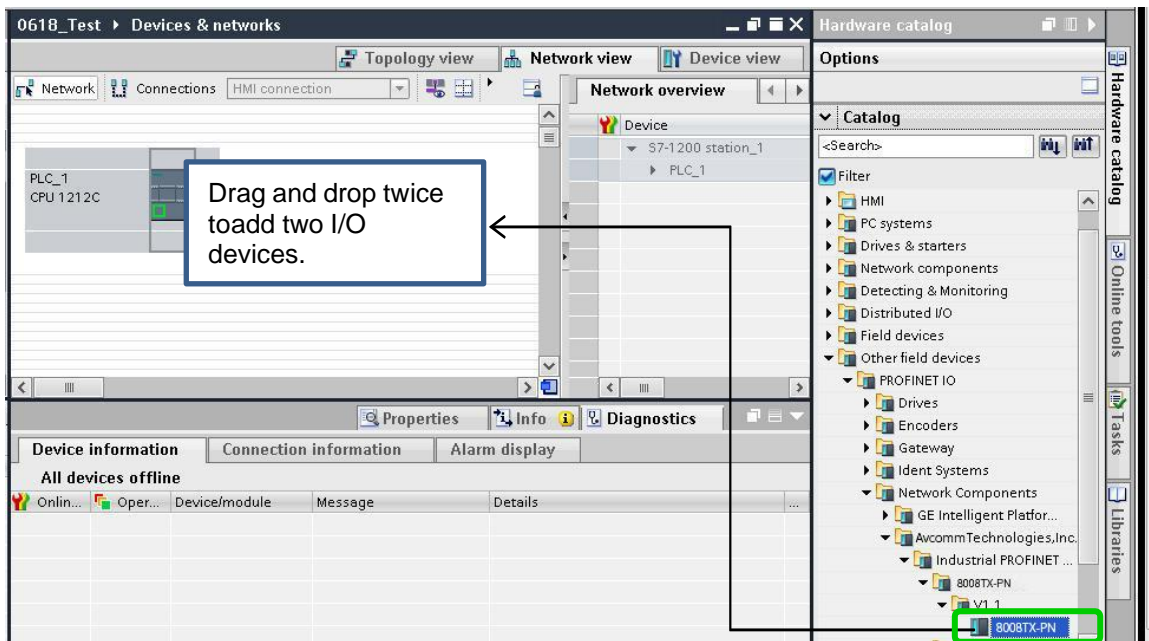➢ Load and install the I/O device's GSD file into controller.

(Device icon and its GSD file should put into the same directory, then the device icon will be displayed in STEP7 after install GSD file)

→Options/Install GSD/Select a GSD file

➢ Add I/O device onto the management interface.

→ Other field devices/ PROFINET IO/ Network Components /AVCOMM ... / 8008TX-PN

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Drag and drop twice to add two I/O devices.

> Connect lines between PLC and I/O Devices. It also can modify I/O Device Name.
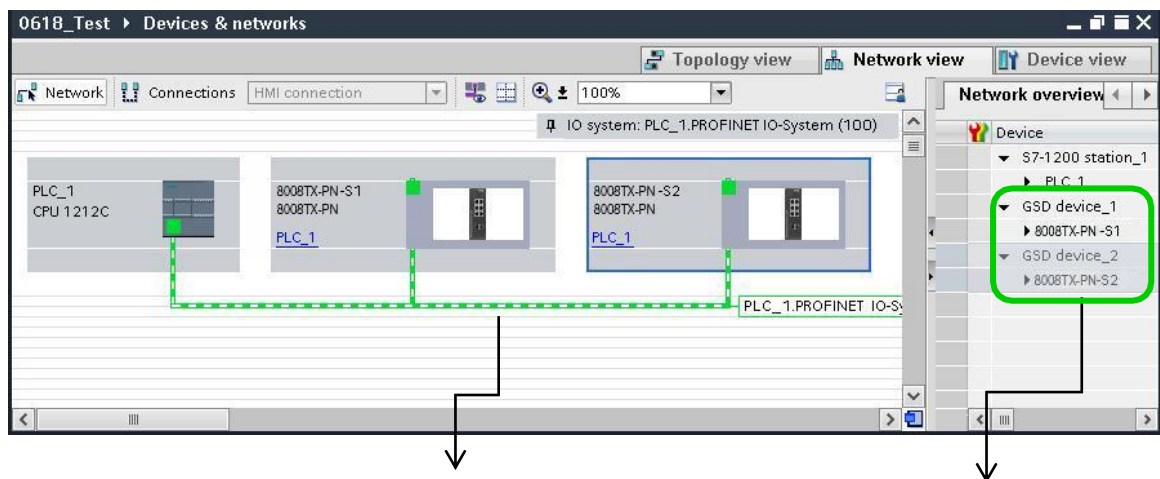
Drag lines between PLC_1←→I/O Device1,   Modify name available

PLC_1 ←→I/O Device2,

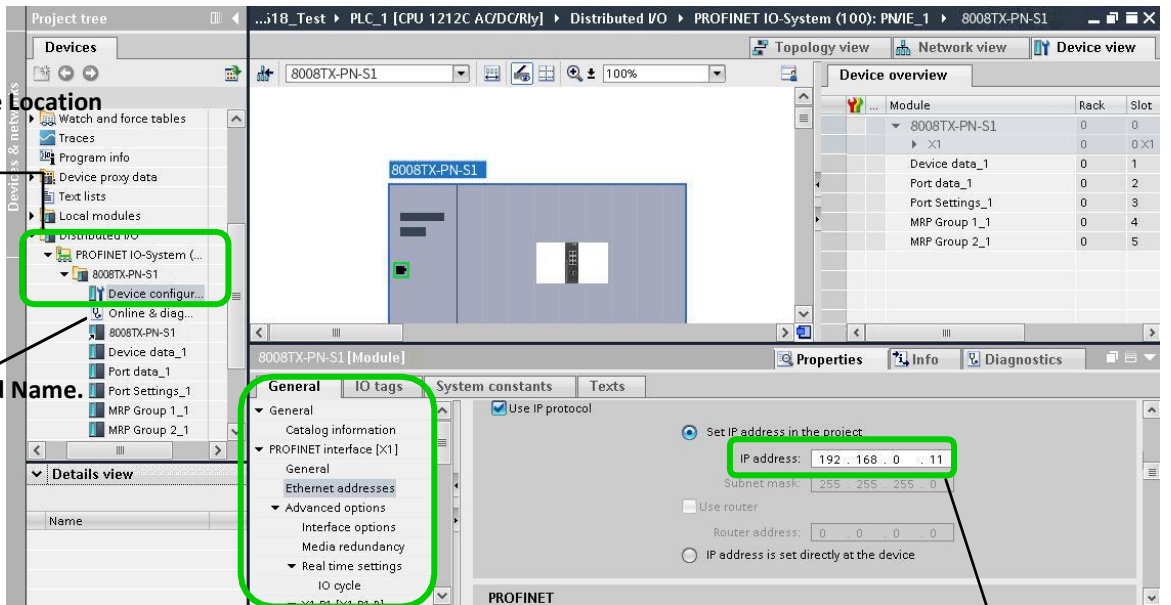> ➢ Pre-Compile the project, then download to PLC.

Compile   Download
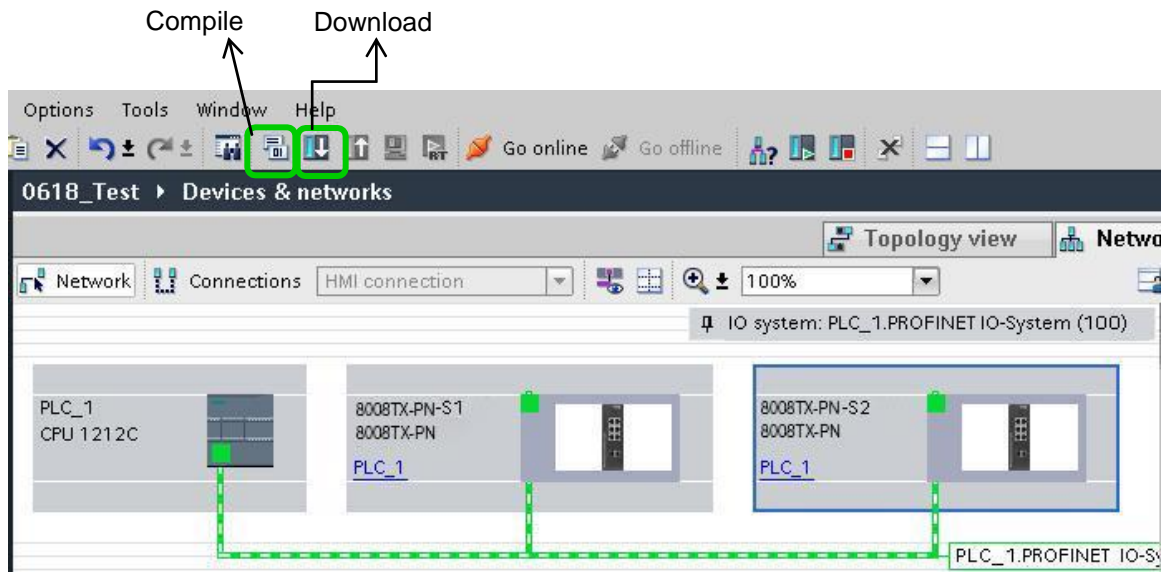
> ➢ Select the connection interface from the PC and the connected controller.
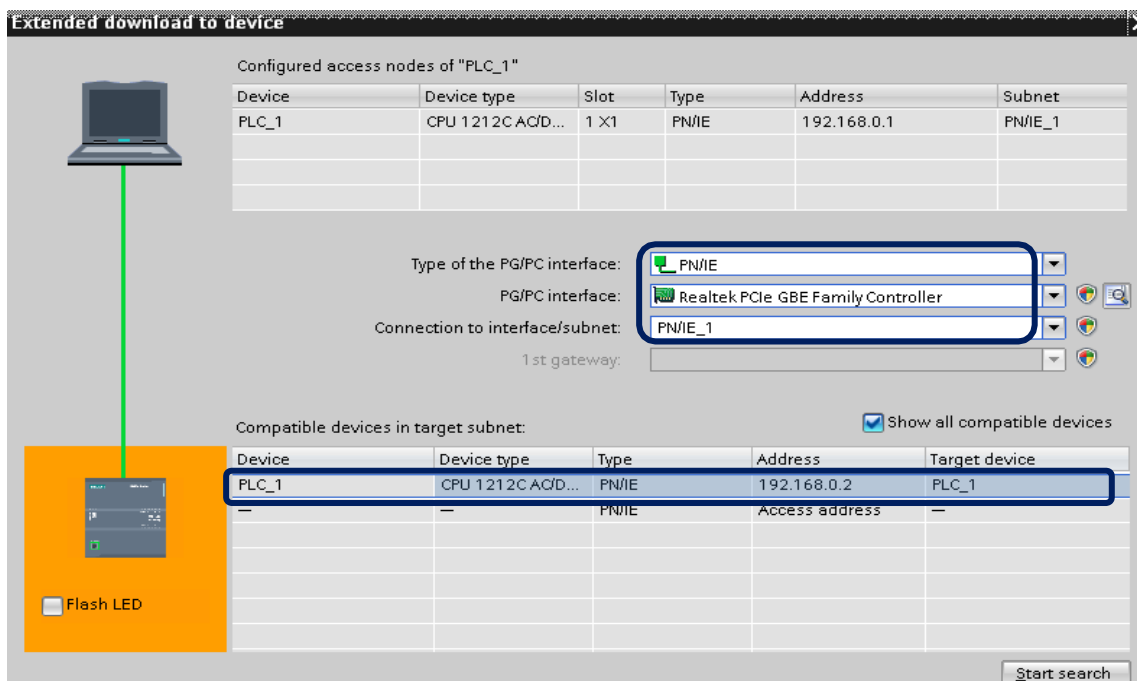
5.4 Device Configuration
> ➢ Start to configure I/O Device including IP address, Name, MRP group, etc.
> →Double click the I/O Device icon will get below page.

Device Location

Set IP and Name.
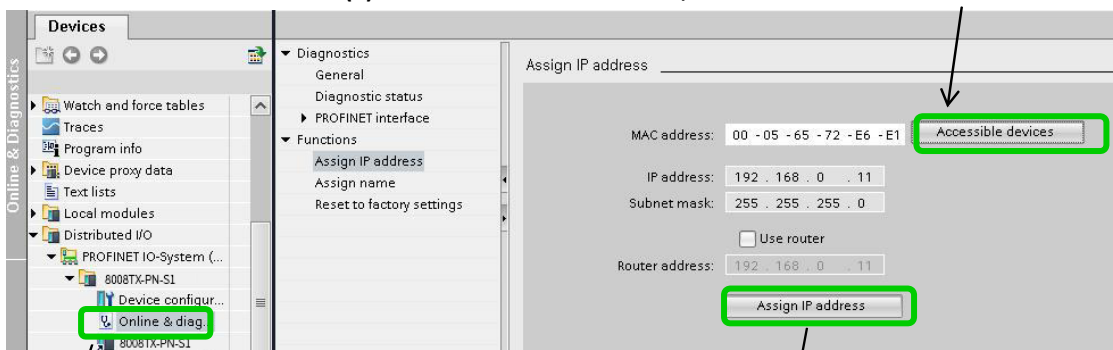
I/O Device parameter configuration   Set desired IP address for this I/O Device

> Set IO Device IP address

(2) To scan the network device, then select the IO Device's MAC.

(1) Double Click

(3) Press "Assign IP address" button

➢ Set IO Device Name
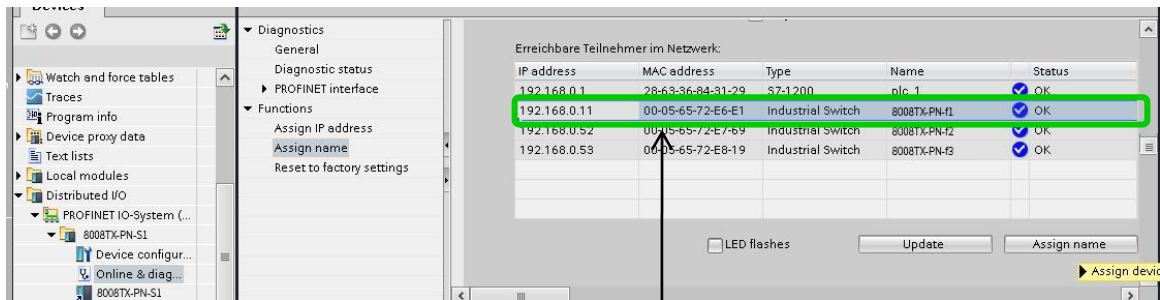
Select the I/O Device, then press "Assign name" button.

➢ Set MRP Group 1.

Role: MRM

Ring Port

➢ Set MRP Group 2.

Mode: Disable
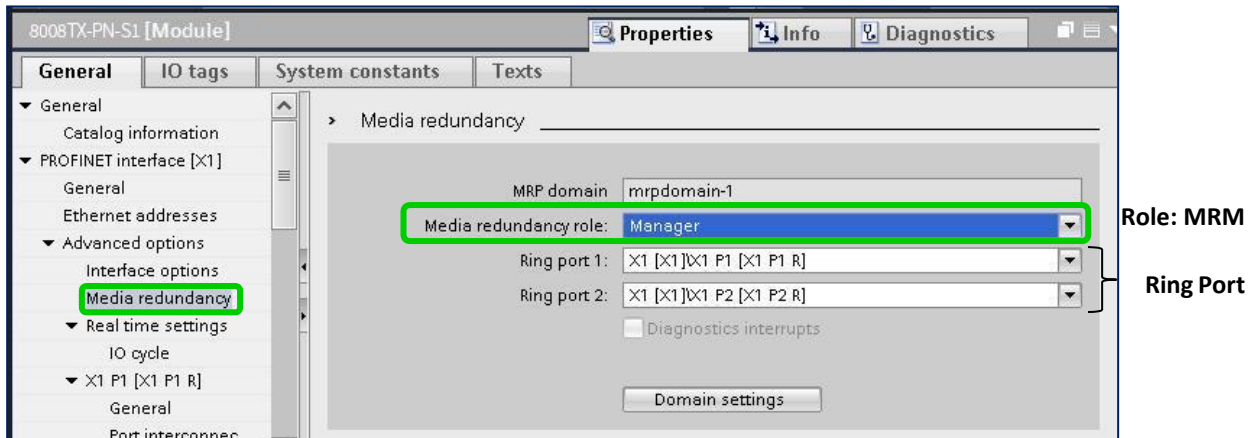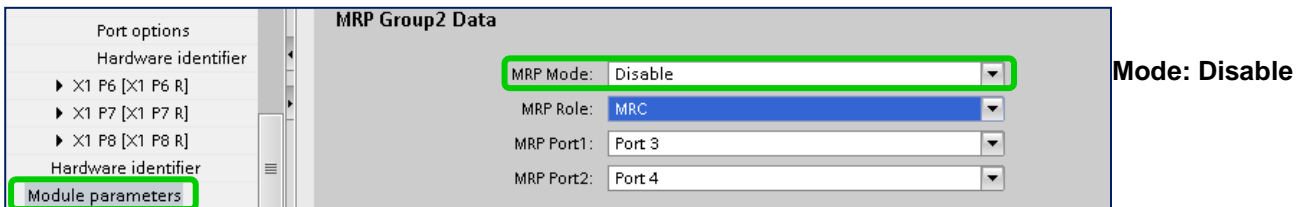
5.5 Compile and load the project into the PLC

➢ After Configure I/O Device1 to MRM, I/O Device2 to MRC,
→ Run Compile and Download to PLC.   (PLC will also send configuration to I/O Device)

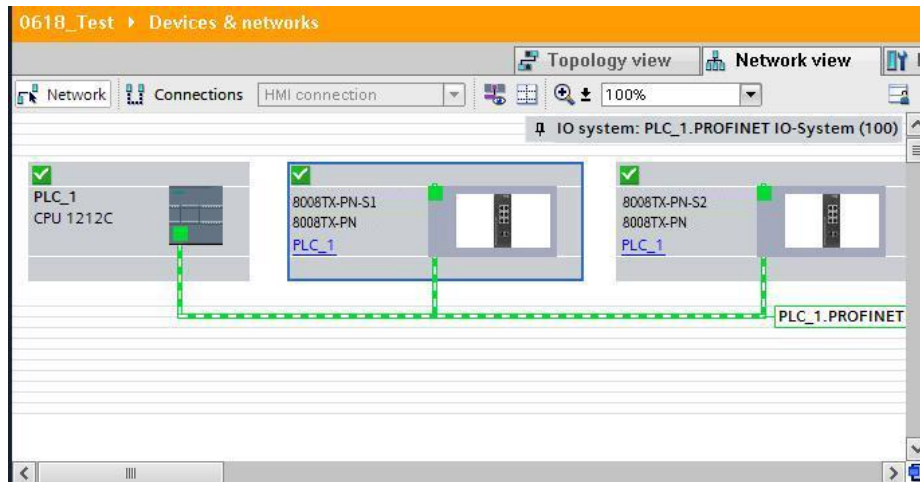AVCOMM Technologies Inc.
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Check MRP Information from IO Devices.

IO-Device 1

```
MRP Group 1 Info:
============================================
Role                            : Manager
Ring Port1                      : 1
Ring Port2                      : 2
Vlan                            : 0
Manager Priority                : 0xa000
Topology Change Interval        : 1
Topology Change Repeat Count    : 3
Short Test Interval             : 10
Default Test Interval           : 20
Test Monitoring Count           : 3
Non Blocking MRC Supported      : 0
Test Monitoring Extended Count  : 25
React on Link Change            : 1
Check Media Redundancy          : 1
Domain Name                     : mrpdomain-4
Real Role State                 : 1
Real Ring State                 : 1
Ring Port1 PortState            : BLOCKED
Ring Port2 PortState            : FORWARDING
```

IO-Device 2

```
MRP Group 1 Info:
============================================
Role                     : Client
Ring Port1               : 1
Ring Port2               : 2
Vlan                     : 0
Link Down Interval       : 20
Link Up Interval         : 20
Link Change Count        : 4
Blocked State Supported  : 1
Domain Name              : mrpdomain-4
Ring Port1 PortState     : FORWARDING
Ring Port2 PortState     : FORWARDING
```

5.6 Monitoring the Switch
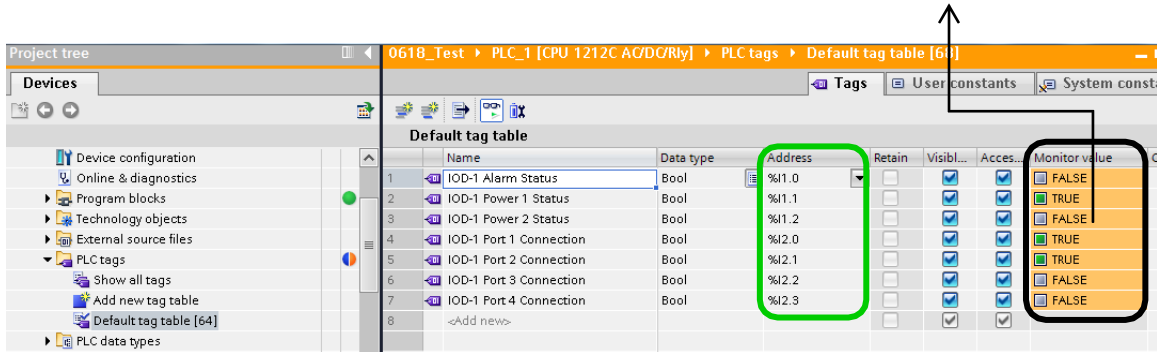
Check RTC Information from IO Controller.

On "Device overview" sheet, it shows each module address in the table.

Ex: To monitor device data, it needs to filter the PLC tags in address 1. (1Byte)The information in this byte is defined in RTC attribute table.

➢ To monitor some RTC attributes below.

Address→Status:
1.0 → Alarm LED off
1.1→ Power 1 on
1.2→ Power 2 off

2.0→ Port 1 connected
2.1→ Port 2 connected
2.2→ Port 3 disconnected
2.3→ Port 4 disconnected

	Name	Data type	Address	Retain	Visibl...	Acces...	Monitor value
1	IOD-1 Alarm Status	Bool	%I1.0		☑	☑	FALSE
2	IOD-1 Power 1 Status	Bool	%I1.1		☑	☑	TRUE
3	IOD-1 Power 2 Status	Bool	%I1.2		☑	☑	FALSE
4	IOD-1 Port 1 Connection	Bool	%I2.0		☑	☑	TRUE
5	IOD-1 Port 2 Connection	Bool	%I2.1		☑	☑	TRUE
6	IOD-1 Port 3 Connection	Bool	%I2.2		☑	☑	FALSE
7	IOD-1 Port 4 Connection	Bool	%I2.3		☑	☑	FALSE
8	<Add new>				☑	☑	

Note:
1.0 means the first bit of PLC tag address 1.
1.1 means the second bit of PLC tag address 1.
1.2 means the third bit of PLC tag address 1.
2.3 means the fourth bit of PLC tag address 2.