USER MANUAL

SI-X208 / SI-X308/ SI-X408 / SI-X608

Industrial EtherCAT Slave I/O Modules

SI-Xx08 M1

SI-X208 / SI-X308 / SI-X408 / SI-X608

Industrial EtherCAT Slave I/O Module

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DISCLAIMER

This user's manual is meant to assist users in installing and setting up the system. The information contained in this document is subject to change without any notice.

CE NOTICE

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

You are cautioned that any change or modifications to the equipment not expressly approve by the party responsible for compliance could void your authority to operate such equipment.

	WARNING: Some internal parts of SI-Xx08 may have high electrical voltage. We strongly recommend that only qualified engineers are allowed to service and disassemble SI-Xx08. If any damages should occur on SI-Xx08 and are caused by unauthorized servicing, it will not be covered by the product warranty.

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Revision History

The revision history of SI-Xx08 User Manual is described below:

Version No.	Revision History	Date
M1	Initial Release	2020/05/11

1 SI-Xx08 Introduction

This chapter provides the introduction for SI-X208, SI-X308, SI-X408 and SI-608 modules, applications list as well as the framework of the user manual.

The following topics are included:

- SI-Xx08 Introduction
- Applications
- User Manual Structure

1.1 SI-Xx08 Introduction

Thank you for purchasing our SI-Xx08 Industrial EtherCAT Slave I/O Modules which supports EtherCAT protocol. EtherCAT (Ethernet Control Automation Technology) which is developed by BECKHOFF Automation is a high-performance Ethernet-based fieldbus industrial network system. This protocol which is standardized in IEC standard IEC61558 is suitable for real-time automation applications.

All EtherCAT Slave I/O Modules can be connected by the network topologies such as star, line, or ring. Our SI-Xx08 I/O modules are installed by daisy chain connection which has the flexibility in devices installation and reduces the costs of infrastructure and operations. For the power requirements, the SI-Xx08 modules are designed for standard industrial unregulated 24 VDC Power input. However, they accept any power unit that supplies power within the range of +9 to +48 VDC. All the I/O modules have the isolated input and output design which protects SI-Xx08 I/O modules against external interference and environment. The EtherCAT Slave Controller has passed and has been verified by the conformance test tool. The qualified EtherCAT Master can connect with SI-Xx08 modules easily and can be applied for various applications.

1.2 Applications

- Factory Automation
- Machine Automation
- Machine Tooling
- Data Acquisition

1.3 User Manual Structure

Chapter 1 Introduction

This chapter gives the brief introduction of SI-Xx08, applications list as well as the framework of this user manual.

Chapter 2 Getting Started

This chapter describes the system architecture, system and I/O specifications, illustrates the physical appearances, block diagrams, quick installation guide as well as configuration and operation. Read the safety reminders carefully on how to take care of SI-Xx08 properly.

Chapter 3 Hardware Configuration

This chapter describes the information of pin assignment, wire connection and DIN-Rail mount installation.

2 Getting Started

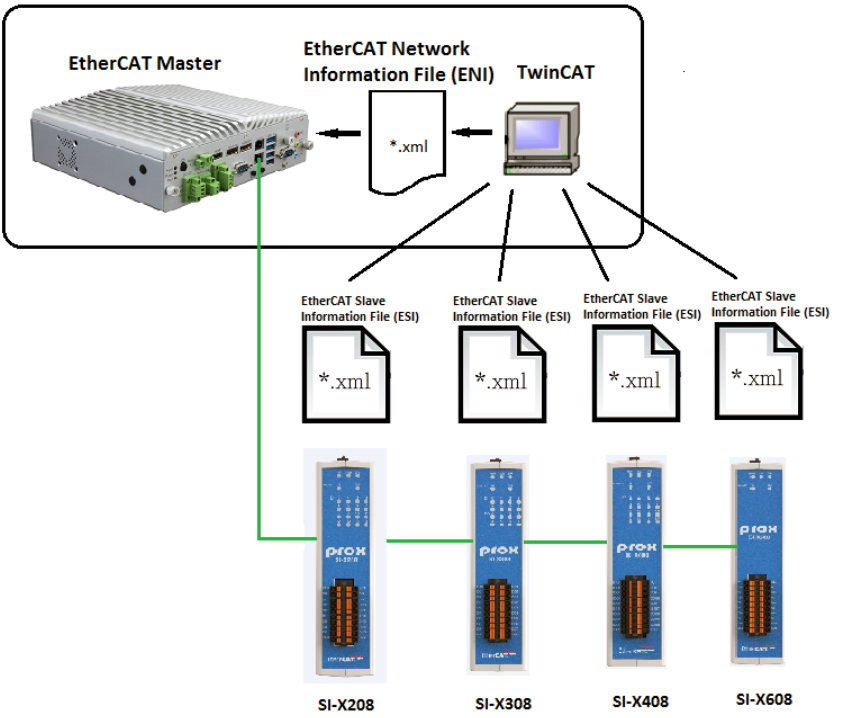
This chapter describes the system architecture, system and I/O specifications, illustrates the physical appearances, block diagrams, quick installation guide as well as configuration and operation. Read the safety reminders carefully on how to take care of SI-Xx08 properly.

The following topics are included:

- System Architecture
- System Overview
- Appearance: Front Panel & Top Panel
- System and I/O Specifications
- Quick Start
- Configuration and Operation
- Safety Precautions

2.1 System Architecture

The System Architecture diagram is shown as below:

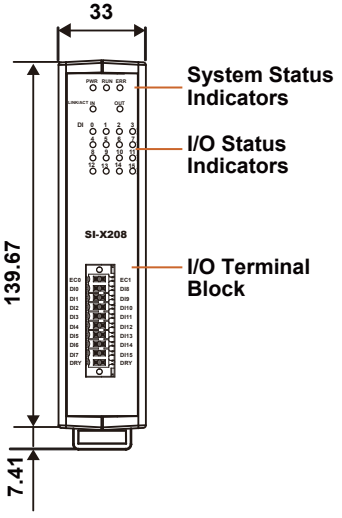


2.2 System Overview

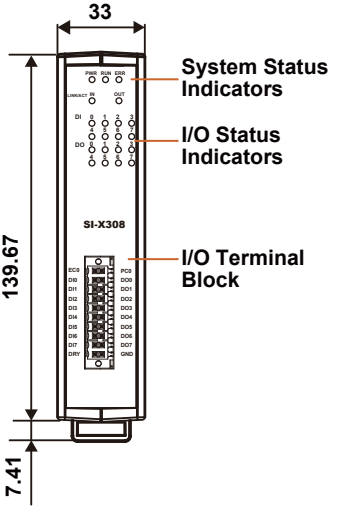
2.2.1 Six Views

Unit: mm

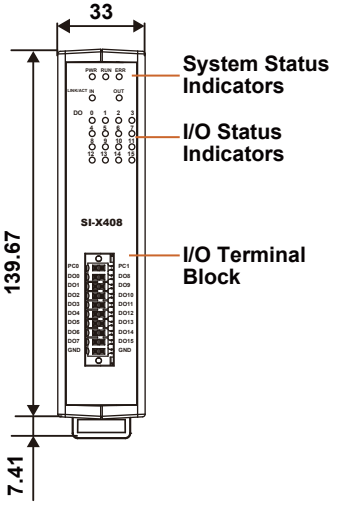
SI-X208 Front View



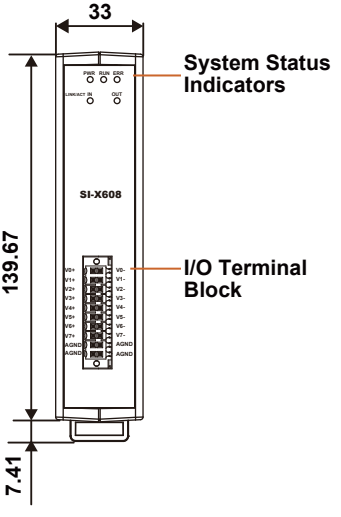
SI-X308 Front View



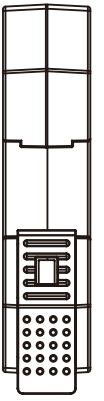
SI-X408 Front View



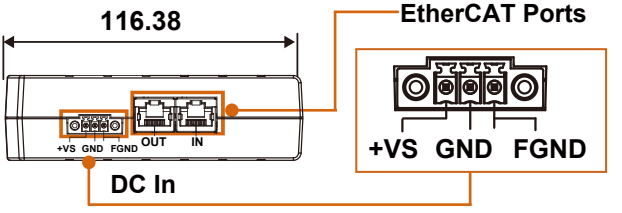
SI-X608 Front View



SI-Xx08 Rear View



SI-Xx08 Top View

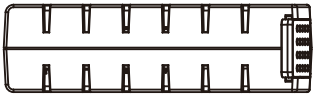


Notes:

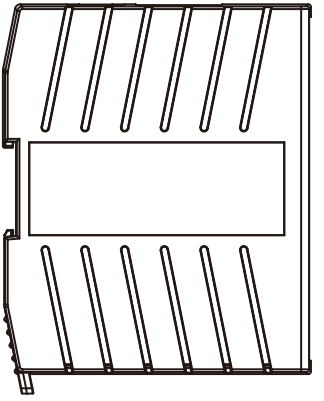
1. It is recommended connecting **FGND PIN** to functional earth via a cable.

2. DO NOT connect **GND PIN** and **FGND PIN** of the terminal block together as they might have potential differences which might cause signal interferences.

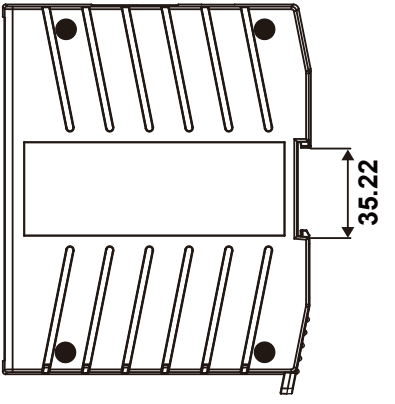
SI-Xx08 Bottom View



SI-Xx08 Left Side View



SI-Xx08 Right Side View

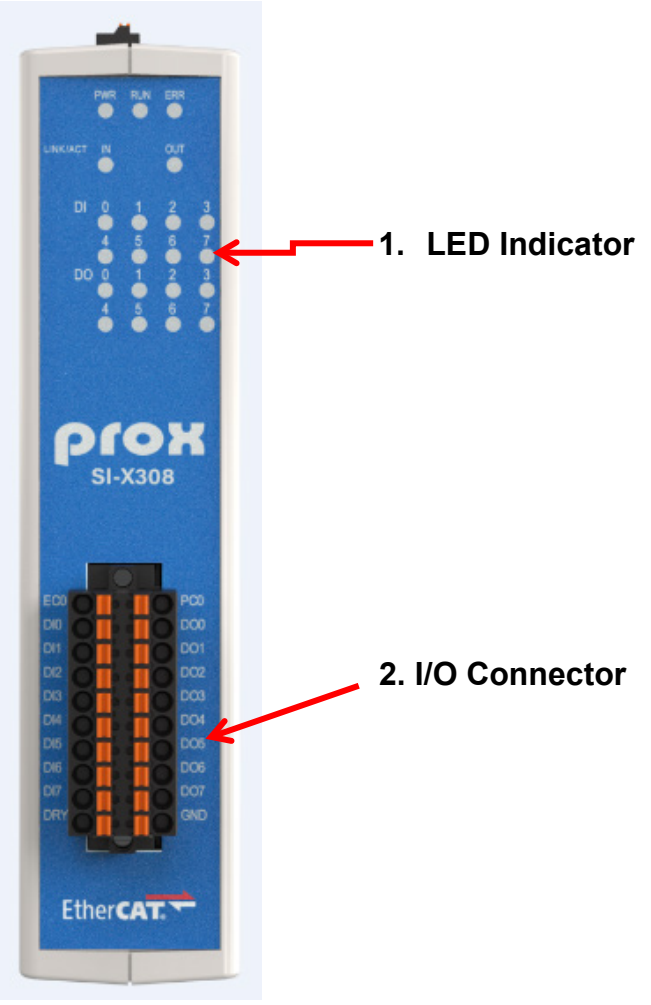


2.2.2 Appearance

The front panel and top panel of the SI-Xx08 module contain the I/O connector, LED Indicators, Ethernet Port and power connector.

2.2.2.1 Front Panel

Taken as an example, the following picture displays the SI-X308 front panel and indicates the locations of LED indicators and I/O connector.



1. LED Indicator Type

- **PWR LED:** After power is supplied to the SI-Xx08 EtherCAT Slave I/O module, the "**PWR**" LED indicator will illuminate.

Indicator State	Module State	Description
Off	Power Off	System Power is OFF.
On	Power On	System Power is ON.

- **RUN LED:** The "**RUN**" LED indicates the operation state of the SI-Xx08 EtherCAT Slave I/O Module.

Indicator State	System State	Description
OFF	Initialization	The device is in the Initialization state.
Blinking	Pre-Operational	The device is in the Pre-Operational state.
Single Flash	Safe Operational	The device is in the Safe Operational state.
On	Operational	The device is in the Operational state.

- **ERR LED**

Indicator State	System State	Description
Off	No Error	No Error. The device is in normal operation state.
Blinking	Invalid Configuration	Configuration error.

- **LINK/ACT (IN/OUT) LED:** EtherCAT Link State.

Indicator State	System State	Description
Off	No Link	No EtherCAT connection.
Blinking	Activity	EtherCAT link and activity.
On	Without Activity	EtherCAT link without activity

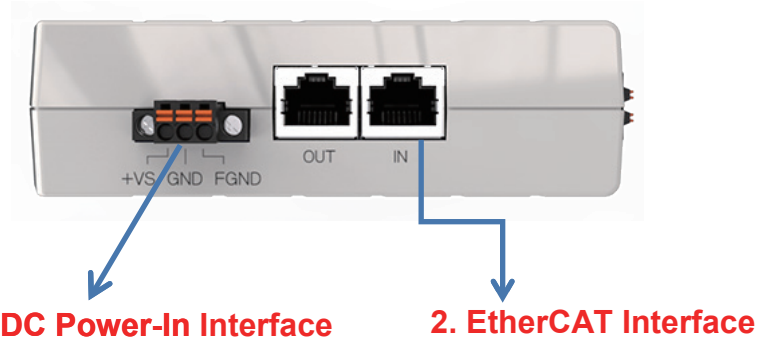
- **I/O LED** (Only for SI-X208/SI-X308/SI-X408)

Indicator State	System State	Description
OFF	No Activity	I/O channel is in active state.
ON	Activity	I/O channel is not in active state.

2. I/O Connector

Please refer to **Section 3.1 to Section 3.4 SI-Xx08 Pin Assignment** for more information about the pin assignments for I/O connector.

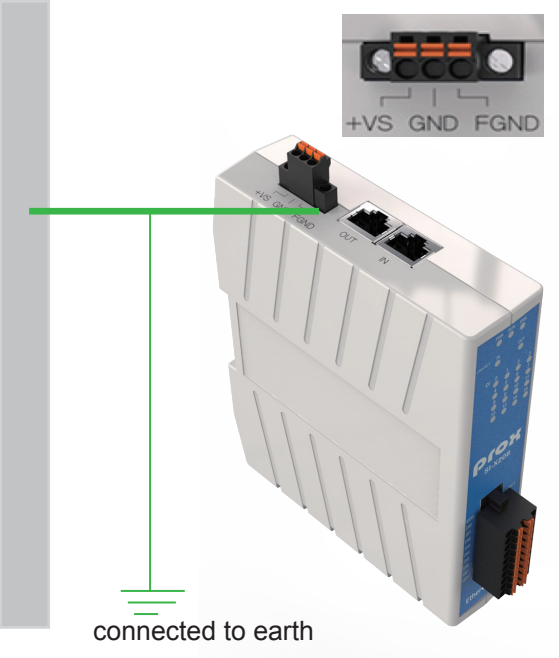
2.2.2.2 Top Panel



1. DC Power-In Interface

The "+VS" and "GND" pins are used for the power supply and apply to all types of SI-Xx08 EtherCAT I/O modules. The valid power voltage range is from +9 to +48 VDC.

The "FGND" is Frame Ground. The SI-Xx08 module device can be connected to the building structure which is connected to the functional earth. With this architecture, the same reference potential can be provided to all EtherCAT I/O modules. Please see the picture below:



2. EtherCAT Interface

SI-Xx08 EtherCAT Slave I/O modules are equipped with two RJ45 EtherCAT Interface ports. One is “IN” port which is EtherCAT signal input port that connects to EtherCAT Master or the EtherCAT signal output port of previous EtherCAT Slave I/O Module. The other is “OUT” port which is EtherCAT Signal output that connects to the EtherCAT signal input port of next EtherCAT Slave I/O Module.

2.3 Specifications

2.3.1 SI-Xx08 System Specifications

System Specification	
Controller	➢ EtherCAT Slave Controller
Communication Interface	➢ Ethernet
Connector	➢ 2 x RJ-45 (Support Daisy Chain)
Protocol	➢ EtherCAT
Distance between Stations	➢ Max. 100m, 100 BASE-TX
Power Supply	➢ 9~48 V DC with 3-pin terminal block
LED Indicator	➢ Power LED, Green ➢ RUN LED, Green ➢ Link IN/OUT, Green ➢ Error LED, Red
Installation	➢ DIN-Rail
Net Weight	➢ 220g
Dimensions (WxHxD)	➢ 139.97mm x 116.97mm x 33mm (without connectors)
Certificate	➢ CE/FCC
Environment	
Operating Temp. (with airflow)	➢ -25°C ~ 75°C (-13°F ~ 167°F)
Storage Temperature	➢ -40°C ~ 85°C (-40°F ~ 185°F)
Humidity	➢ 20% ~ 90%

2.3.2 I/O Specifications

2.3.2.1 SI-X208 I/O Specifications

Digital Input	
I/O Type	➢ Digital Input
No. of Channel	➢ 16
Input Type	➢ Wet (Sink/ Source)
Wet Contact	➢ On Voltage Level, "1": +10 ~ +30VDC ➢ Off Voltage Level, "0": +3VDC Max
Photo Isolation	➢ 3750 VDC
I/O Indicator LED	➢ **ON:** R/W ➢ **OFF:** No Action

2.3.2.2 SI-X308 I/O Specifications

Digital Input	
No. of Channel	➢ 8
Input Type	➢ Wet (Sink / Source)
Wet Contact	➢ On Voltage Level, "1": +10 ~ +30VDC ➢ Off Voltage Level, "0": +3VDC Max
Photo Isolation	➢ 3750 VDC
I/O Indicator LED	➢ **ON:** R/W ➢ **OFF:** No Action
Digital Output	
No. of Channel	➢ 8
Output Type	➢ Open Collector (Sink)
Max. Load Current	➢ 350mA/ch @ 25°C ➢ 250mA/ch @ 75°C
Photo Isolation	➢ 3750 VDC
I/O Indicator LED	➢ **ON:** R/W ➢ **OFF:** No Action

2.3.2.3 SI-X408 I/O Specifications

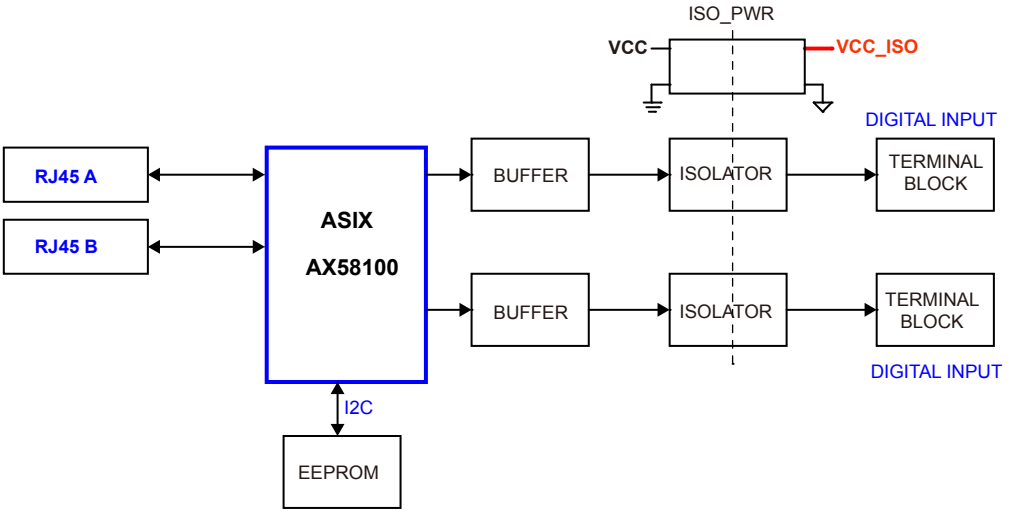
Digital Output	
No. of Channel	➢ 16
Output Type	➢ Open Collector (Sink)
Max. Load Current	➢ 350mA/ch @ 25°C ➢ 250mA/ch @ 75°C
Photo Isolation	➢ 3750 VDC
I/O Indicator LED	➢ **ON:** R/W ➢ **OFF:** No Action

2.3.2.4 SI-X608 I/O Specifications

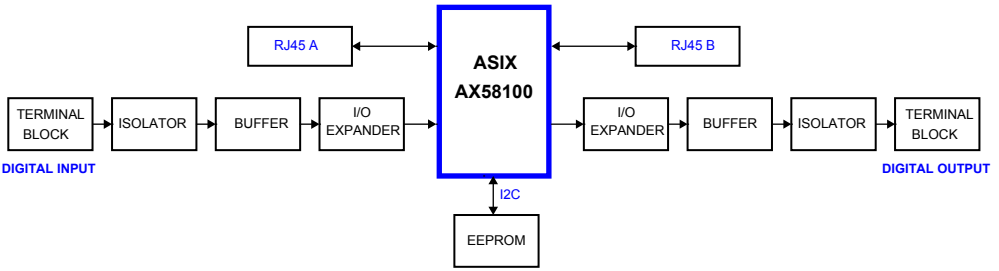
Analog Input	
No. of Channel	➢ 8
Wire Connection	➢ Differential
Input Type	➢ Voltage, Current (software selectable)
Range	➢ 0~5V, 0~10V, ±10V, ±5V ➢ 0~20mA, ±20mA, 4~20mA
Resolution	➢ 16-bit
Sample Rate	➢ 1k Hz per channel
Accuracy	➢ < ±0.2% of FSR
Over Voltage Protection	➢ ± 35 VDC

2.4 Block Diagram

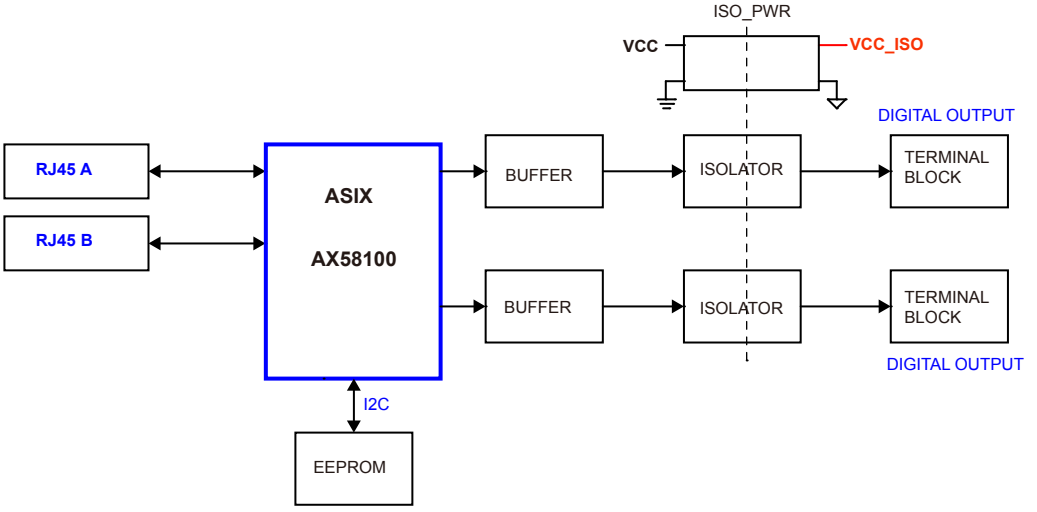
2.4.1 SI-X208 Block Diagram



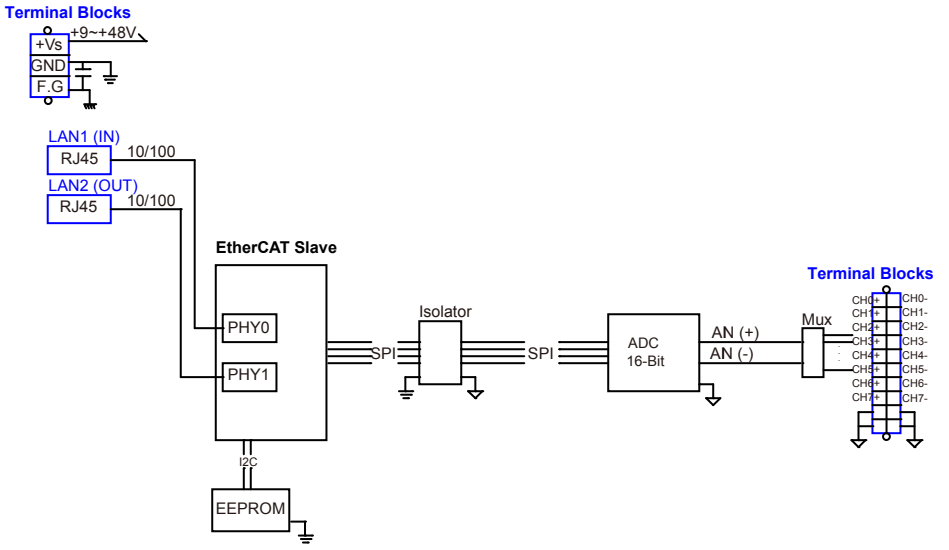
2.4.2 SI-X308 Block Diagram



2.4.3 SI-X408 Block Diagram



2.4.4 SI-X608 Block Diagram

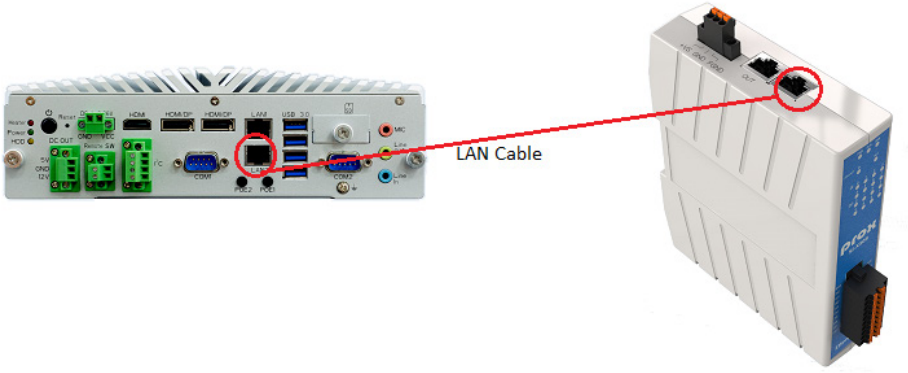


2.5 Quick Start

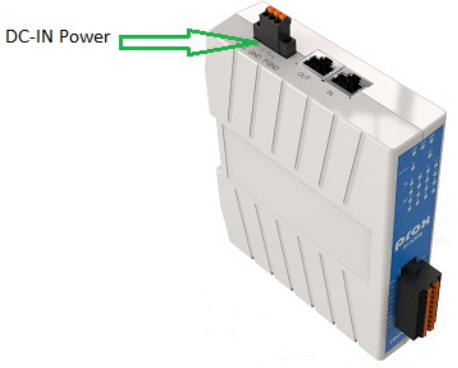
This section describes how to connect your EtherCAT Slave I/O Module SI-Xx08 with your Host PC and Power Supply. Follow the instructions below:

Prerequisites:
Please make sure the network settings of Host PC have been configured accurately and the network connection operates normally for the Host PC.

Step 1. Use a LAN cable to connect the "**IN**" Port of SI-Xx08 module with the LAN Port (RJ45) of your Host PC or the "**OUT**" Port of the previous SI-Xx08 module. See the picture below:



Step 2. Supply power for SI-Xx08 I/O Module.

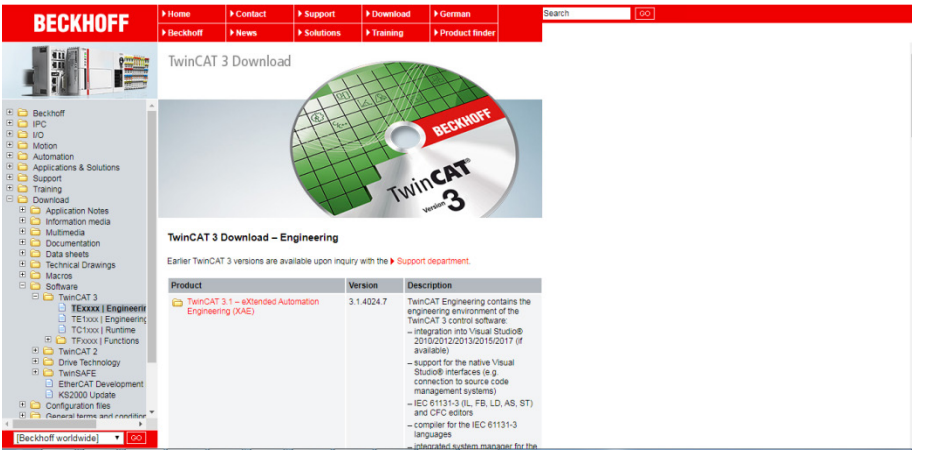


2.6 Configuration and Operation

It is highly recommended that you use “TwinCAT software” (developed by BECKHOFF) as your “EtherCATMaster software” for operating EtherCAT slave devices. BECKHOFF “**TwinCAT 3**” version is suggested.

Click the link below to download BECKHOFF **TwinCAT 3.x**:

https://www.beckhoff.com/english.asp?download/default.htm

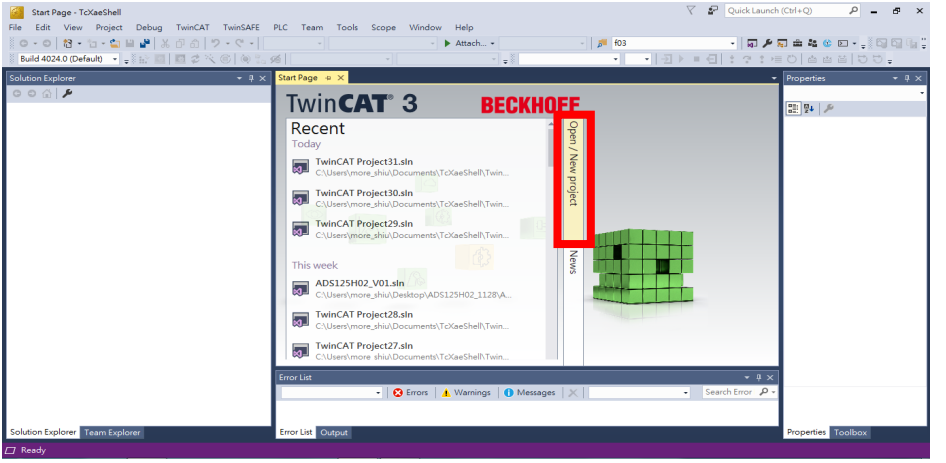


EtherCAT Slave Information (ESI) file that comes with the device is XML based and contains the complete description of its network accessible properties, such as process data and contains the complete description of its network accessible properties. Before you install the SI-Xx08 I/O Module, please make sure you have installed the latest XML device description in TwinCAT folder.

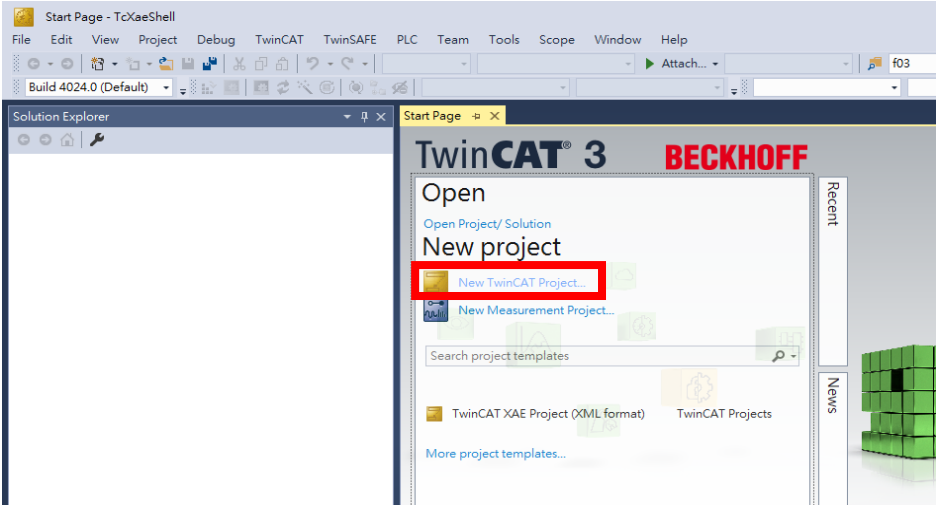
2.6.1 SI-X208

2.6.1.1 EEPROM Update

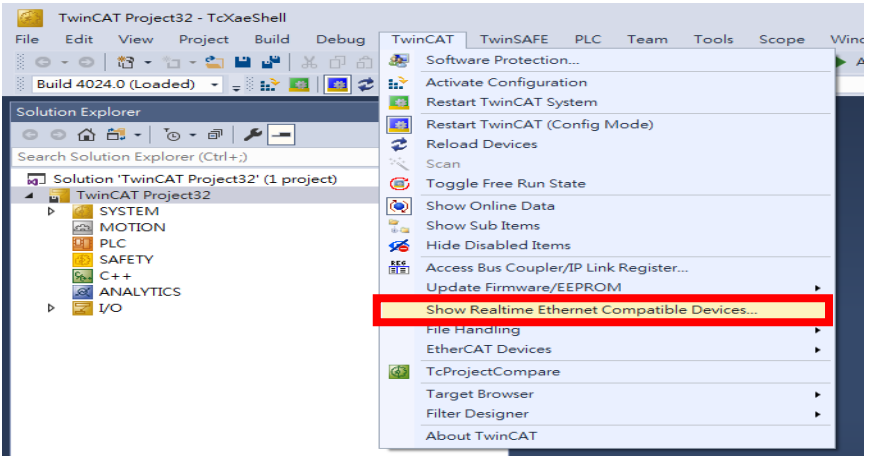
- **Step 1:** Click "**New TwinCAT Project…**".



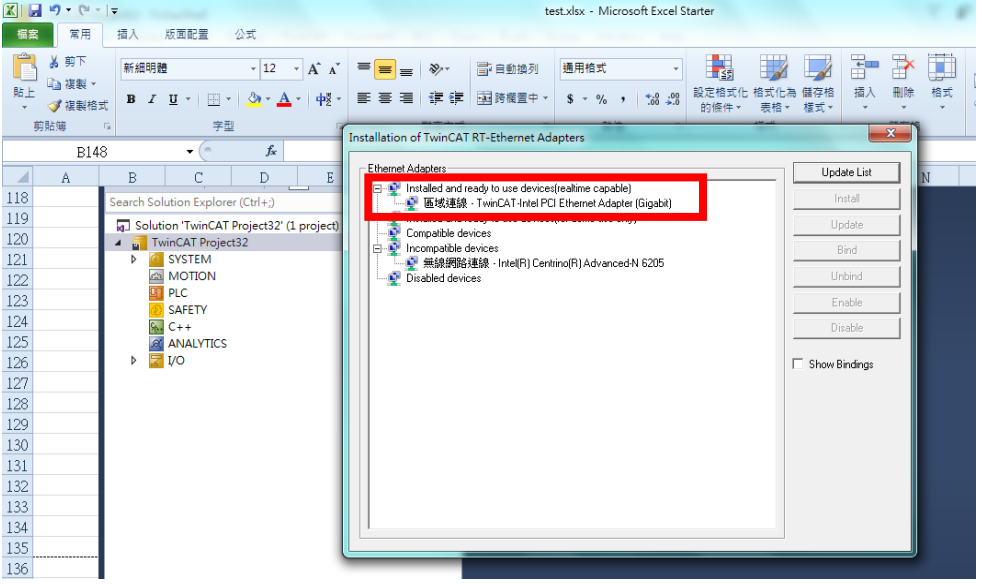
- **Step 2:** Specify "**Name**" and "**Location**". Click "**OK**".



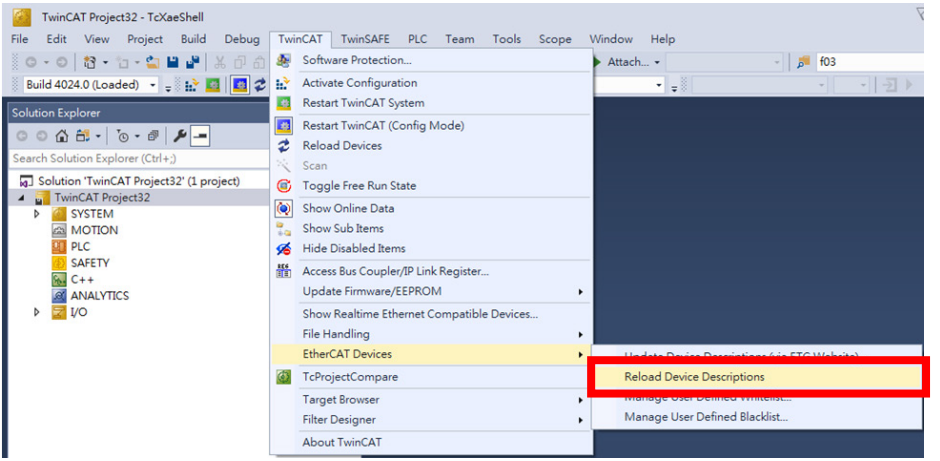
- **Step 3:** Click "**Show Realtime Ethernet Compatible Devices…**".



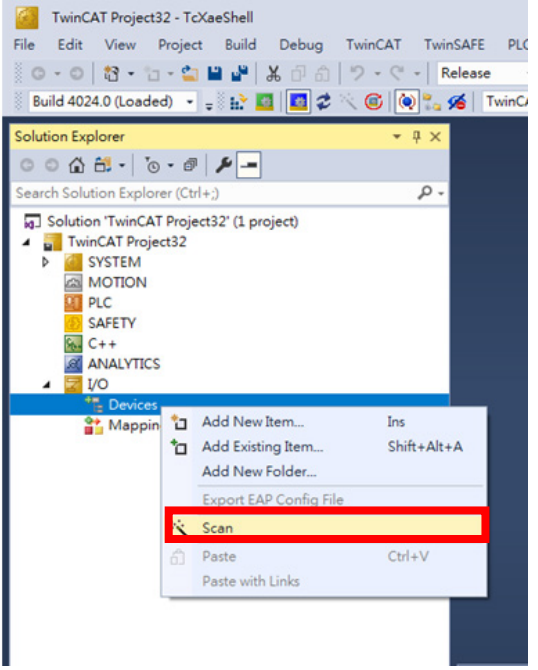
- **Step 4:** Make sure your network adapter has installed BECKHOFF EtherCAT real-time driver. If your network adapter appears under "**Compatible devices**", click the "**Install**" button to install BECKHOFF real-time driver.



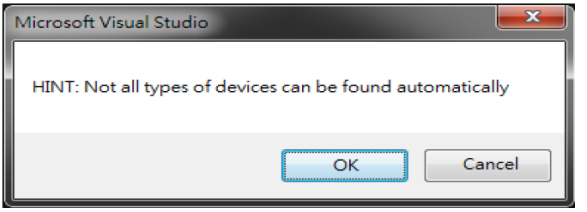
- **Step 5:** Click "**Reload Device Descriptions**".



- **Step 6:** Right-click on "**I/O -> Devices**" and select "**Scan**".

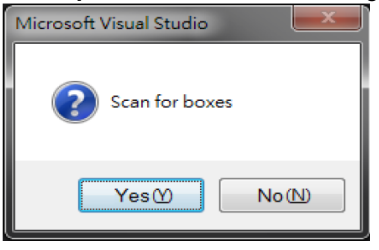


- **Step 7:** Click "**OK**" in the dialog box shown below:

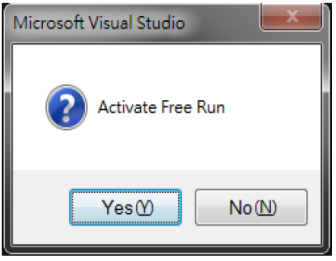


- **Step 8:** Select the correct local area connection that link to EtherCAT slave and click "**OK**".

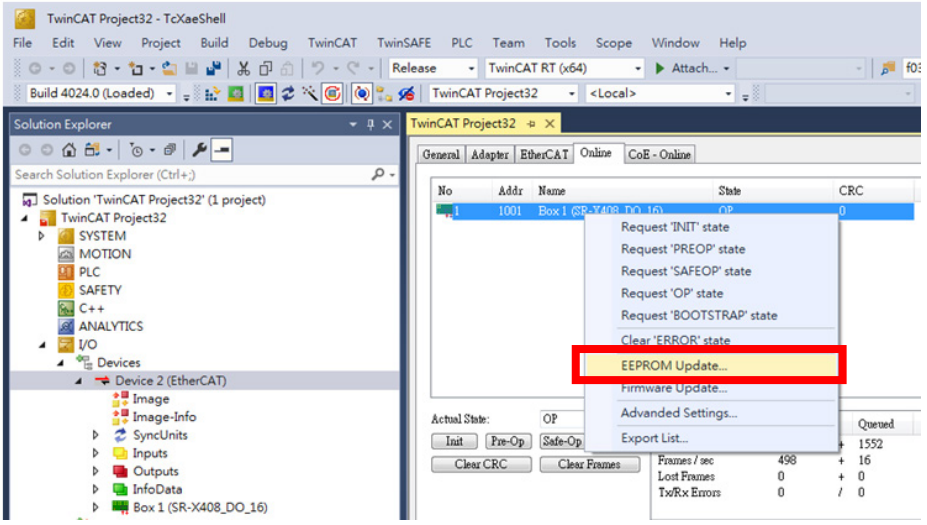
- **Step 9:** Click "**Yes**" in the dialog box shown below:



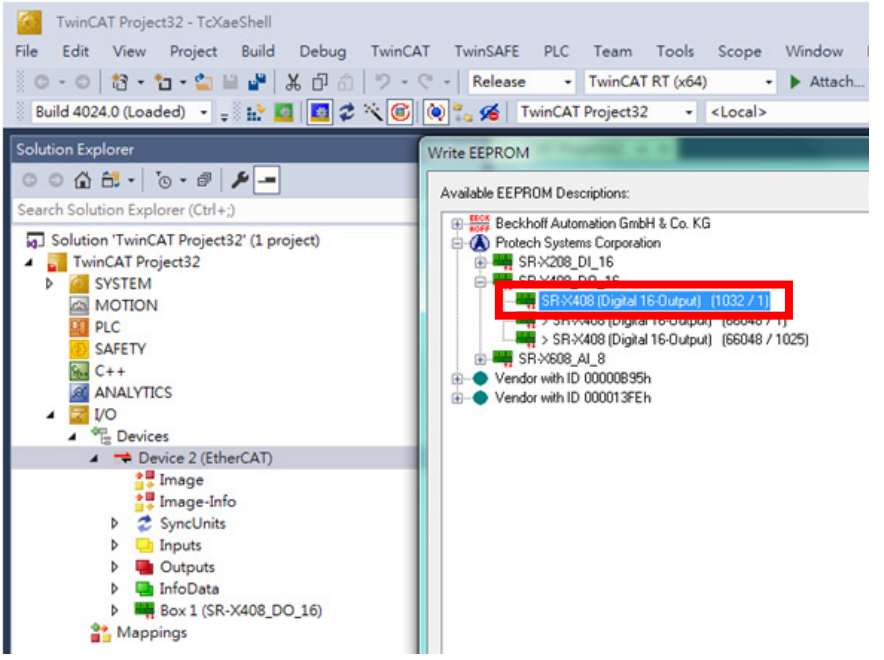
- **Step 10:** Click "**Yes**" in the dialog box shown below:



- **Step 11:** Click "**EEPROM Update…**".



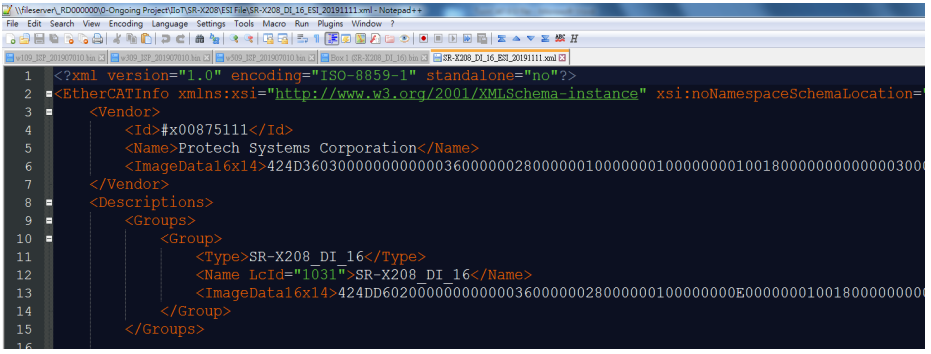
- **Step 12:** Select "**SR-X408[Digital 16-Output] [1032/1]**" and click "**OK**".



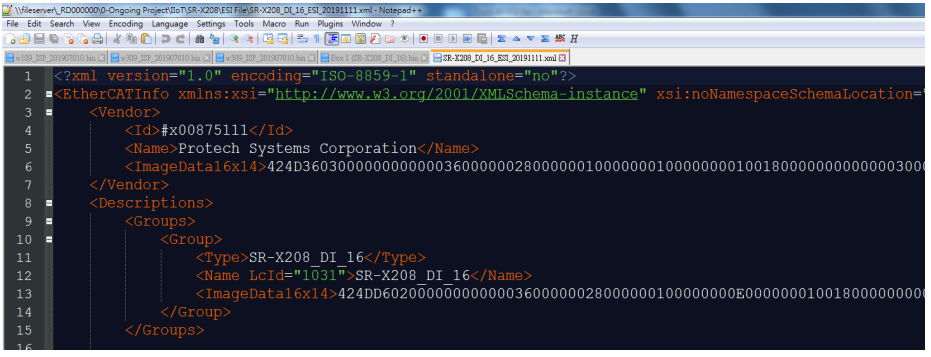
2.6.1.2 ESI File Rule

Each EtherCAT Slave shall be delivered with an EtherCAT Slave Information (ESI) file.

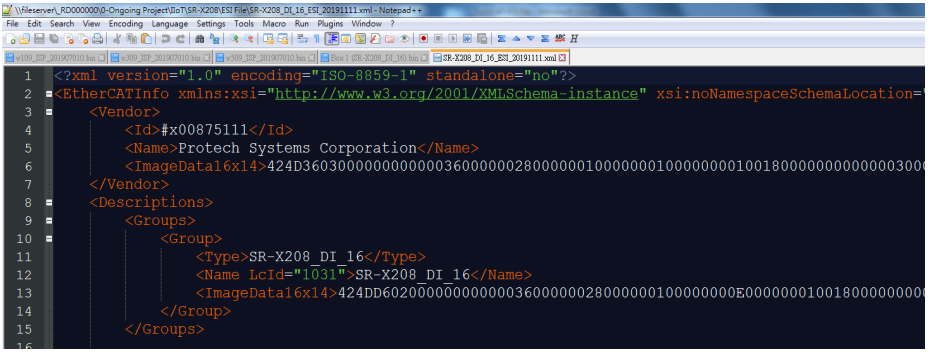
- **Vendor Id: #x00875111(Protech Systems Corporation)**



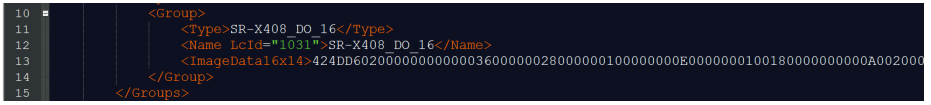
- **Name:** name of the company

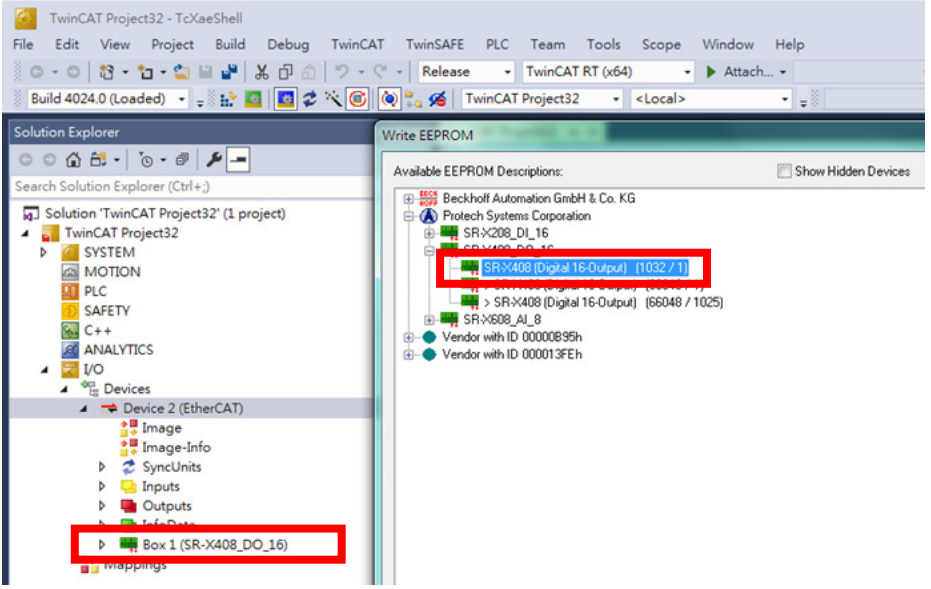


- **<ImageData16x14>:** Convert 16*14 bmp file into hexadecimal format



- **<Type>SR-X408_DO_16</Type>**
- **<Name LcId="1031">SR-X408_DO_16</Name>**





- **<Type ProductCode="#x00000408" RevisionNo="#x00000001">SR-X408_DO_16</Type>**

```
<Devices>
    <!-- DIO,   GPIO,       FMMU=2, SM=3,   DI=16,  DO=16,  ProductCode="#x00010200" RevisionN
    <Device Physics="YY">
        <Type ProductCode="#x00010200" RevisionNo="#x00000001">SR-X408_DO_16</Type>
        <Name LcId="1031">SR-X408 (Digital 16-Output)</Name>
        <GroupType>SR-X408_DO_16</GroupType>
        <Fmmu>Outputs</Fmmu>
        <Fmmu>Inputs</Fmmu>
        <Sm StartAddress="#x0f02" ControlByte="#x44" Enable="1" OpOnly="1">Outputs</Sm>
        <Sm StartAddress="#x0f03" ControlByte="#x44" Enable="1" OpOnly="1">Outputs</Sm>
        <Sm StartAddress="#x1000" ControlByte="0" Enable="1">Inputs</Sm>
```

- **SR-X208 DI-16**

```
            <TxPdo Fixed="1" Sm="2">
                <Index>#x1600</Index>
                <Name>Byte 0</Name>
                <Entry>
                    <Index>#x3001</Index>
                    <SubIndex>1</SubIndex>
                    <BitLen>8</BitLen>
                    <Name>Input</Name>
                    <DataType>BITARR8</DataType>
                </Entry>
            </TxPdo>
            <TxPdo Fixed="1" Sm="2">
                <Index>#x1601</Index>
                <Name>Byte 1</Name>
                <Entry>
                    <Index>#x3001</Index>
                    <SubIndex>2</SubIndex>
                    <BitLen>8</BitLen>
                    <Name>Input</Name>
                    <DataType>BITARR8</DataType>
                </Entry>
            </TxPdo>
```

- **SR-X408 DO-16**

```
            <RxPdo Fixed="1" Sm="0">
                <Index>#x1a00</Index>
                <Name>Byte 0</Name>
                <Entry>
                    <Index>#x3101</Index>
                    <SubIndex>1</SubIndex>
                    <BitLen>8</BitLen>
                    <Name>Output</Name>
                    <DataType>BITARR8</DataType>
                </Entry>
            </RxPdo>
            <RxPdo Fixed="1" Sm="1">
                <Index>#x1a01</Index>
                <Name>Byte 1</Name>
                <Entry>
                    <Index>#x3101</Index>
                    <SubIndex>2</SubIndex>
                    <BitLen>8</BitLen>
                    <Name>Output</Name>
                    <DataType>BITARR8</DataType>
                </Entry>
            </RxPdo>
```

2.6.1.3 Index Ranges

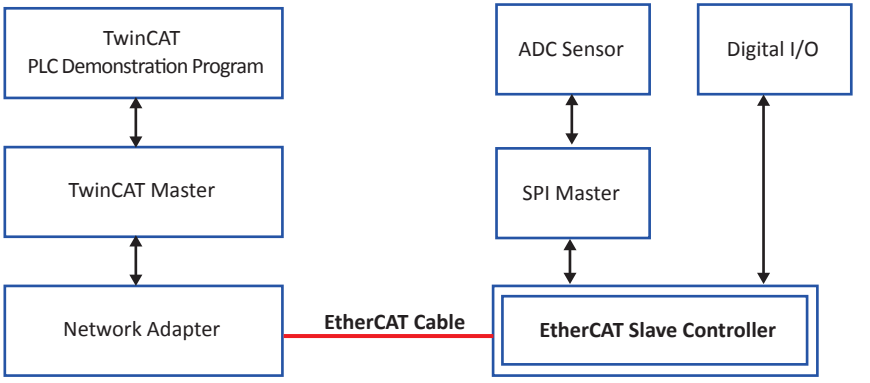
The index ranges depends on the used EtherCAT profile. The Basic index ranges used in the SSC (Slave Stack Code) are listed in the table below:

Table: Basic object index ranges

Index Range	Description
0x0000 – 0x0FFF	Data Type Area
0x1000 – 0x1FFF	Communication Area
0x1600 – 0x19FF	RxPDO Mapping
0x1A00 – 0x1BFF	TxPDO Mapping
0x1C10 – 0x1C2F	Sync Manager PDO Assignment
0x1C30 – 0x1C4F	Sync Manager Parameters

2.6.1.4 System Topology

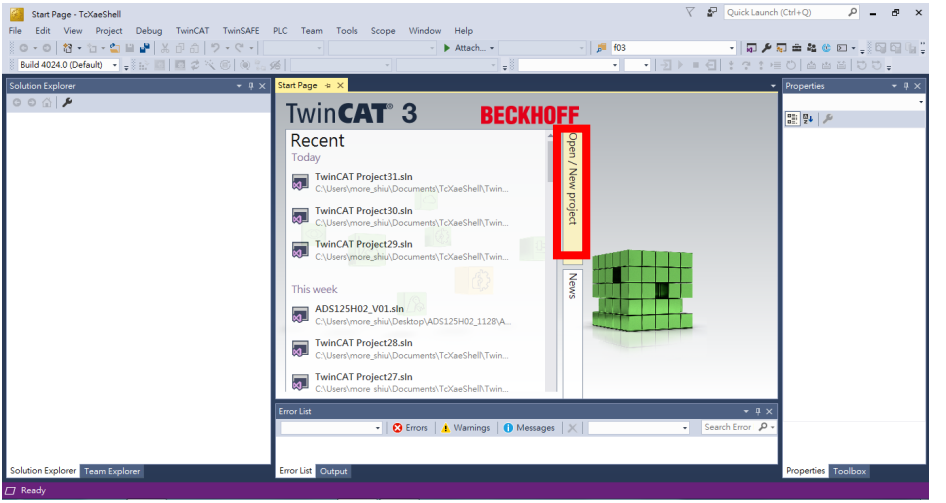
The system topology of demonstration is very simple. We only setup a TwinCAT master and let it connect to an EtherCAT slave. The following diagram illustrates topology and block diagram in system upper layer.



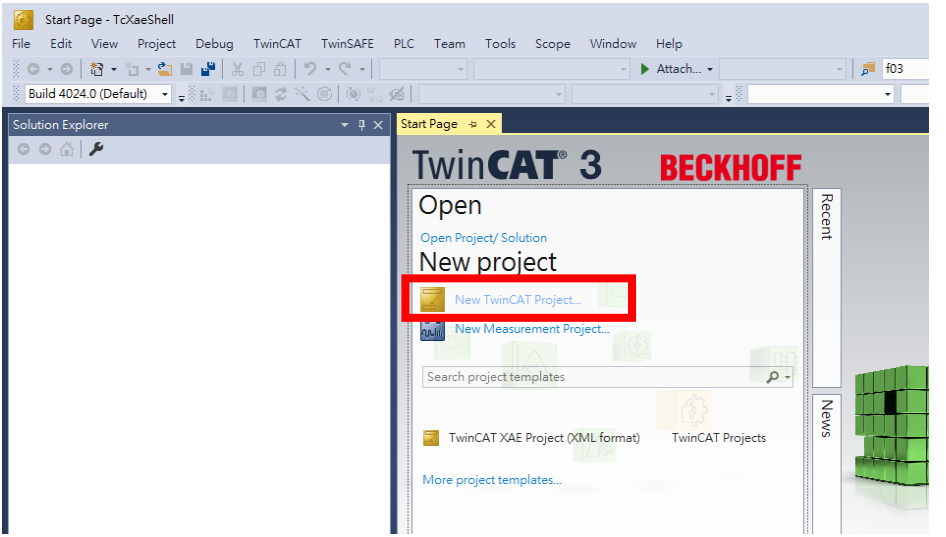
2.6.2 SI-X308

2.6.2.1 EEPROM Update

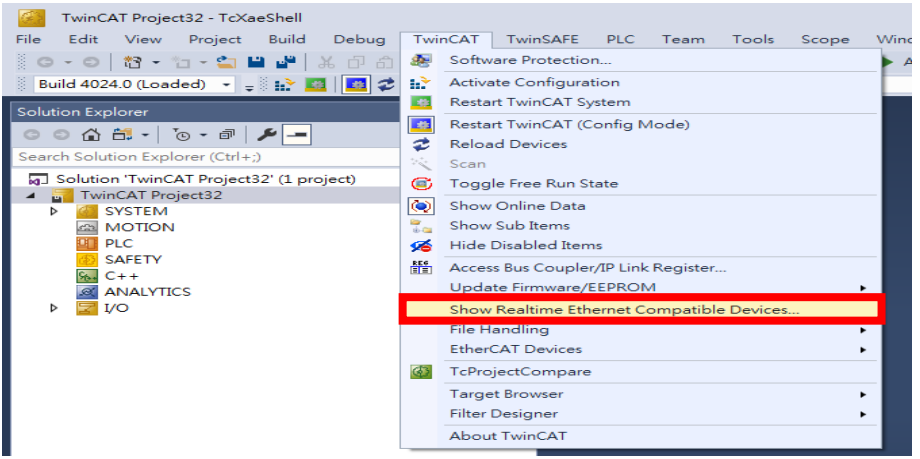
- **Step 1:** Click "**New TwinCAT Project…**".



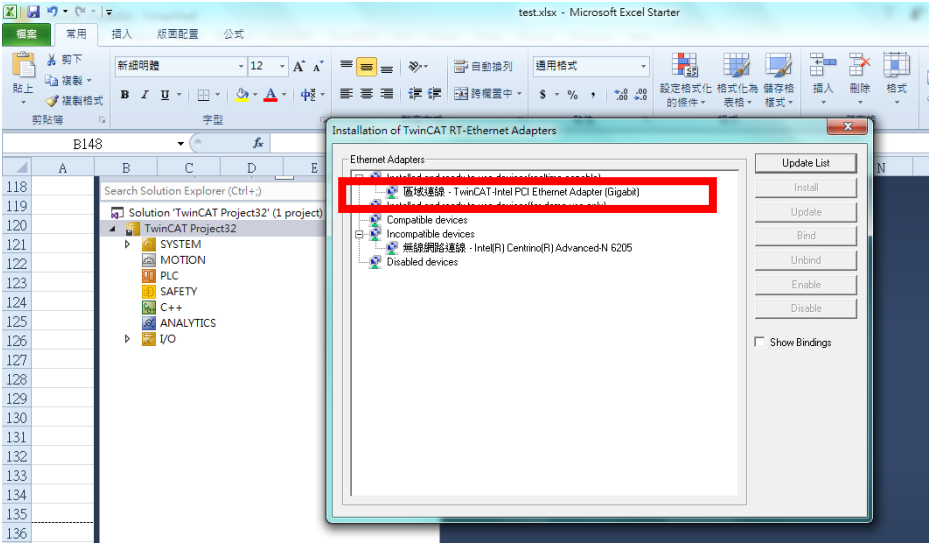
- **Step 2:** Specify "**Name**" and "**Location**" and click "**OK**".



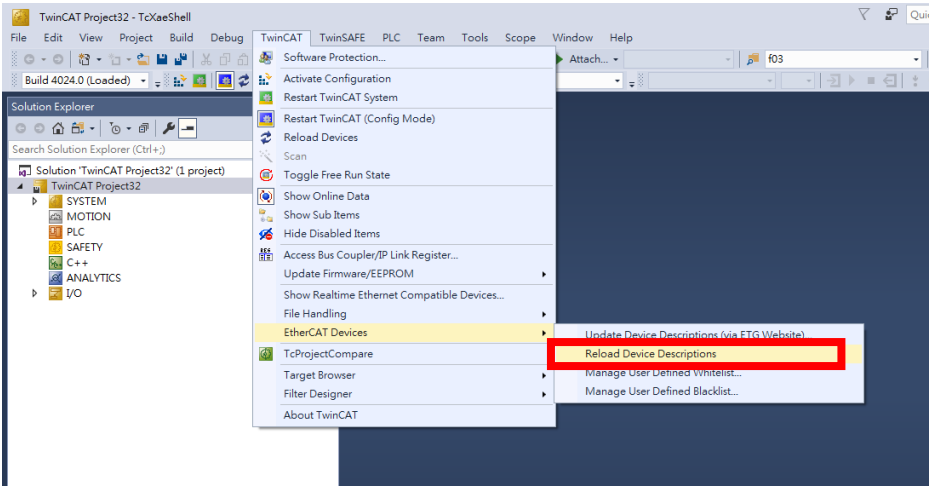
- **Step 3:** Click "**Show Realtime Ethernet Compatible Devices…**".



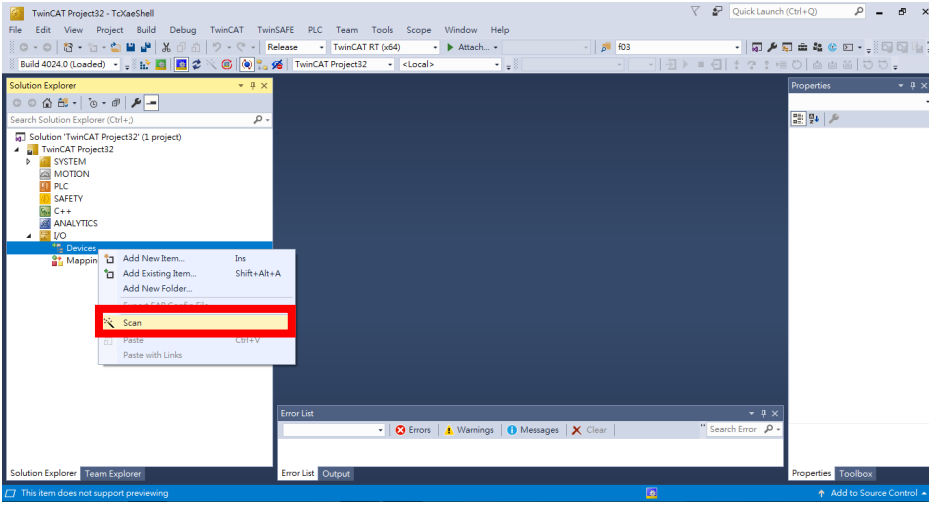
- **Step 4:** Make sure your network adapter has installed BECKHOFF EtherCAT real-time driver. If your network adapter appears under "**Compatible devices**", click the "**Install**" button to install BECKHOFF real-time driver.



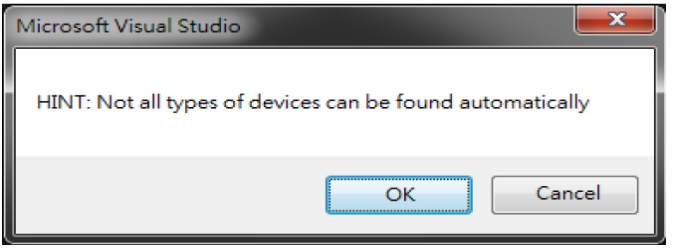
- **Step 5:** Click "**Reload Device Descriptions**".



- **Step 6:** Right-click on **"I/O -> Devices"** and select **"Scan"**.

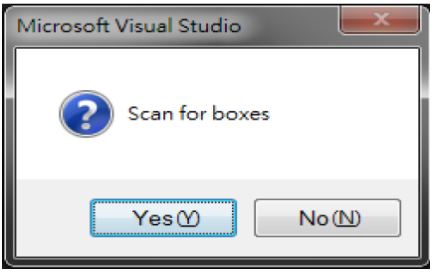


- **Step 7:** Click "**OK**" in the dialog box shown below:

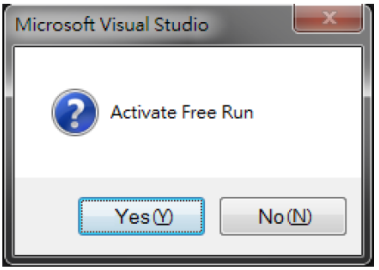


- **Step 8:** Select the correct local area connection that link to EtherCAT slave and click "**OK**".

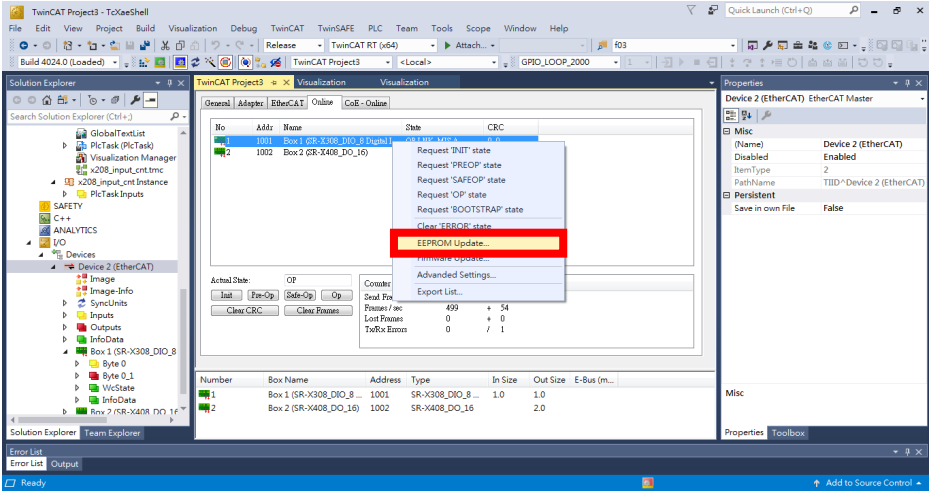
- **Step 9:** Click "**Yes**" on the dialog box shown below:



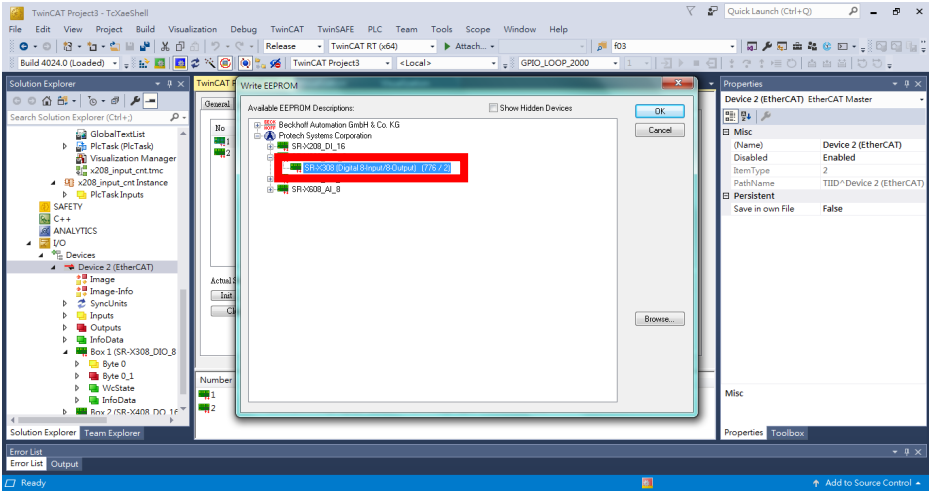
- **Step 10:** Click "**Yes**" on the dialog box shown below:



- **Step 11:** Click "**EEPROM Update…**".



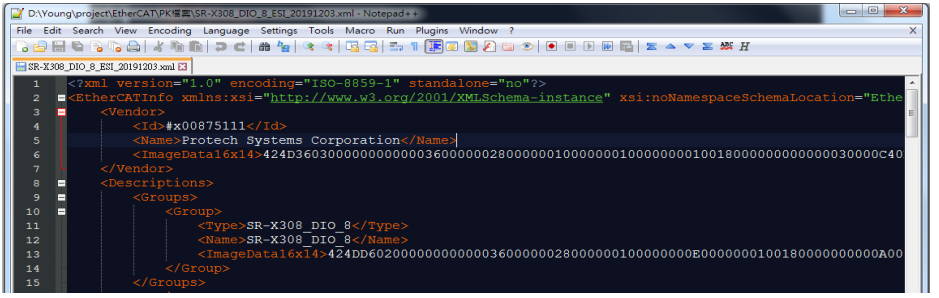
- **Step 12:** Select "**SR-X308[Digital 8-Input/8-Output] [776/2]**" and click "**OK**".



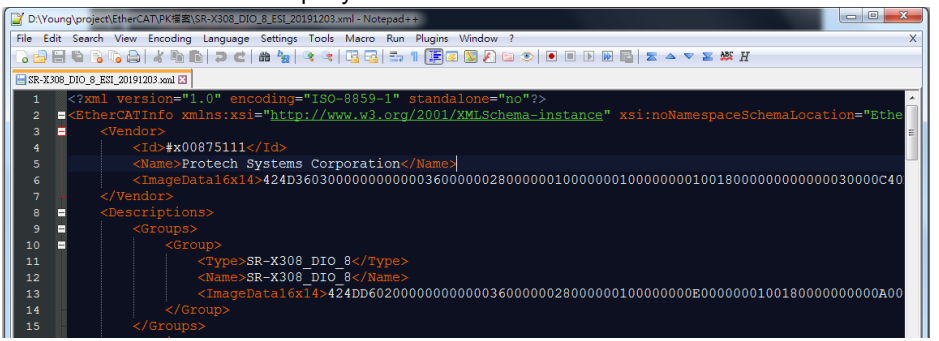
2.6.2.2 ESI File Rule

Each EtherCAT Slave shall be delivered with an EtherCAT Slave Information (ESI) file.

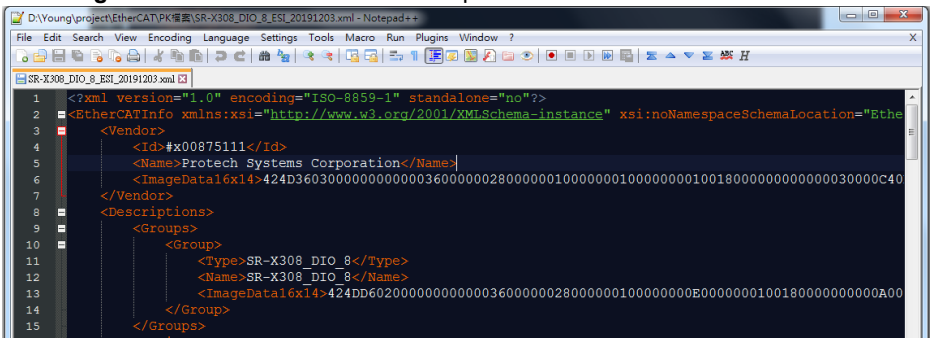
- **Vendor Id: #x00875111(Protech Systems Corporation)**



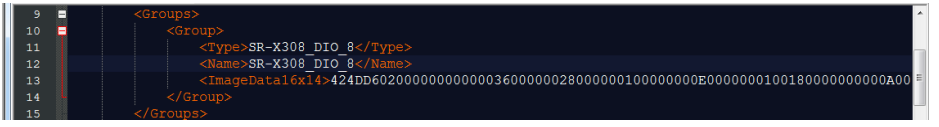
- **Name:** Name of the company

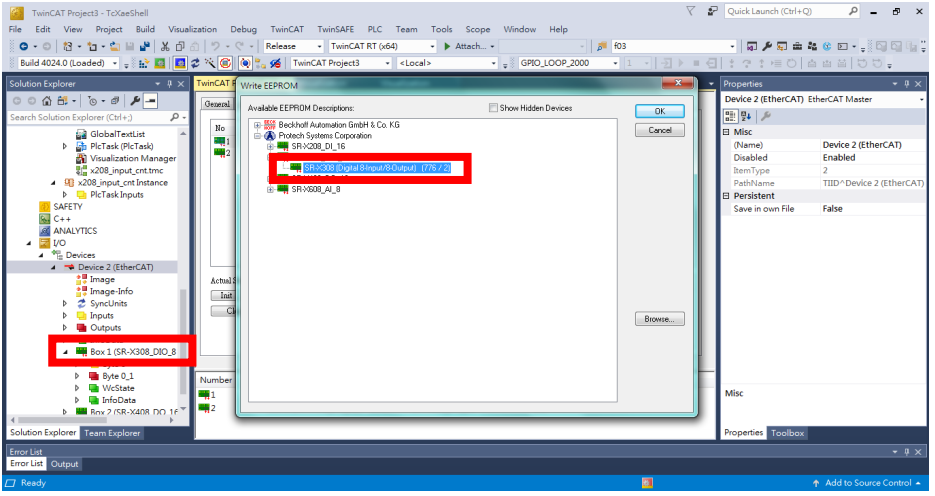


- **<ImageData16x14>:** Convert 16*14 bmp file into hexadecimal format



- **<Type>SR-X308_DIO_8</Type>**
- **<Name>SR-X308_DIO_8</Name>**





- **<Type ProductCode="#x00000308" RevisionNo="#x00000002">SR-X308_DIO_8 Digital I/O : 8 Input/8 Output</Type>**

```
<Devices>
    <Device Physics="YY">
        <Type ProductCode="#x00000308" RevisionNo="#x00000002">SR-X308_DIO_8 Digital I/O : 8 Input/8 Output</Type>
        <Name>SR-X308 (Digital 8-Input/8-Output)</Name>
        <GroupType>SR-X308_DIO_8</GroupType>
        <Fmmu>Outputs</Fmmu>
        <Fmmu>Inputs</Fmmu>
        <Sm StartAddress="#xf03" ControlByte="#x44" Enable="1">Outputs</Sm>
        <Sm ControlByte="#x00000000" StartAddress="#x1002" Enable="1">Inputs</Sm>
        <RxPdo Fixed="1" Sm="0">
            <Index>#x1600</Index>
            <Name>Byte 0</Name>
            <Entry>
                <Index>#x3101</Index>
                <SubIndex>1</SubIndex>
                <BitLen>8</BitLen>
```

- **SR-X308_DIO_8**

```
<Name>SR-X308 (Digital 8-Input/8-Output)</Name>
<GroupType>SR-X308_DIO_8</GroupType>
<Fmmu>Outputs</Fmmu>
<Fmmu>Inputs</Fmmu>
<Sm StartAddress="#xf03" ControlByte="#x44" Enable="1">Outputs</Sm>
<Sm ControlByte="#x00000000" StartAddress="#x1002" Enable="1">Inputs</Sm>
<RxPdo Fixed="1" Sm="0">
    <Index>#x1600</Index>
    <Name>Byte 0</Name>
    <Entry>
        <Index>#x3101</Index>
        <SubIndex>1</SubIndex>
        <BitLen>8</BitLen>
        <Name>Output</Name>
        <DataType>BITARR8</DataType>
    </Entry>
</RxPdo>
<TxPdo Fixed="1" Sm="1">
    <Index>#x1a00</Index>
    <Name>Byte 0</Name>
    <Entry>
        <Index>#x3001</Index>
        <SubIndex>1</SubIndex>
        <BitLen>8</BitLen>
        <Name>Input</Name>
        <DataType>BITARR8</DataType>
    </Entry>
</TxPdo>
<Dc>
    <OpMode>
```

2.6.2.3 Index Ranges

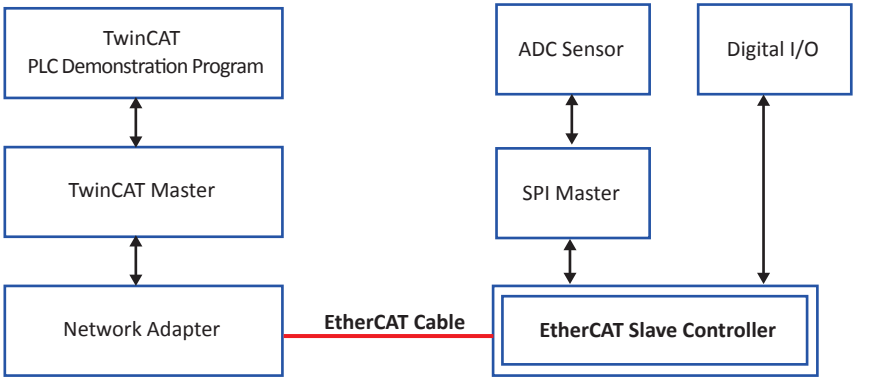
The index ranges depends on the used EtherCAT profile. The Basic index ranges used in the SSC are listed in the table below:

Table: Basic object index ranges

Index Range	Description
0x0000 – 0x0FFF	Data Type Area
0x1000 – 0x1FFF	Communication Area
0x1600 – 0x19FF	RxPDO Mapping
0x1A00 – 0x1BFF	TxPDO Mapping
0x1C10 – 0x1C2F	Sync Manager PDO Assignment
0x1C30 – 0x1C4F	Sync Manager Parameters

2.6.2.4 System Topology

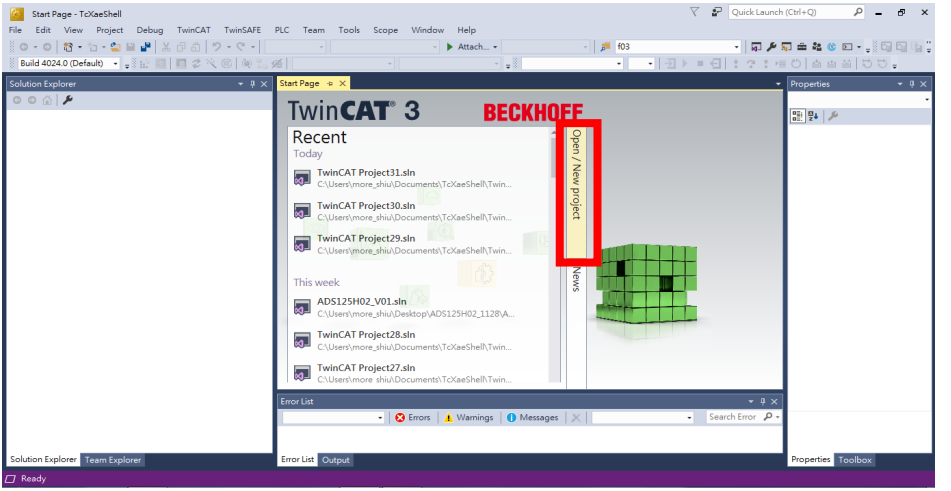
The system topology of demonstration is very simple. We only setup a TwinCAT master and let it connect to an EtherCAT slave. The following diagram illustrates topology and block diagram in system upper layer.



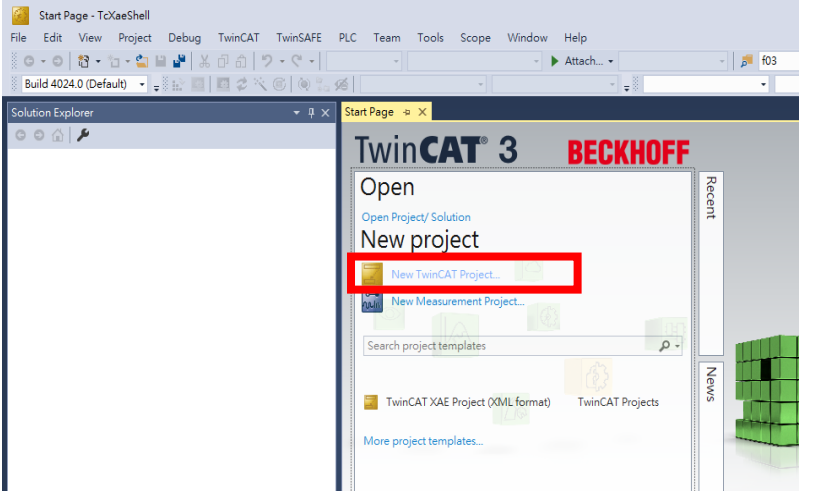
2.6.3 SI-X408

2.6.3.1 EEPROM Update

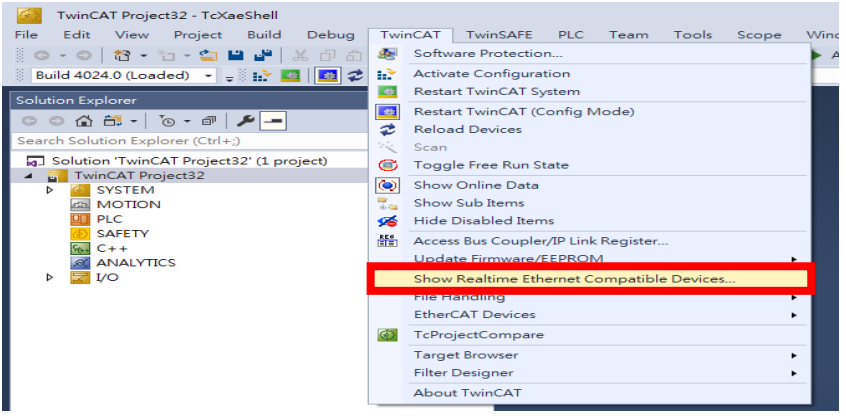
- **Step 1:** Click **"New TwinCAT Project…"**.



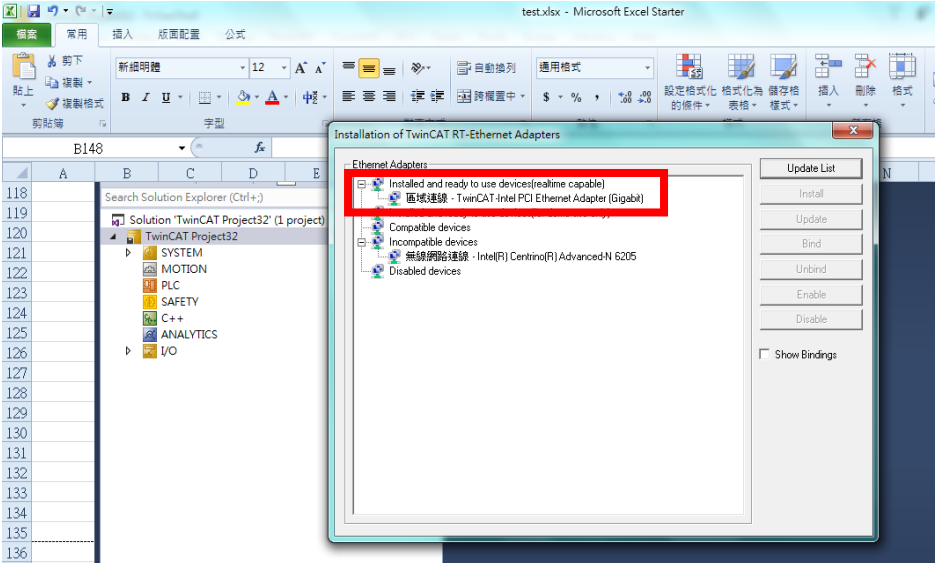
- **Step 2:** Specify "**Name**" and "**Location**". Click "**OK**".



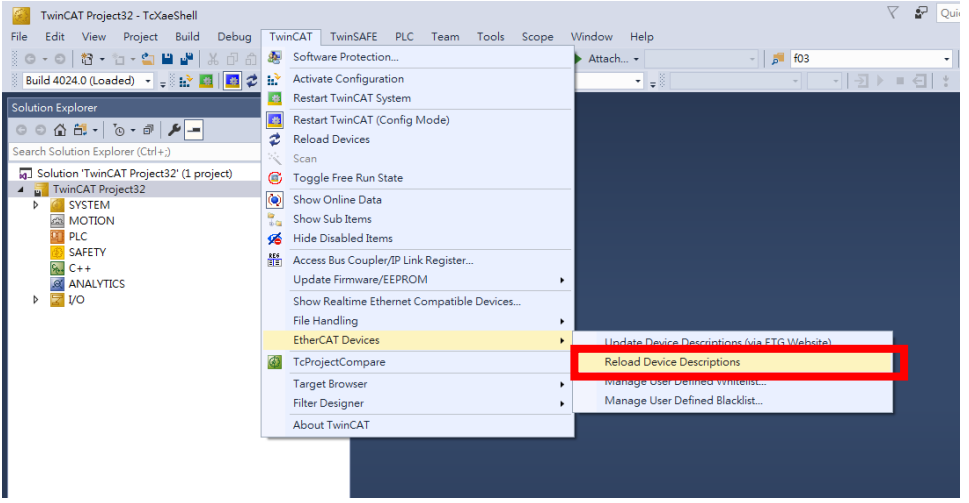
- **Step 3:** Click "**Show Realtime Ethernet Compatible Devices…**".



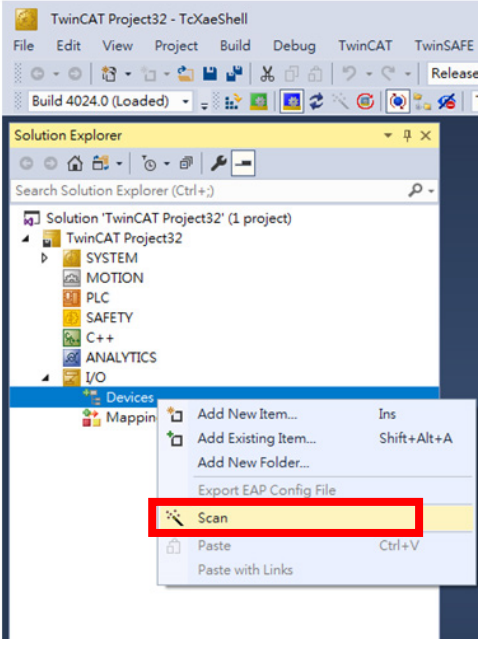
- **Step 4:** Make sure your network adapter has installed BECKHOFF EtherCAT real-time driver. If your network adapter appears under "**Compatible**", click the "**Install**" button to install BECKHOFF real-time driver.



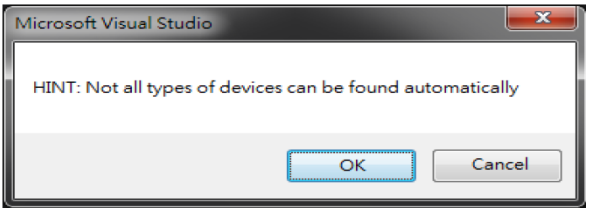
- **Step 5:** Click "**Reload Device Descriptions**".



- **Step 6:** Right-click on "**I/O -> Devices**" and select "**Scan**".

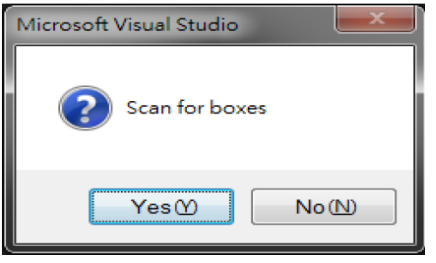


- **Step 7:** Click "**OK**" in the dialog box shown below:

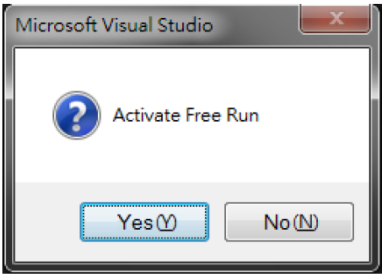


- **Step 8:** Select the correct local area connection that link to EtherCAT slave and click "**OK**".

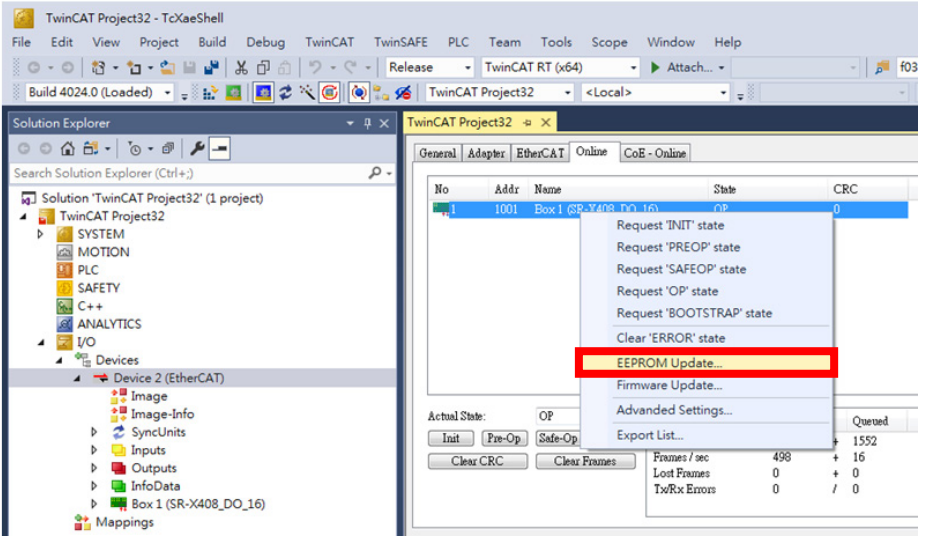
- **Step 9:** Click "**Yes**" in the dialog box shown below:



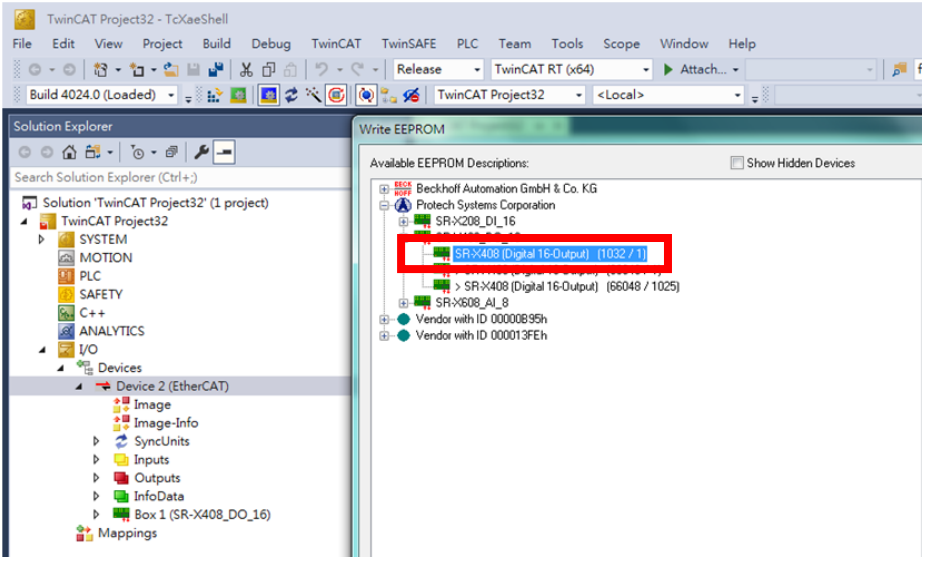
- **Step 10:** Click "**Yes**" in the dialog box shown below:



- **Step 11:** Click "**EEPROM Update…**".



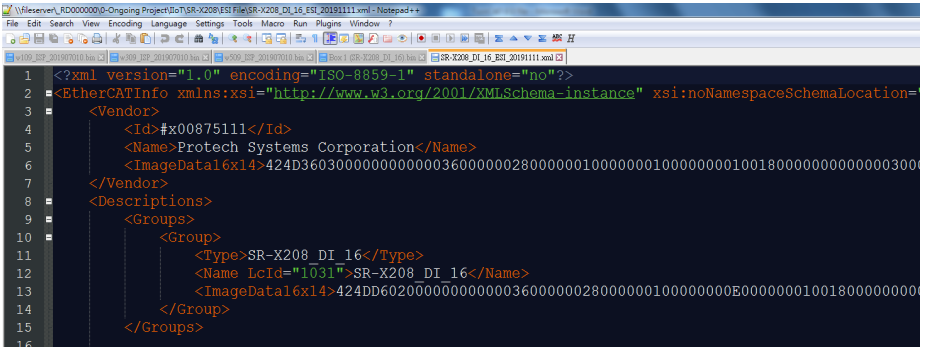
- **Step 12:** Select "**SR-X408[Digital 16-Output] [1032/1]**" and click "**OK**".



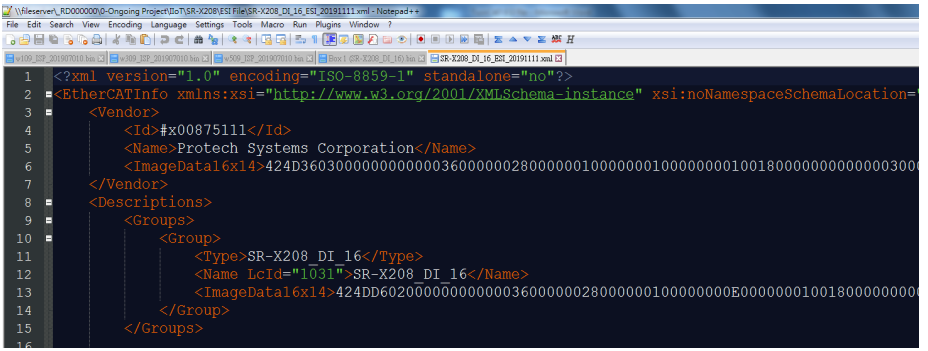
2.6.3.2 ESI File Rule

Each EtherCAT Slave shall be delivered with an EtherCAT Slave Information (ESI) file.

- **Vendor Id: #x00875111(Protech Systems Corporation)**

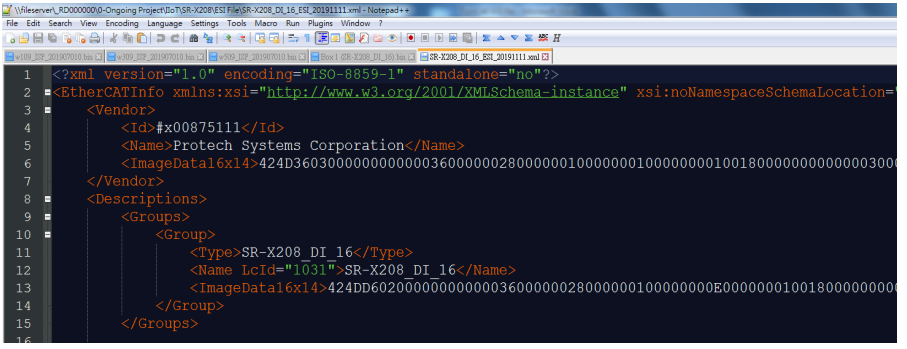


- **Name:** Name of the company



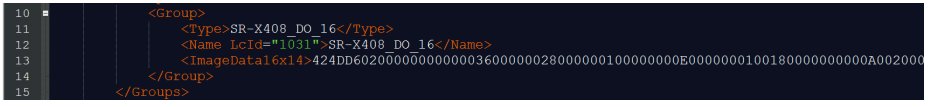
```
<?xml version="1.0" encoding="ISO-8859-1" standalone="no"?>
<EtherCATInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="
    <Vendor>
        <Id>#x00875111</Id>
        <Name>Protech Systems Corporation</Name>
        <ImageData16x14>424D3603000000000000360000002800000010000000100000000100180000000000003000
    </Vendor>
    <Descriptions>
        <Groups>
            <Group>
                <Type>SR-X208_DI_16</Type>
                <Name LcId="1031">SR-X208_DI_16</Name>
                <ImageData16x14>424DD602000000000000360000002800000010000000E000000010018000000000
            </Group>
        </Groups>
```

- **<ImageData16x14>:** Convert 16*14 bmp file into hexadecimal format

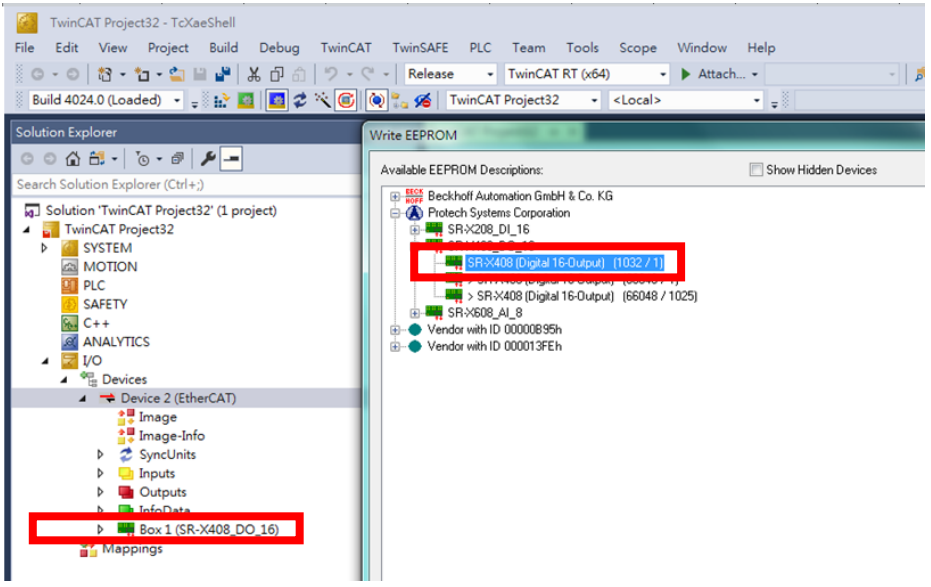


```
<?xml version="1.0" encoding="ISO-8859-1" standalone="no"?>
<EtherCATInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="
    <Vendor>
        <Id>#x00875111</Id>
        <Name>Protech Systems Corporation</Name>
        <ImageData16x14>424D3603000000000000360000002800000010000000100000000100180000000000003000
    </Vendor>
    <Descriptions>
        <Groups>
            <Group>
                <Type>SR-X208_DI_16</Type>
                <Name LcId="1031">SR-X208_DI_16</Name>
                <ImageData16x14>424DD602000000000000360000002800000010000000E000000010018000000000
            </Group>
        </Groups>
```

- **<Type>SR-X408_DO_16</Type>**
- **<Name LcId="1031">SR-X408_DO_16</Name>**



```
            <Group>
                <Type>SR-X408_DO_16</Type>
                <Name LcId="1031">SR-X408_DO_16</Name>
                <ImageData16x14>424DD602000000000000360000002800000010000000E000000010018000000000A002000
            </Group>
        </Groups>
```



- **<Type ProductCode="#x00000408" RevisionNo="#x00000001">SR-X408_DO_16</Type>**

```
17      <Devices>
18          <!-- DIO,   GPIO,       FMMU=2, SM=3,   DI=16,  DO=16,  ProductCode="#x00010200" RevisionN
19          <Device Physics="YY">
20              <Type ProductCode="#x00010200" RevisionNo="#x00000001">SR-X408_DO_16</Type>
21              <Name LcId="1031">SR-X408 (Digital 16-Output)</Name>
22              <GroupType>SR-X408_DO_16</GroupType>
23              <Fmmu>Outputs</Fmmu>
24              <Fmmu>Inputs</Fmmu>
25              <Sm StartAddress="#x0f02" ControlByte="#x44" Enable="1" OpOnly="1">Outputs</Sm>
26              <Sm StartAddress="#x0f03" ControlByte="#x44" Enable="1" OpOnly="1">Outputs</Sm>
27              <Sm StartAddress="#x1000" ControlByte="0" Enable="1">Inputs</Sm>
```

- **SR-X208 DI-16**

```
<TxPdo Fixed="1" Sm="2">
    <Index>#x1600</Index>
    <Name>Byte 0</Name>
    <Entry>
        <Index>#x3001</Index>
        <SubIndex>1</SubIndex>
        <BitLen>8</BitLen>
        <Name>Input</Name>
        <DataType>BITARR8</DataType>
    </Entry>
</TxPdo>
<TxPdo Fixed="1" Sm="2">
    <Index>#x1601</Index>
    <Name>Byte 1</Name>
    <Entry>
        <Index>#x3001</Index>
        <SubIndex>2</SubIndex>
        <BitLen>8</BitLen>
        <Name>Input</Name>
        <DataType>BITARR8</DataType>
    </Entry>
</TxPdo>
```

- **SR-X408 DO-16**

```
<RxPdo Fixed="1" Sm="0">
    <Index>#x1a00</Index>
    <Name>Byte 0</Name>
    <Entry>
        <Index>#x3101</Index>
        <SubIndex>1</SubIndex>
        <BitLen>8</BitLen>
        <Name>Output</Name>
        <DataType>BITARR8</DataType>
    </Entry>
</RxPdo>
<RxPdo Fixed="1" Sm="1">
    <Index>#x1a01</Index>
    <Name>Byte 1</Name>
    <Entry>
        <Index>#x3101</Index>
        <SubIndex>2</SubIndex>
        <BitLen>8</BitLen>
        <Name>Output</Name>
        <DataType>BITARR8</DataType>
    </Entry>
</RxPdo>
```

2.6.3.3 Index Ranges

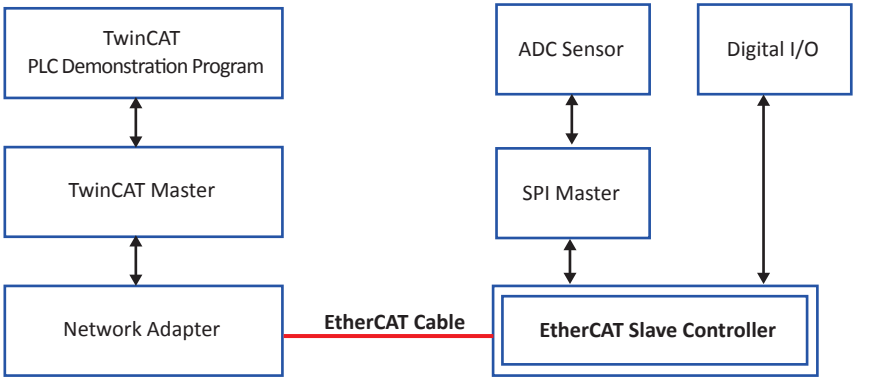
The index ranges depends on the used EtherCAT profile. The Basic index ranges used in the SSC are listed in the table below:

Table: Basic object index ranges

Index Range	Description
0x0000 – 0x0FFF	Data Type Area
0x1000 – 0x1FFF	Communication Area
0x1600 – 0x19FF	RxPDO Mapping
0x1A00 – 0x1BFF	TxPDO Mapping
0x1C10 – 0x1C2F	Sync Manager PDO Assignment
0x1C30 – 0x1C4F	Sync Manager Parameters

2.6.3.4 System Topology

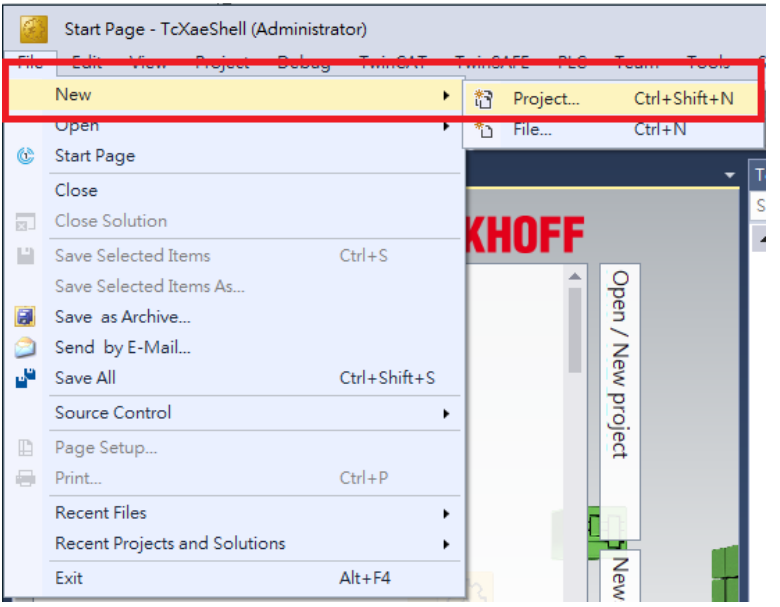
The system topology of demonstration is very simple. We only setup a TwinCAT master and let it connect to an EtherCAT slave. The following diagram illustrates topology and block diagram in system upper layer.

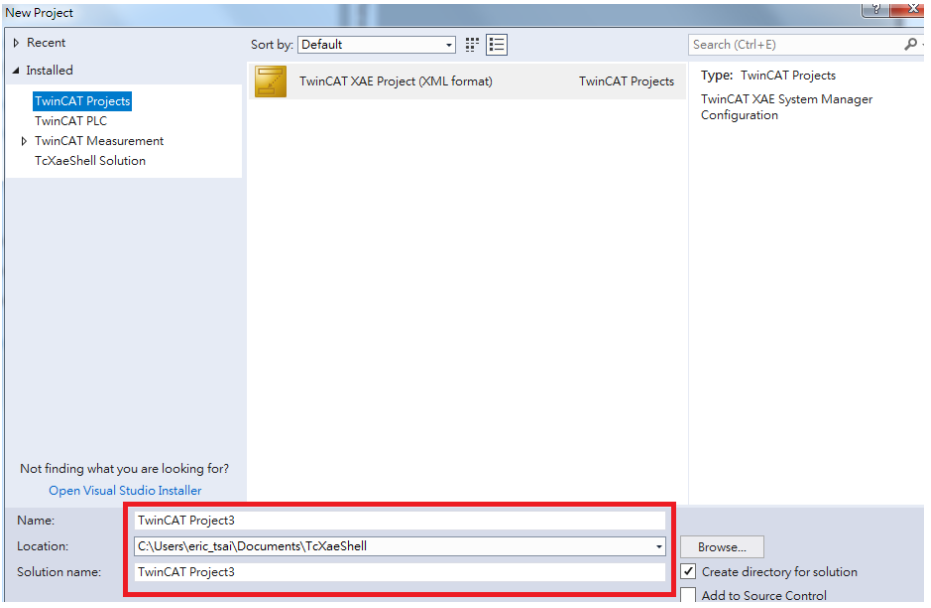


2.6.4 SI-X608

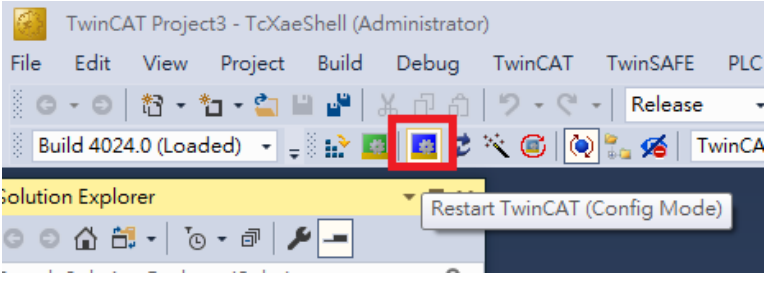
2.6.4.1 Scan Device

(1) Create a new project in TwinCat.

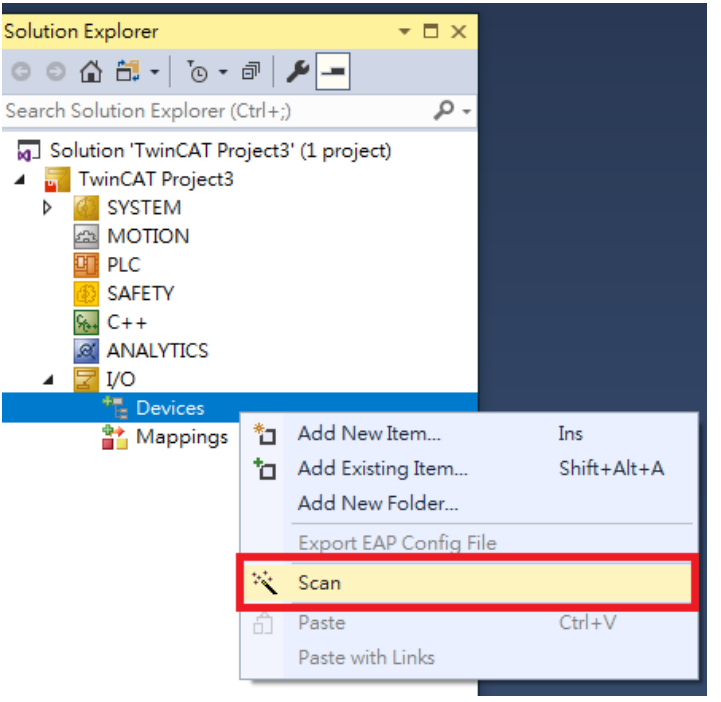


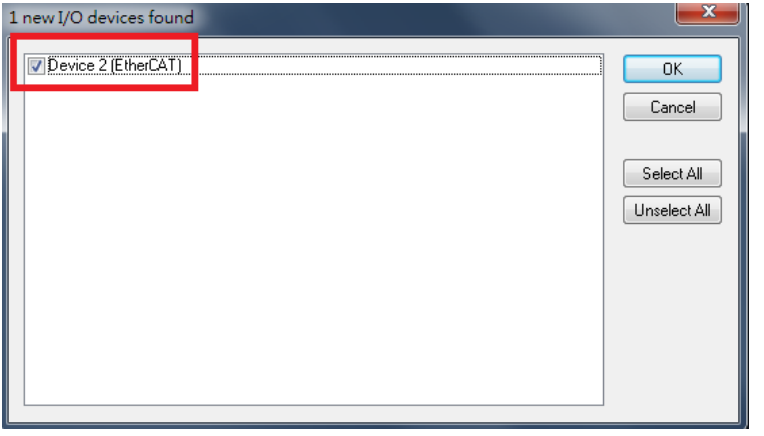


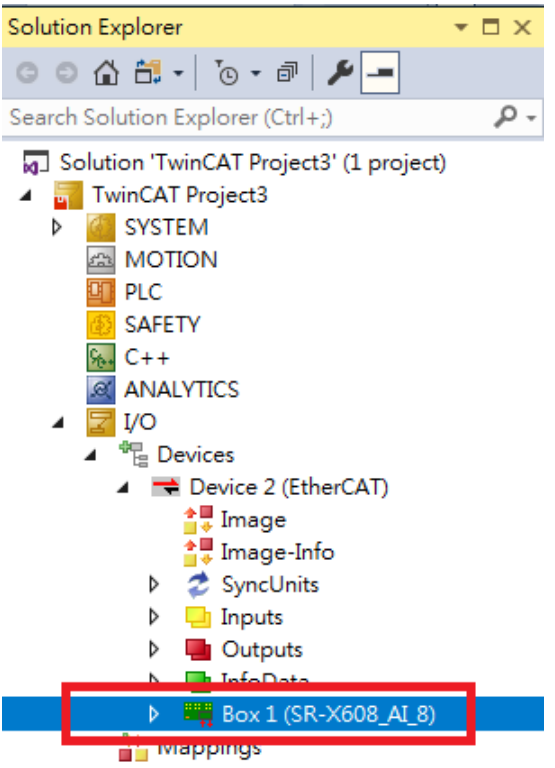
(2) Switch to configuration mode



(3) Scan Device

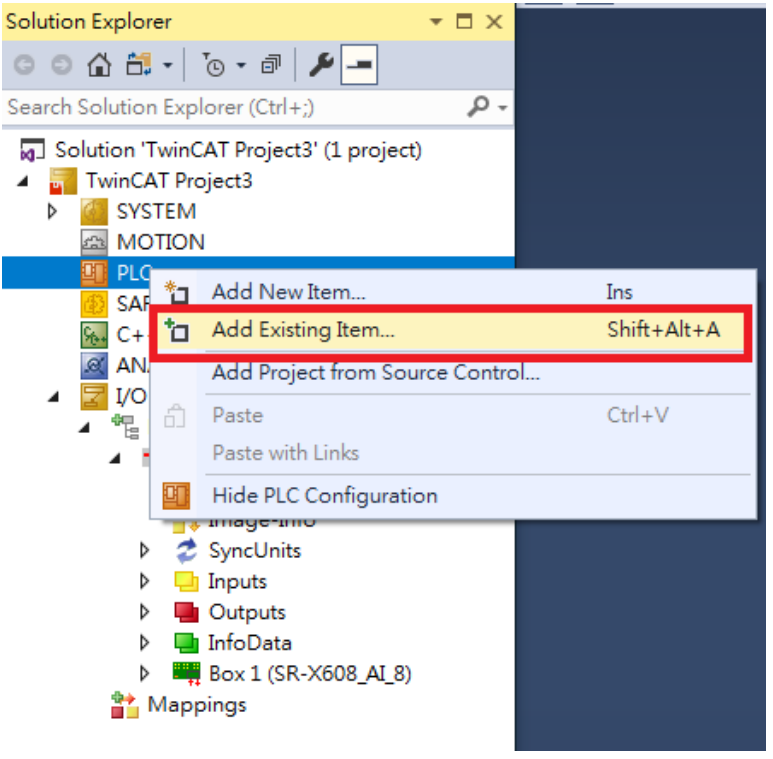


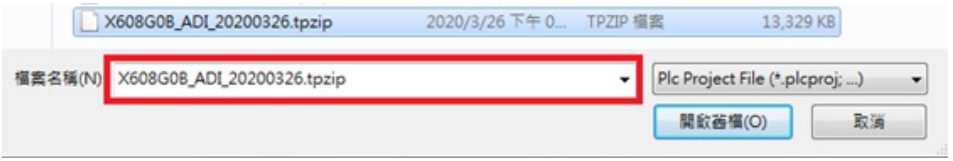



Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'TwinCAT Project3' (1 project)
TwinCAT Project3
SYSTEM
MOTION
PLC
SAFETY
C++
ANALYTICS
I/O
Devices
Device 2 (EtherCAT)
Image
Image-Info
SyncUnits
Inputs
Outputs
Box 1 (SR-X608_AI_8)

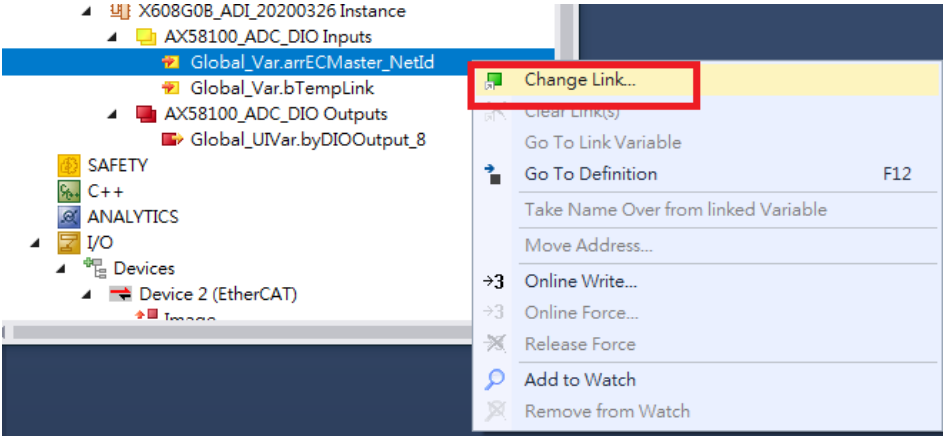
2.6.4.2 Import PLC Code

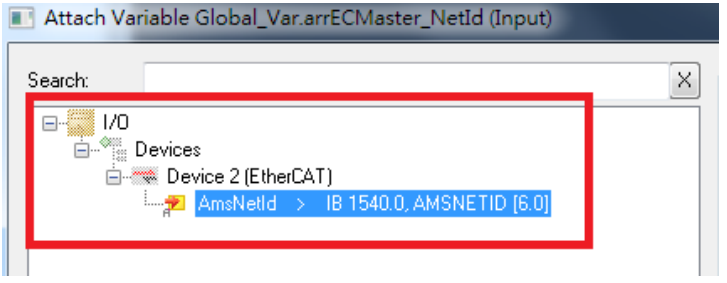
(1) Add Existing Item

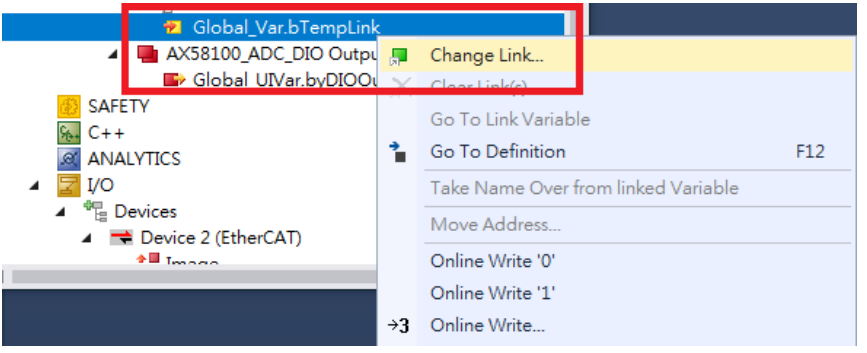


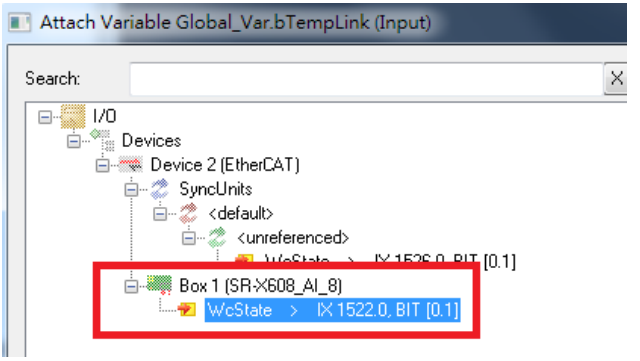


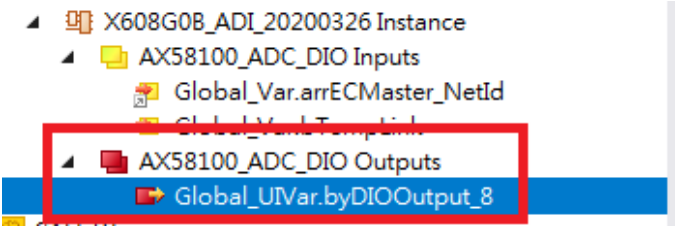
(2) Link ID and GPIO

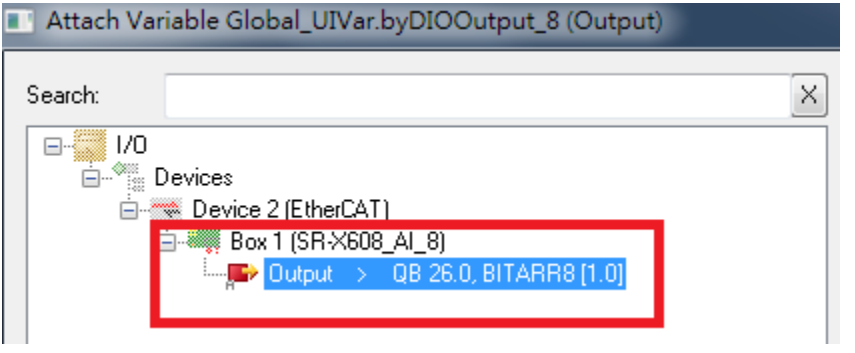






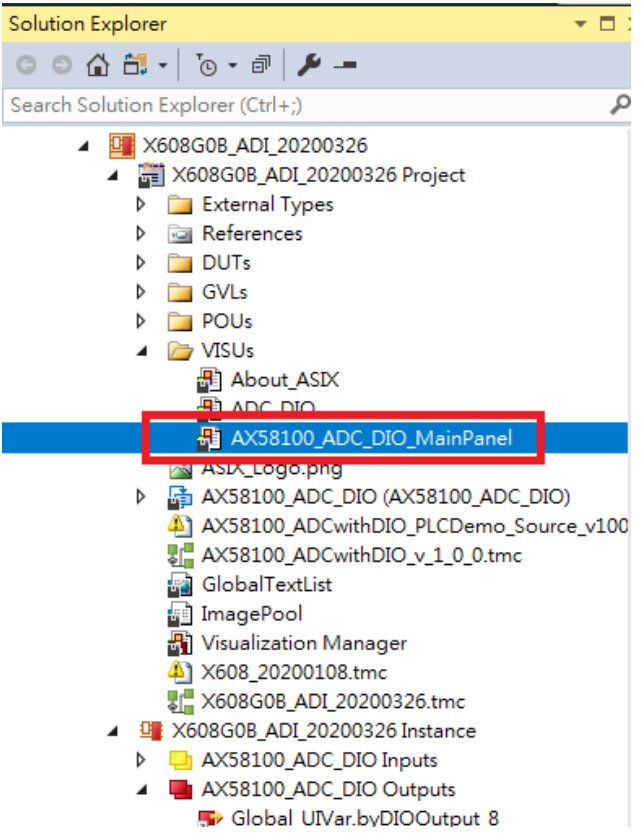

Attach Variable Global_Var.bTempLink (Input)
Search:
I/O
Devices
Device 2 (EtherCAT)
SyncUnits
<default>
<unreferenced>
Box 1 (SR-X608_AI_8)
WcState > IX 1522.0, BIT [0.1]


X608G0B_ADI_20200326 Instance
AX58100_ADC_DIO Inputs
Global_Var.arrECMaster_NetId
AX58100_ADC_DIO Outputs
Global_UIVar.byDIOOutput_8

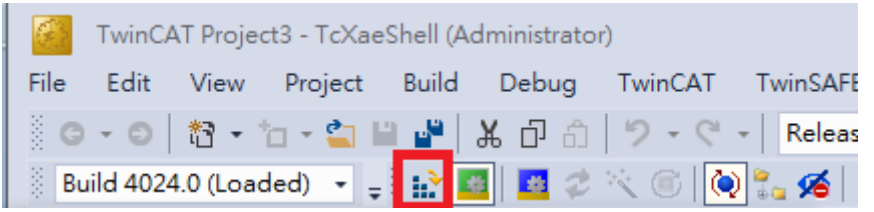

Attach Variable Global_UIVar.byDIOOutput_8 (Output)
Search:
I/O
Devices
Device 2 (EtherCAT)
Box 1 (SR-X608_AI_8)
Output > QB 26.0, BITARR8 [1.0]

2.6.4.3 GUI

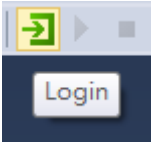
(1) VISU folder

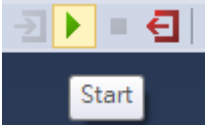


(2) Activate configuration

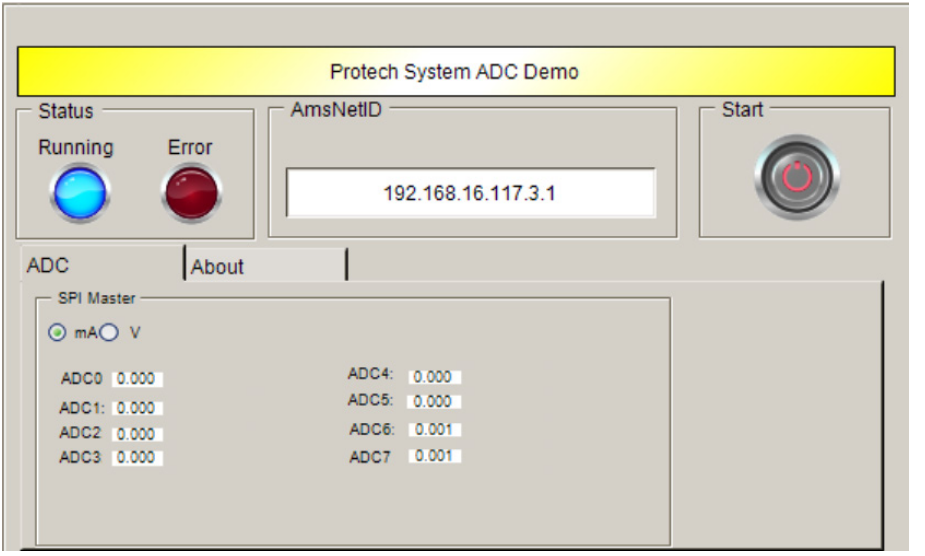


(3) Login and start

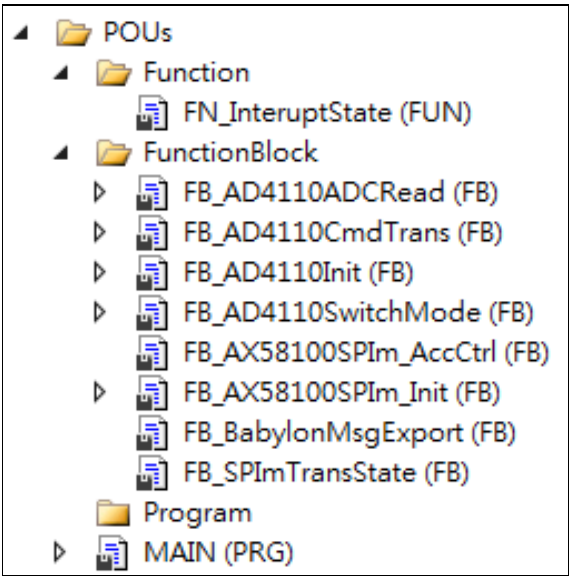




(4) GUI information (V and mA)



2.6.4.4 PLC Code POU Description



Functional Name	Description
main	Main function
FB_AD4110ADCRead	AD4110 data read
FB_AD4110CmdTrans	AD4110 command
FB_AD4110Init	AD4110 initial
AD4110SwitchMode	AD4110 volt and current switch
FB_AX58100SPIm_AccCtrl	AX58100 SPI control
FB_AX58100_SPIm_Init	AX58100 SPI initial
FB_SPImTransState	AX58100 SPI low level layer

2.7 Safety Precautions

Before operating SI-Xx08 I/O module, read the following information carefully to protect it from damages, and extend the life cycle of SI-Xx08 I/O Module.

1. Check the Line Voltage

- The operating voltage for the power supply should be within the range of 9~48V DC; otherwise, SI-Xx08 may be damaged.

2. Environmental Conditions

- Install DIN-Rail Mount on SI-Xx08. Be sure to allow enough space around SI-Xx08 to have easy access needs.
- Avoid direct sunlight exposure for a long period of time (for example, in a closed car in summer time. Also keep SI-Xx08 from any heating device.). Or do not use SI-Xx08 when it has been left outdoors in a cold winter day.
- Avoid moving SI-Xx08 rapidly from a hot place to a cold place, and vice versa, because condensation may occur inside SI-Xx08.
- Do not place SI-Xx08 too close to any radio-active device. Radio-active device may cause signal interference.

3. Handling

- Avoid placing heavy objects on the top of SI-Xx08.
- Do not allow any objects to fall into this device.
- If water or other liquid spills into the device, unplug the power cord immediately.

4. Good Care

- When the outside case gets stained, remove the stains using neutral washing agent with a dry cloth.
- Never use strong agents such as benzene and thinner to clean the surface of the case.
- If heavy stains are present, moisten a cloth with diluted neutral washing agent or alcohol and then wipe thoroughly with a dry cloth.
- If dust is accumulated on the case surface, remove it by using a special vacuum cleaner for computers.

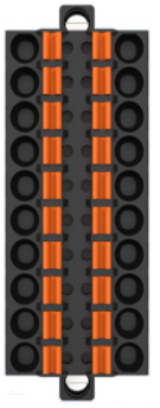
3 Hardware Configuration

This chapter describes the information of pin assignment, wire connection and DIN-Rail mount installation.

The following topics are included:

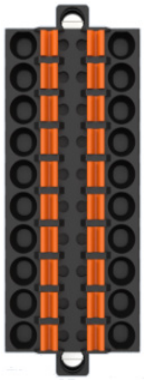
- PIN Assignment
- Wire Connection
- Installing DIN-Rail Mount

3.1 SI-X208 Pin Assignment

Terminal No.	Pin Assignment		Pin Assignment	Terminal No.
2	EC0		EC1	1
4	DI0		DI8	3
6	DI1		DI9	5
8	DI2		DI10	7
10	DI3		DI11	9
12	DI4		DI12	11
14	DI5		DI13	13
16	DI6		DI14	15
18	DI7		DI15	17
20	DRY		DRY	19

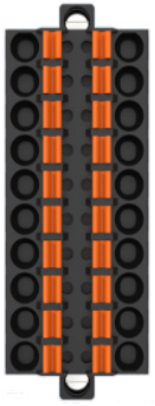
Signal Name	Description
DI0~DI15	Isolated Digital Input
EC0, EC1	External common VCC/GND for isolated digital input EC0 for DI0~DI7 EC1 for DI8~DI15
DRY	External ground for isolated digital input

3.2 SI-X308 Pin Assignment

Terminal No.	Pin Assignment		Pin Assignment	Terminal No.
2	EC0		PC0	1
4	DI0		DO0	3
6	DI1		DO1	5
8	DI2		DO2	7
10	DI3		DO3	9
12	DI4		DO4	11
14	DI5		DO5	13
16	DI6		DO6	15
18	DI7		DO7	17
20	DRY		GND	19

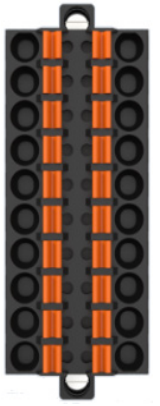
Signal Name	Description
DI0~DI7	Isolated Digital Input
EC0	External common VCC/GND for isolated digital input
DRY	External ground for isolated digital input
DO0~DO7	Isolated Digital Output
PC0	Freewheeling common diode for isolated digital output
GND	External ground for isolated digital output

3.3 SI-X408 Pin Assignment

Terminal No.	Pin Assignment		Pin Assignment	Terminal No.
2	PC0		PC1	1
4	DO0		DO8	3
6	DO1		DO9	5
8	DO2		DO10	7
10	DO3		DO11	9
12	DO4		DO12	11
14	DO5		DO13	13
16	DO6		DO14	15
18	DO7		DO15	17
20	GND		GND	19

Signal Name	Description
D00~D015	Isolated Digital Output
PC0, PC1	Freewheeling common diode for isolated digital output PC0 for DO0~DO7 PC1 for DO8~DO15
GND	External ground for isolated digital Output

3.4 SI-X608 Pin Assignment

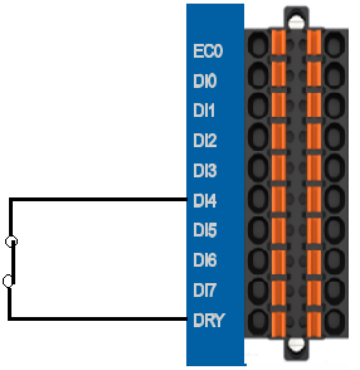
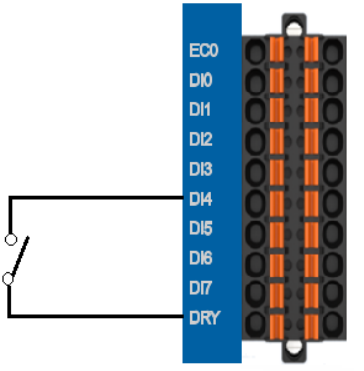
Terminal No.	Pin Assignment		Pin Assignment	Terminal No.
2	V0+		V0-	1
4	V1+		V1-	3
6	V2+		V2-	5
8	V3+		V3-	7
10	V4+		V4-	9
12	V5+		V5-	11
14	V6+		V6-	13
16	V7+		V7-	15
18	AGND		AGND	17
20	AGND		AGND	19

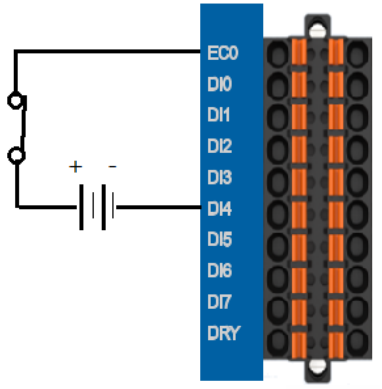
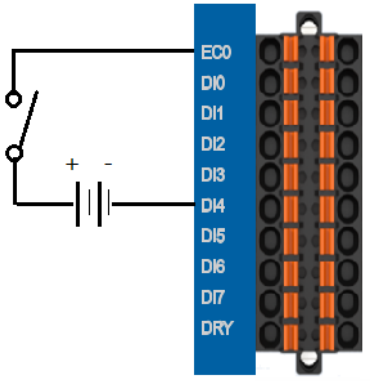
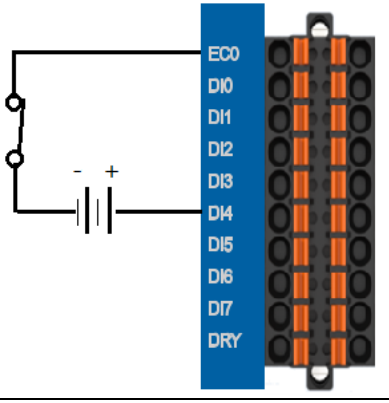
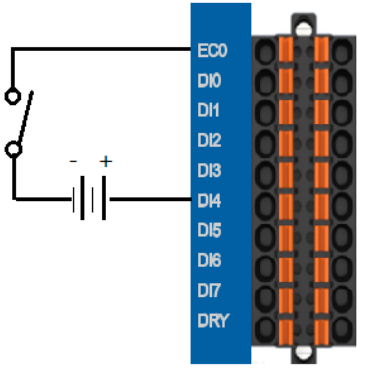
Signal Name	Description
V0+ ~ V7+	Analog positive input channels 0 through 7
V0- ~ V7-	Analog negative input channels 0 through 7
AGND	External Ground for Analog Input

3.5 I/O Connections

3.5.1 Isolated Digital Input Connections

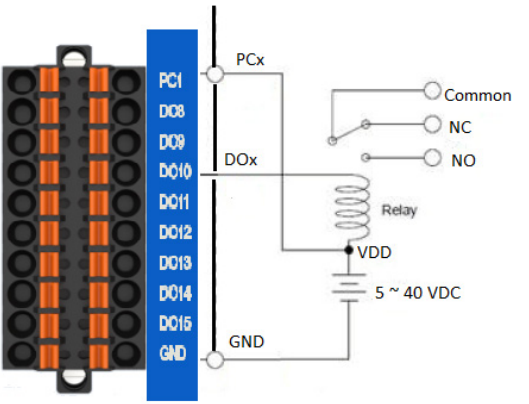
The acceptable voltage range of all isolated digital input channels is from 10 to 30 V DC for Wet contact type. There are two external common pins for digital input channels. EC0 is for DI0 ~ DI7 and EC1 is for DI8 ~ DI15. Also all isolated digital input channels are supported for dry contact. The figure below shows the connections between an external input source and isolated input channels of I/O module for Dry contact and Wet Contact.

Digital Input	On Voltage Level, "1"	Off Voltage Level, "0"
Dry Contact	Close to DRY 	Open 

Digital Input	On Voltage Level, "1"	Off Voltage Level, "0"
Wet Contact - Sink	+10 ~ +30VDC 	<+3VDC or Open 
Wet Contact - Source	+10 ~ +30VDC 	<+3VDC or Open 

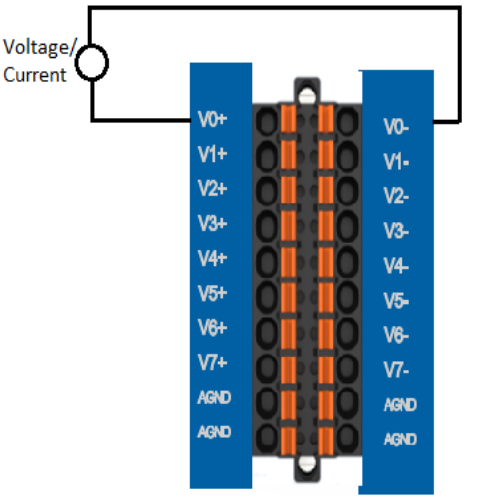
3.5.2 Isolated Digital Output Connections

The voltage range of external source is from +5 ~ +40V. And the external source is connected to each isolated digital output channel and the maximum load current is 350mA for each channel. Also the Isolated digital Output modules provide GND pin isolated digital output connection. The figure below shows the connections between an external output load and the module's isolated output.

Digital Output	

3.5.3 Isolated Analog Input Connections

SI-X608 has 8 differential analog input channels. See the picture below for connections:

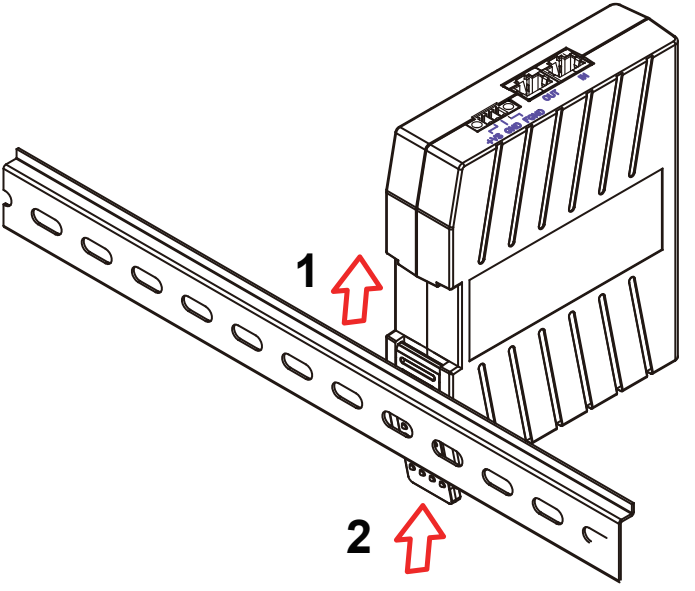
Analog Input	

3.6 Installing DIN-Rail Mount

Step 1. Use 35mm DIN-RAIL and install it into the groove located on the rear side of the system.

Step 2. Push the bottom hinge upwards to secure DIN-RAIL onto the system.

The DIN-RAIL Mount installation is then completed.



3.7 Technical Support

If you have any technical question after you purchase our product, you can use the following form to contact our technical support staff.

https://www.protech.com.tw/Support/Technical_us.asp

When you request technical support, please provide the following information to our technical support staff.

1. Module Name and Serial Number: The serial number can be found printed on the barcode label attached on the rating label.
2. Host Configuration information, including type and operating system.
3. How to reproduce the technical question you meet?
   Please give full details to describe the procedures to reproduce the problem.
4. If the problem involves other hardware accessories or programs, please provide the details of the problem.
5. Any comments or suggestions related to the problem are welcome.