NEXCOM International Co., Ltd.

IoT Automation Solutions Business Group
EtherCAT Slave Module
NEIO Series
User Manual

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PREFACE

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Acknowledgements

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Regulatory Compliance Statements

This section provides the FCC compliance statement for Class B devices and describes how to keep the system CE compliant.

Declaration of Conformity

FCC

This equipment has been tested and verified to comply with the limits for a Class B digital device, pursuant to Part 15 of 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 instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area (domestic environment) is likely to cause harmful interference, in which case the user will be required to correct the interference (take adequate measures) at their own expense.

CE

The product(s) described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

RoHS Compliance

NEXCOM RoHS Environmental Policy and Status Update

NEXCOM is a global citizen for building the digital infrastructure. We are committed to providing green products and services, which are compliant with European Union RoHS (Restriction on Use of Hazardous Substance in Electronic Equipment) directive 2011/65/EU, to be your trusted green partner and to protect our environment.

RoHS restricts the use of Lead (Pb) < 0.1% or 1,000ppm, Mercury (Hg) < 0.1% or 1,000ppm, Cadmium (Cd) < 0.01% or 100ppm, Hexavalent Chromium (Cr6+) < 0.1% or 1,000ppm, Polybrominated biphenyls (PBB) < 0.1% or 1,000ppm, and Polybrominated diphenyl Ethers (PBDE) < 0.1% or 1,000ppm.

In order to meet the RoHS compliant directives, NEXCOM has established an engineering and manufacturing task force in to implement the introduction of green products. The task force will ensure that we follow the standard NEXCOM development procedure and that all the new RoHS components and new manufacturing processes maintain the highest industry quality levels for which NEXCOM are renowned.

The model selection criteria will be based on market demand. Vendors and suppliers will ensure that all designed components will be RoHS compliant.

How to recognize NEXCOM RoHS Products?

For existing products where there are non-RoHS and RoHS versions, the suffix "(LF)" will be added to the compliant product name.

All new product models launched after January 2013 will be RoHS compliant. They will use the usual NEXCOM naming convention.

Warranty and RMA

NEXCOM Warranty Period

NEXCOM manufactures products that are new or equivalent to new in accordance with industry standard. NEXCOM warrants that products will be free from defect in material and workmanship for 2 years, beginning on the date of invoice by NEXCOM. HCP series products (Blade Server) which are manufactured by NEXCOM are covered by a three year warranty period.

NEXCOM Return Merchandise Authorization (RMA)

- Customers shall enclose the "NEXCOM RMA Service Form" with the returned packages.

- Customers must collect all the information about the problems encountered and note anything abnormal or, print out any on-screen messages, and describe the problems on the "NEXCOM RMA Service Form" for the RMA number apply process.

- Customers can send back the faulty products with or without accessories (manuals, cable, etc.) and any components from the card, such as CPU and RAM. If the components were suspected as part of the problems, please note clearly which components are included. Otherwise, NEXCOM is not responsible for the devices/parts.

- Customers are responsible for the safe packaging of defective products, making sure it is durable enough to be resistant against further damage and deterioration during transportation. In case of damages occurred during transportation, the repair is treated as "Out of Warranty."

- Any products returned by NEXCOM to other locations besides the customers' site will bear an extra charge and will be billed to the customer.

Repair Service Charges for Out-of-Warranty Products

NEXCOM will charge for out-of-warranty products in two categories, one is basic diagnostic fee and another is component (product) fee.

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System Level

- Component fee: NEXCOM will only charge for main components such as SMD chip, BGA chip, etc. Passive components will be repaired for free, ex: resistor, capacitor.

- Items will be replaced with NEXCOM products if the original one cannot be repaired. Ex: motherboard, power supply, etc.

- Replace with 3rd party products if needed.

- If RMA goods can not be repaired, NEXCOM will return it to the customer without any charge.

Board Level

- Component fee: NEXCOM will only charge for main components, such as SMD chip, BGA chip, etc. Passive components will be repaired for free, ex: resistors, capacitors.

- If RMA goods can not be repaired, NEXCOM will return it to the customer without any charge.

Warnings

Read and adhere to all warnings, cautions, and notices in this guide and the documentation supplied with the chassis, power supply, and accessory modules. If the instructions for the chassis and power supply are inconsistent with these instructions or the instructions for accessory modules, contact the supplier to find out how you can ensure that your computer meets safety and regulatory requirements.

Cautions

Electrostatic discharge (ESD) can damage system components. Do the described procedures only at an ESD workstation. If no such station is available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the computer chassis.

Safety Information

Before installing and using the device, note the following precautions:

- Read all instructions carefully.

- Do not place the unit on an unstable surface, cart, or stand.

- Follow all warnings and cautions in this manual.

- When replacing parts, ensure that your service technician uses parts specified by the manufacturer.

- Avoid using the system near water, in direct sunlight, or near a heating device.

- The load of the system unit does not solely rely for support from the rackmounts located on the sides. Firm support from the bottom is highly necessary in order to provide balance stability.

- The computer is provided with a battery-powered real-time clock circuit. There is a danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Installation Recommendations

Ensure you have a stable, clean working environment. Dust and dirt can get into components and cause a malfunction. Use containers to keep small components separated.

Adequate lighting and proper tools can prevent you from accidentally damaging the internal components. Most of the procedures that follow require only a few simple tools, including the following:

- A Philips screwdriver

- A flat-tipped screwdriver

- A grounding strap

- An anti-static pad

Using your fingers can disconnect most of the connections. It is recommended that you do not use needle-nose pliers to disconnect connections as these can damage the soft metal or plastic parts of the connectors.

Safety Precautions

1. Read these safety instructions carefully.

2. Keep this User Manual for later reference.

3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.

4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.

5. Keep this equipment away from humidity.

6. Put this equipment on a stable surface during installation. Dropping it or letting it fall may cause damage.

7. The openings on the enclosure are for air convection to protect the equipment from overheating. DO NOT COVER THE OPENINGS.

8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.

9. Place the power cord in a way so that people will not step on it. Do not place anything on top of the power cord. Use a power cord that has been approved for use with the product and that it matches the voltage and current marked on the product's electrical range label. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product.

10. All cautions and warnings on the equipment should be noted.

11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.

12. Never pour any liquid into an opening. This may cause fire or electrical shock.

13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.

14. If one of the following situations arises, get the equipment checked by service personnel:
    a. The power cord or plug is damaged.
    b. Liquid has penetrated into the equipment.
    c. The equipment has been exposed to moisture.
    d. The equipment does not work well, or you cannot get it to work according to the user's manual.
    e. The equipment has been dropped and damaged.
    f. The equipment has obvious signs of breakage.

15. Do not place heavy objects on the equipment.

16. The unit uses a three-wire ground cable which is equipped with a third pin to ground the unit and prevent electric shock. Do not defeat the purpose of this pin. If your outlet does not support this kind of plug, contact your electrician to replace your obsolete outlet.

17. CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER. DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

Technical Support and Assistance

1. For the most updated information of NEXCOM products, visit NEXCOM's website at www.nexcom.com.

2. For technical issues that require contacting our technical support team or sales representative, please have the following information ready before calling:
   – Product name and serial number
   – Detailed information of the peripheral devices
   – Detailed information of the installed software (operating system, version, application software, etc.)
   – A complete description of the problem
   – The exact wordings of the error messages

Warning!
1. Handling the unit: carry the unit with both hands and handle it with care.

2. Maintenance: to keep the unit clean, use only approved cleaning products or clean with a dry cloth.

Conventions Used in this Manual

Warning:
Information about certain situations, which if not observed, can cause personal injury. This will prevent injury to yourself when performing a task.

Caution:
Information to avoid damaging components or losing data.

Note:
Provides additional information to complete a task easily.

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CHAPTER 1: PRODUCT INTRODUCTION

1.1 Overview

Introduction

NEIO is a series of EtherCAT slave I/O modules for distributed industrial applications. Each module is equipped with high density I/O (up to 32 points) and powerful features in a compact size. DIN-rail design and daisy-chain wiring powered by EtherCAT technology make it easy to install NEIO modules in the field. NEIO provides a wide variety of I/O combinations with standard ESI file so that users can always find suitable I/O modules for their high-speed EtherCAT-based applications.

Highlights

- High-density I/O Points

- Ease-of-maintenance

- State-of-art Design

- Standard EtherCAT Slaves

- Rich I/O Selections

1.2 Product Appearance

EtherCAT Connector (OUT)

Status LEDs

EtherCAT Connector (IN)

I/O Terminal Blocks

Channel Status LEDs

PWR RUN

IN

OUT

DI 16 17 18 19 20 21 22 23   DI 24 25 26 27 28 29 30 31

NEXCOM   EtherCAT
                         NEIO B1101

DI 0 1 2 3 4 5 6 7   DI 8 9 10 11 12 13 14 15

DC IN   + − ⏚

24V$_{DC}$ Input

I/O Terminal Blocks

Channel Status LEDs
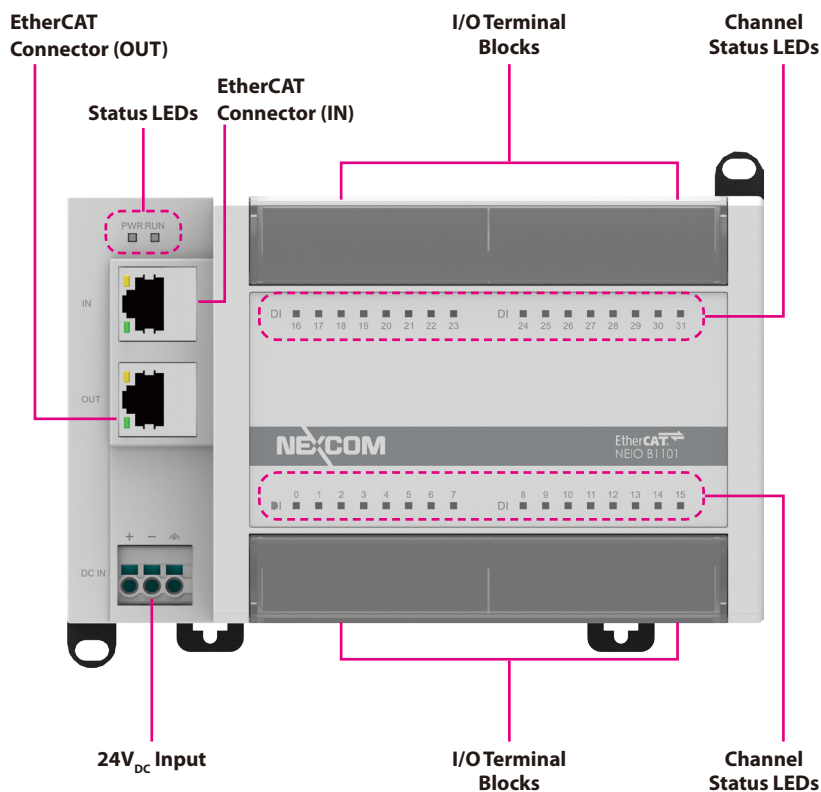
Status LEDs

Indicates the status of power and communication.

EtherCAT Connector (IN)

Used to connect an EtherCAT master system or the previous slave module.

EtherCAT Connector (OUT)

Used to connect the next slave module.

24V$_{DC}$ Input

Used to wire power cable.

I/O Terminal Blocks

Used to connect I/O signals.

Channel Status LEDs

Indicates the status of I/O channels.

1.3 Key Features

Finger-safe Wiring Cover
Smart latch design for easy opening/closing

- Flexibility to be installed in control cabinets
- Safe operation when connecting to I/O circuits

On-module LED indicators
LEDs for module status and I/O information

- Clear I/O status indication
- Quickly diagnose faults with multiple LEDs

Multiple mounting methods
DIN-rail mounting and
wall mounting

- Works with standard DIN-rail
- Easy to install in most applications

Detachable screw terminals
Secure screw connection
technology

- Flexible wiring to terminals
  on-module or off-module
- Easy to switch modules while
  keeping existing wiring
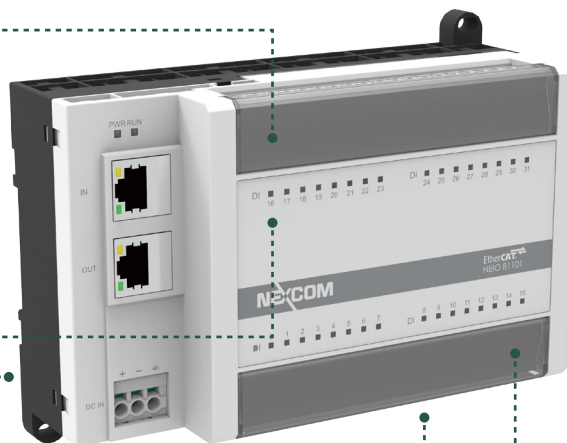
User-friendly wiring labels
Professional wiring instructions
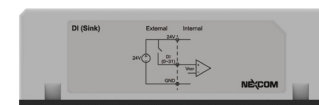
- Detailed wiring diagram
- Instantly operate the I/O module with the given wiring information

QR code for ESI file
QR code sticker on module

- Quick access to ESI download link
- Also link to related product information

Rotational pin-assignment marks
Self-explanatory pin-assignment information

- No blind spots when checking pin assignments
- Easy maintenance even when the module is installed in a cabinet

1.4 Model Designation

Digital Input Module

Model Name	Channels	Wiring Type	Description	Ordering Information
NEIO-B1101	32-ch	sink	$24V_{DC}$, filter 3ms (IEC 61131-2 type 1/2/3)	10J80110100X0
NEIO-B1102	32-ch	sink / source	$24V_{DC}$, filter 1ms	10J80110200X0

Digital Output Module

Model Name	Channels	Wiring Type	Description	Ordering Information
NEIO-B1201	32-ch	sink	$24V_{DC}$, output current 0.5A	10J80120100X0
NEIO-B1202	32-ch	source	$24V_{DC}$, output current 0.5A	10J80120200X0

Mixed Digital Input/Output Module

Model Name	Channels	Wiring Type	Description	Ordering Information
NEIO-B1811	32-ch	DI: sink DO: sink	16-ch DI, $24V_{DC}$, filter 3ms (IEC 61131-2 type 1/2/3) 16-ch DO, $24V_{DC}$, output current 0.5A	10J80181100X0
NEIO-B1812	32-ch	DI: sink/source DO: source	16-ch DI, $24V_{DC}$, filter 1ms 16-ch DO, $24V_{DC}$, output current 0.5A	10J80181200X0

1.5 General Specifications

General Specifications	
Dimensions (WxHxD)	155 x 95 x 57.4 mm
Weight	324g ± 20%
Mounting	DIN-Rail (35mm) / wall mount
Operating Temperature	0 ~ +55 °C
Storage Temperature	-40 ~ +85 °C
Relative Humidity	5~95 %, no condensation
Ingress Protection Ratings	IP 20
Vibration Resistance	IEC 60068-2-6 (2G, 10~500 Hz, Sine, Operating) IEC 60068-2-64 (2Grms, 10~500 Hz, Random, Operating)
Shock Resistance	IEC 60068-2-27 (25G @ Din-rail, Half Sine, 11ms, Operating)
Drop Resistance	IEC 60068-2-32 (Gross weight: 324g, falling height 97cm)
EMC Emission	EN 61000-6-4
Certifications	CE/FCC Class A

1.6 Mechanical Dimensions
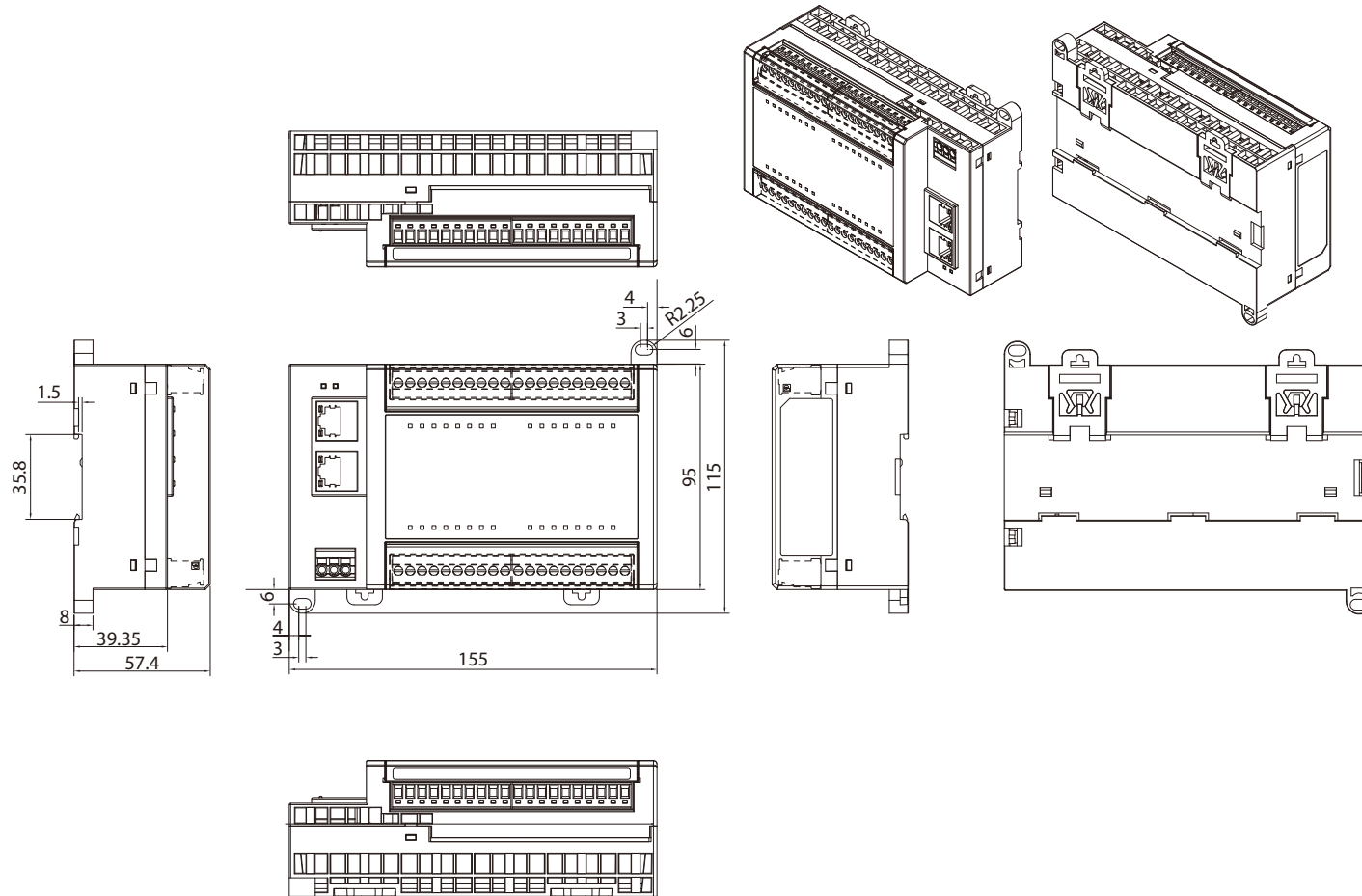
1.7 Hardware Installation Guidelines

This section includes information about how to wire and mount NEIO modules.

1.7.1 Wiring Instructions

▪ Wiring the 24 V$_{DC}$ Power

1. The 3-pin connector on the bottom left side of the module is the connector for 24 V$_{DC}$ input.

2. Insert a flat-tipped screw driver vertically into the square hole to open the spring inside the terminal block.
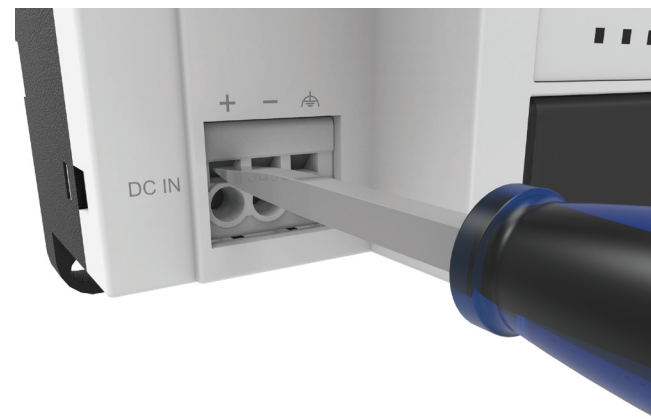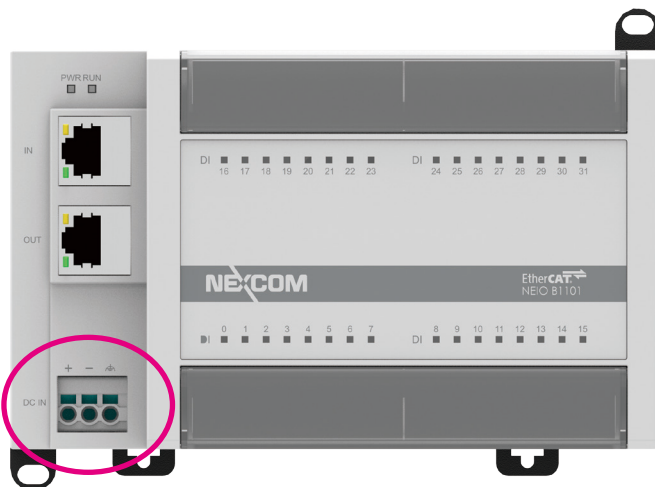
3. Insert wires into the circular hole and confirm they are in the correct position.
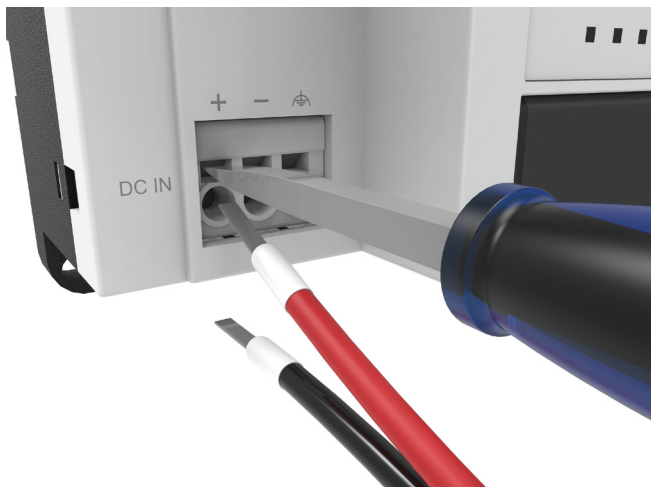
- The terminal block for power connector is spring type with 5mm pitch (3-pin).
- The recommended wire size is AWG 26 ~12 (0.2~2.5mm^2), and the suggested wire stripping length is around 9mm ~ 10 mm.
- The recommended tool is 0.5x3.0mm flat-tipped screw driver.

4. Remove the flat-tipped screw driver from the square hole, and check that the wires are clamped firmly.

▪ **Wiring the I/O Signal**

1. Insert wires into the terminal block in the correct positions. You can find the pin-assignments on the wiring covers, and you can refer to the wiring label on the side of the module for more information about the wiring diagram.
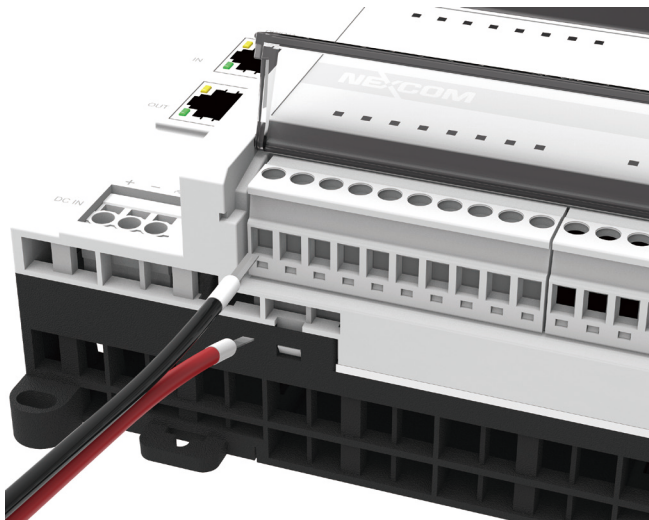
2. Use a flat-tipped screw driver to tighten the wires.
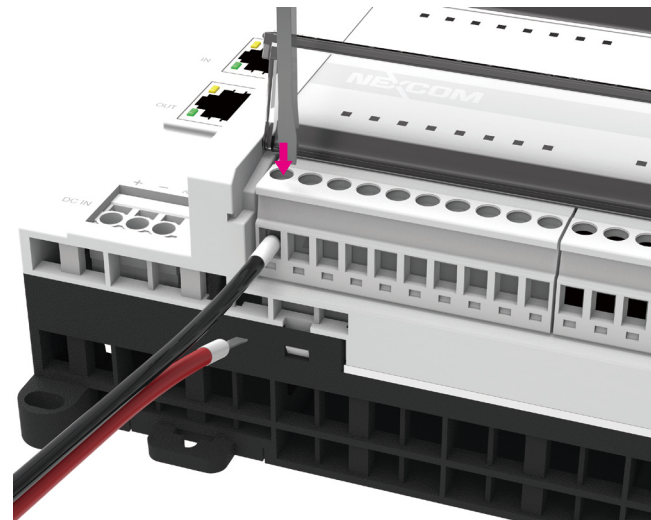
3. Check that the wires are clamped firmly.

- The terminal block is a detachable screw terminal with 5mm pitch, 10-pin, and 90-degree.
- The recommended wire size is solid wire AWG 28 ~12 (0.2~4mm^2) or stranded wire AWG 30 ~12 (0.2~2.5 mm^2), and the suggested wire stripping length is around 7mm ~ 8mm.
- The recommended tool is 0.6 x 3.5mm flat-tipped screw driver.

1.7.2 Mounting Instructions

▪ **DIN-Rail Mounting**

1. Turn over the module and slide down the two mounting clips on the bottom side.
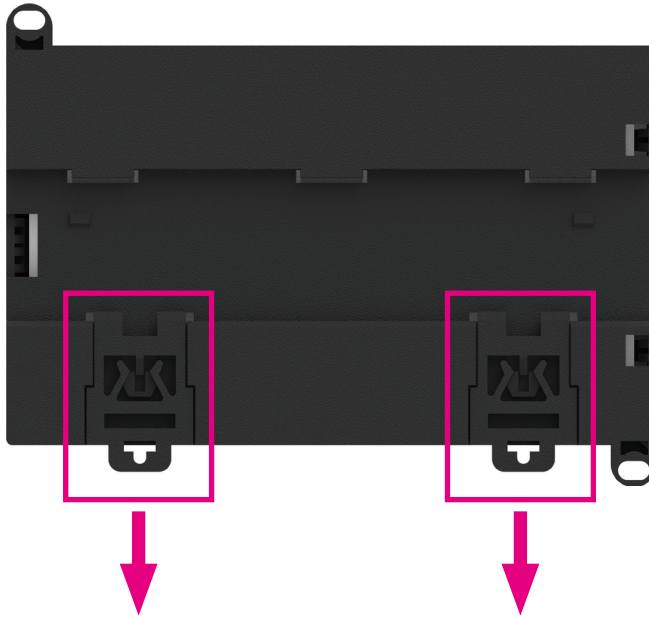
2. Place the module on the mounting rail at a tilted angle. (DIN-rail size: 35mm x 15mm).
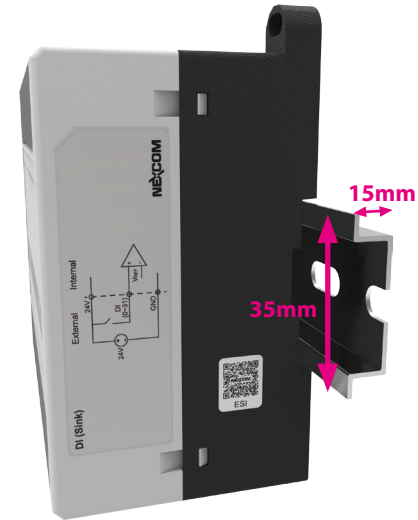
3. Slide up the two clips to lock the module.

4. The minimum mounting distance from the DIN-rail to the bottom of the module is 6cm.

6cm
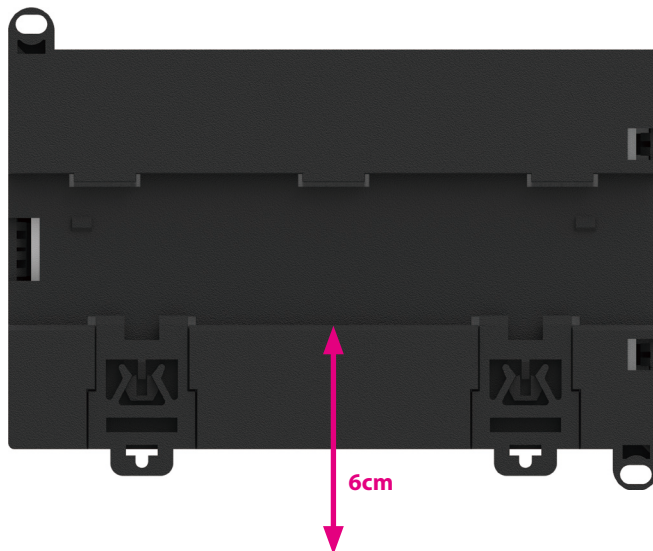
▪ **Wall Mounting**

1. Each module has two mounting-screw holes on the top and bottom as shown below.

2. Mount the module with M4 screws.

CHAPTER 2: DIGITAL INPUT MODULE

2.1 NEIO-B1101 32-ch Digital Input (Sink) EtherCAT Slave Module

2.1.1 Introduction

NEIO-B1101 is a 32-channel sink type digital input EtherCAT slave module. The voltage input of NEIO-B1101 is $24V_{DC}$ which complies with IEC-61131-2 Standard. All of the NEIO modules are provided with high isolation protection, and verified by the EtherCAT conformance test tool. Therefore NEIO is a reliable module to implement in your applications.

2.1.2 Wiring Diagram
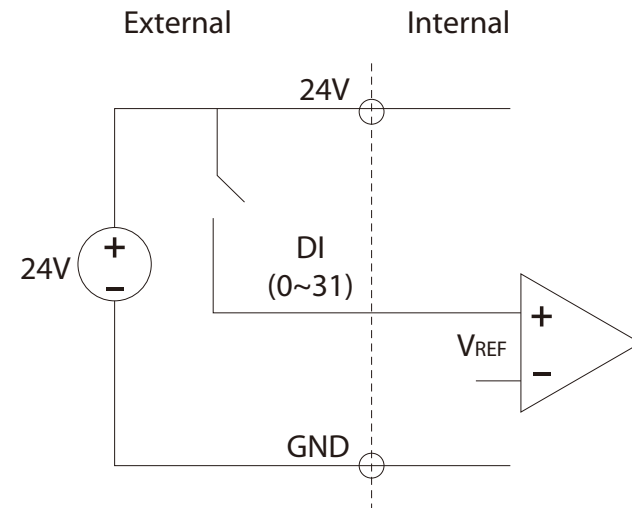
2.1.3 Pin Assignments
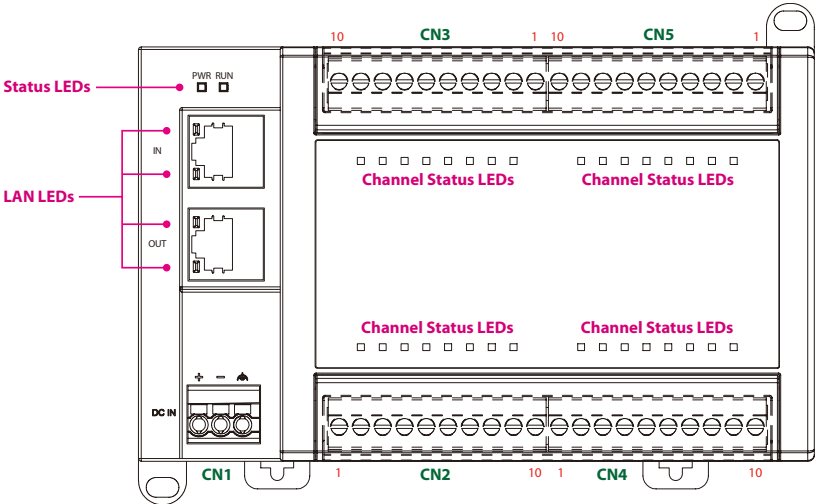
CN1: Power

Pin	Description
1	V +
2	V -
3	GND

CN2: Digital Input

Pin	Description
1	DI 0
2	DI 1
3	DI 2
4	DI 3
5	DI 4
6	DI 5
7	DI 6
8	DI 7
9	24V
10	GND

CN3: Digital Input

Pin	Description
1	GND
2	24V
3	DI 23
4	DI 22
5	DI 21
6	DI 20
7	DI 19
8	DI 18
9	DI 17
10	DI 16

CN4: Digital Input

Pin	Description
1	DI 8
2	DI 9
3	DI 10
4	DI 11
5	DI 12
6	DI 13
7	DI 14
8	DI 15
9	24V
10	GND

CN5: Digital Input

Pin	Description
1	GND
2	24V
3	DI 31
4	DI 30
5	DI 29
6	DI 28
7	DI 27
8	DI 26
9	DI 25
10	DI 24

2.1.4 LED Indicators

Status LEDs

LED	Status	Color	Description
PWR	On	Green	Power on (Power input range: 24 V_{DC}, ±20%).
	Off	-	Power off.
RUN	On	Green	The module is in the Operational state.
	Blinking	Green	The module is in the Safe-operational state.
	Blinking	Green	The module is in the Pre-operational state.
	Off	-	The module is in the Initial state.

LAN LEDs

LED	Communication Speed	Link	Act
LINK ACT	0	Off	Off
	10 Mbps	Off	Blinking (Yellow)
	100 Mbps	On (Green)	Blinking (Yellow)

Channel Status LEDs

LED	Status	Color	Description
DI 0 ~ DI 31	On	Green	On-state voltage: 11 ~ 30 V_{DC}
DI 0 ~ DI 31	Off	-	Off-state voltage: 0 ~ 5 V_{DC}

2.1.5 Hardware Specifications

Power Input	
Nominal Voltage Input	24V_{DC}
Power Input Range	Minimum 19.2V_{DC} ~ Maximum 28.8V_{DC} (24V_{DC}, ±20%)
Power Consumption	2W
Electrical Isolation	2.5KV
Terminal Block	Spring type (3P, 5.00mm)
Cross Sections	0.2~2.5mm² / AWG 26 ~ 12
Digital Input	
Channels	32
Input Type	24V_{DC} (sink)
Input Filter	3 ms
On-state Voltage, "1"	15 ~ 30 V_{DC} (IEC 61131-2 type 1) 11 ~ 30 V_{DC} (IEC 61131-2 type 2/3)
Off-state Voltage, "0"	0 ~ 5 V_{DC} (IEC 61131-2 type 1/2/3)
Input Current	0.62 mA
Electrical Isolation	3 KV
Terminal Block	Detachable screw terminals (90°, 10P, 5.00mm)
Cross Sections	Solid wire: 0.2 ~ 4mm² / AWG 28 ~ 12 Stranded wire: 0.2 ~ 2.5mm² / AWG 30 ~ 12

2.1.6 Object Dictionary

The following table describes the Process Data Objects (PDOs) of NEIO-B1101. The PDOs are used to transmit the cyclic communication data which are also defined in the ESI File.

Index	Mapping Index	Bit Length	Description	Data Type	Index	Mapping Index	Bit Length	Description	Data Type
0x1a00	0x6000:01	1	Channel 0	BOOL	0x1a10	0x6000:17	1	Channel 16	BOOL
0x1a01	0x6000:02	1	Channel 1	BOOL	0x1a11	0x6000:18	1	Channel 17	BOOL
0x1a02	0x6000:03	1	Channel 2	BOOL	0x1a12	0x6000:19	1	Channel 18	BOOL
0x1a03	0x6000:04	1	Channel 3	BOOL	0x1a13	0x6000:20	1	Channel 19	BOOL
0x1a04	0x6000:05	1	Channel 4	BOOL	0x1a14	0x6000:21	1	Channel 20	BOOL
0x1a05	0x6000:06	1	Channel 5	BOOL	0x1a15	0x6000:22	1	Channel 21	BOOL
0x1a06	0x6000:07	1	Channel 6	BOOL	0x1a16	0x6000:23	1	Channel 22	BOOL
0x1a07	0x6000:08	1	Channel 7	BOOL	0x1a17	0x6000:24	1	Channel 23	BOOL
0x1a08	0x6000:09	1	Channel 8	BOOL	0x1a18	0x6000:25	1	Channel 24	BOOL
0x1a09	0x6000:10	1	Channel 9	BOOL	0x1a19	0x6000:26	1	Channel 25	BOOL
0x1a0a	0x6000:11	1	Channel 10	BOOL	0x1a1a	0x6000:27	1	Channel 26	BOOL
0x1a0b	0x6000:12	1	Channel 11	BOOL	0x1a1b	0x6000:28	1	Channel 27	BOOL
0x1a0c	0x6000:13	1	Channel 12	BOOL	0x1a1c	0x6000:29	1	Channel 28	BOOL
0x1a0d	0x6000:14	1	Channel 13	BOOL	0x1a1d	0x6000:30	1	Channel 29	BOOL
0x1a0e	0x6000:15	1	Channel 14	BOOL	0x1a1e	0x6000:31	1	Channel 30	BOOL
0x1a0f	0x6000:16	1	Channel 15	BOOL	0x1a1f	0x6000:32	1	Channel 31	BOOL

2.2 NEIO-B1102 32-ch Digital Input (Sink/Source) EtherCAT Slave Module

2.2.1 Introduction

The NEIO-B1102 is a 32-channel sink/source type digital input EtherCAT slave module. The input filter of NEIO-B1102 is 1ms, and its normal input voltage is 24V_{DC}. All of the NEIO modules are provided with high isolation protection, and verified by the EtherCAT conformance test tool. Therefore NEIO is a reliable module to implement in your applications.

2.2.2 Wiring Diagram
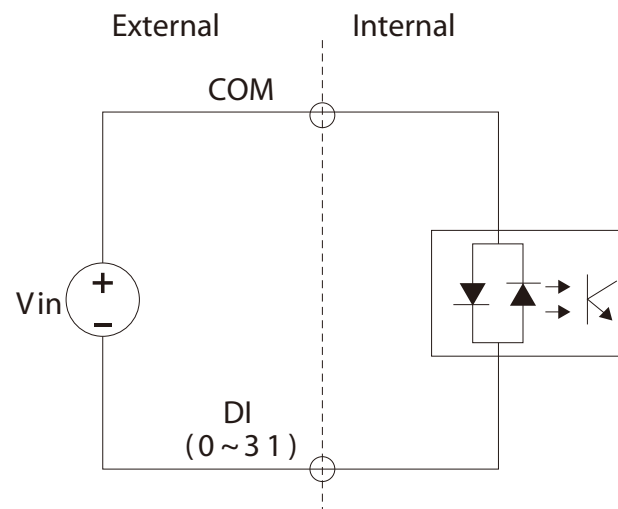
2.2.3 Pin Assignments
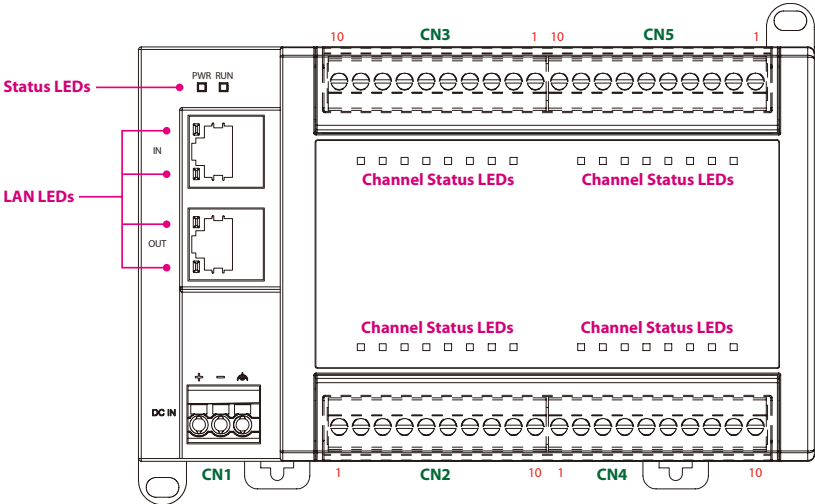
CN1: Power

Pin	Description
1	V +
2	V -
3	GND

CN2: Digital Input

Pin	Description
1	DI 0
2	DI 1
3	DI 2
4	DI 3
5	DI 4
6	DI 5
7	DI 6
8	DI 7
9	COM
10	COM

CN3: Digital Input

Pin	Description
1	COM
2	COM
3	DI 23
4	DI 22
5	DI 21
6	DI 20
7	DI 19
8	DI 18
9	DI 17
10	DI 16

CN4: Digital Input

Pin	Description
1	DI 8
2	DI 9
3	DI 10
4	DI 11
5	DI 12
6	DI 13
7	DI 14
8	DI 15
9	COM
10	COM

CN5: Digital Input

Pin	Description
1	COM
2	COM
3	DI 31
4	DI 30
5	DI 29
6	DI 28
7	DI 27
8	DI 26
9	DI 25
10	DI 24

2.2.4 LED Indicators

Status LEDs

LED	Status	Color	Description
PWR	On	Green	Power on (Power input range: 24 V_{DC}, ±20%).
	Off	-	Power off.
RUN	On	Green	The module is in the Operational state.
	Blinking	Green	The module is in the Safe-operational state.
	Blinking	Green	The module is in the Pre-operational state.
	Off	-	The module is in the Initial state.

LAN LEDs

LED	Communication Speed	Link	Act
LINK ACT	0	Off	Off
	10 Mbps	Off	Blinking (Yellow)
	100 Mbps	On (Green)	Blinking (Yellow)

Channel Status LEDs

LED	Status	Color	Description
DI 0 ~ DI 31	On	Green	On-state voltage: 9~24 V_{DC} (sink) 0~15 V_{DC} (source)
DI 0 ~ DI 31	Off	-	Off-state voltage: 0~8 V_{DC} (sink) 16~24 V_{DC} (source)

2.2.5 Hardware Specifications

Power Input	
Nominal Voltage Input	24V_{DC}
Power Input Range	Minimum 19.2V_{DC} ~ Maximum 28.8V_{DC} (24V_{DC}, ±20%)
Power Consumption	2.5W
Electrical Isolation	2.5KV
Terminal Block	Spring type (3P, 5.00mm)
Cross Sections	0.2~2.5mm² / AWG 26 ~ 12
Digital Input	
Channels	32
Input Type	24V_{DC} (sink/source)
Input Filter	1 ms
On-state Voltage, "1"	9 ~ 24 V_{DC}
Off-state Voltage, "0"	0 ~ 8 V_{DC}
Input Current	3.6 mA
Electrical Isolation	3 KV
Terminal Block	Detachable screw terminals (90°, 10P, 5.00mm)
Cross Sections	Solid wire: 0.2 ~ 4mm² / AWG 28 ~ 12 Stranded wire: 0.2 ~ 2.5mm² / AWG 30 ~ 12

2.2.6 Object Dictionary

The following table describes the Process Data Objects (PDOs) of NEIO-B1102. The PDOs are used to transmit the cyclic communication data which are also defined in the ESI File.

Index	PDO Mapping Index	Bit Length	Description	Data Type
0x1600	0x3001:01	8	Byte 0	BITARR8
0x1601	0x6000:02	8	Byte 1	BITARR8
0x1602	0x6000:03	8	Byte 2	BITARR8
0x1603	0x6000:04	8	Byte 3	BITARR8

CHAPTER 3: DIGITAL OUTPUT MODULE

3.1 NEIO-B1201 32-ch Digital Output (Sink) EtherCAT Slave Module

3.1.1 Introduction

The NEIO-B1201 is a 32-channel sink type digital output EtherCAT slave module. Its normal output voltage is $24V_{DC}$, and it supports resistive, inductive types of loads. All of the NEIO modules are provided with high isolation protection, and verified by the EtherCAT conformance test tool. Therefore NEIO is a reliable module to implement in your applications.

3.1.2 Wiring Diagram

3.1.3 Pin Assignments

CN1: Power

Pin	Description
1	V +
2	V -
3	GND

CN2: Digital Output

Pin	Description
1	DO 0
2	DO 1
3	DO 2
4	DO 3
5	DO 4
6	DO 5
7	DO 6
8	DO 7
9	24V
10	GND

CN3: Digital Output

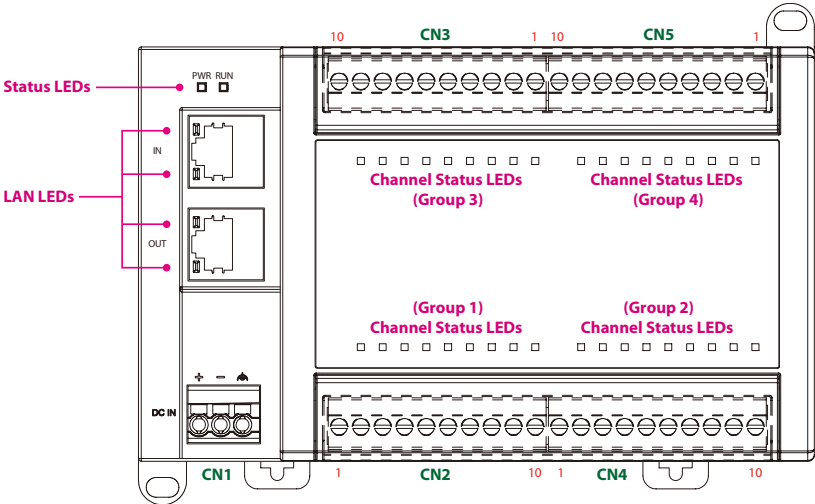| Pin	Description
1	GND
2	24V
3	DO 23
4	DO 22
5	DO 21
6	DO 20
7	DO 19
8	DO 18
9	DO 17
10	DO 16

CN4: Digital Output

Pin	Description
1	DO 8
2	DO 9
3	DO 10
4	DO 11
5	DO 12
6	DO 13
7	DO 14
8	DO 15
9	24V
10	GND

CN5: Digital Output

Pin	Description
1	GND
2	24V
3	DO 31
4	DO 30
5	DO 29
6	DO 28
7	DO 27
8	DO 26
9	DO 25
10	DO 24

3.1.4 LED Indicators

Status LEDs

LED	Status	Color	Description
PWR	On	Green	Power on (Power input range: 24 V_{DC}, ±20%).
	Off	-	Power off.
RUN	On	Green	The module is in the Operational state.
	Blinking	Green	The module is in the Safe-operational state.
	Blinking	Green	The module is in the Pre-operational state.
	Off	-	The module is in the Initial state.

LAN LEDs

LED	Communication Speed	Link	Act
LINK ACT	0	Off	Off
	10 Mbps	Off	Blinking (Yellow)
	100 Mbps	On (Green)	Blinking (Yellow)

Channel Status LEDs

LED	Status	Color	Description
DO 0 ~ DO 31	On	Green	Digital output signal is set.
	Off	-	No digital output signal.
24V	On	Orange	24V_{DC} external power supply for each DO group is connected.
	Off	-	24V_{DC} external power supply for each DO group is not connected.

Note: The NEIO series digital output modules all require a 24V_{DC} external power supply for each DO channel group. With the DO 24V_{DC} LEDs you can diagnose the status of external power supply.

3.1.5 Hardware Specifications

Power Input	
Nominal Voltage Input	24V_{DC}
Power Input Range	Minimum 19.2V_{DC} ~ Maximum 28.8V_{DC}
Power Consumption	2W
Electrical Isolation	2.5KV
Terminal Block	Spring type (3P, 5.00mm)
Cross Sections	0.2~2.5mm² / AWG 26 ~ 12
Digital Output	
Channels	32
Output Type	24V_{DC} (sink)
Load Type	Resistive, Inductive
Output Current	Maximum: 500mA/ch
Switching Time	OFF to ON: 100us ON to OFF: 150us
Output Protection	Over Current Limit Over Voltage Protection: 45V
Terminal Block	Detachable screw terminals (90°, 10P, 5.00mm)
Cross Sections	Solid wire: 0.2 ~ 4mm² / AWG 28 ~ 12 Stranded wire: 0.2 ~ 2.5mm² / AWG 30 ~ 12

3.1.6 Object Dictionary

The following table describes the Process Data Objects (PDOs) of NEIO-B1201. The PDOs are used to transmit the cyclic communication data which are also defined in the ESI File.
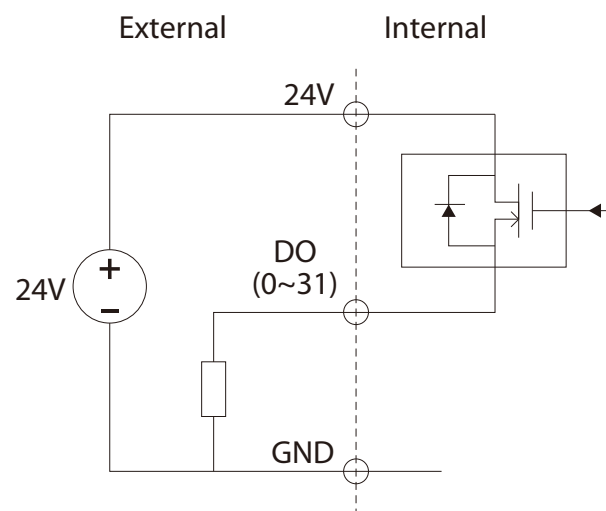
Index	Mapping Index	Bit Length	Description	Data Type
0x1a00	0x3101:01	8	Byte 0	BITARR8
0x1a01	0x3101:02	8	Byte 1	BITARR8
0x1a02	0x3101:03	8	Byte 2	BITARR8
0x1a03	0x3101:04	8	Byte 3	BITARR8

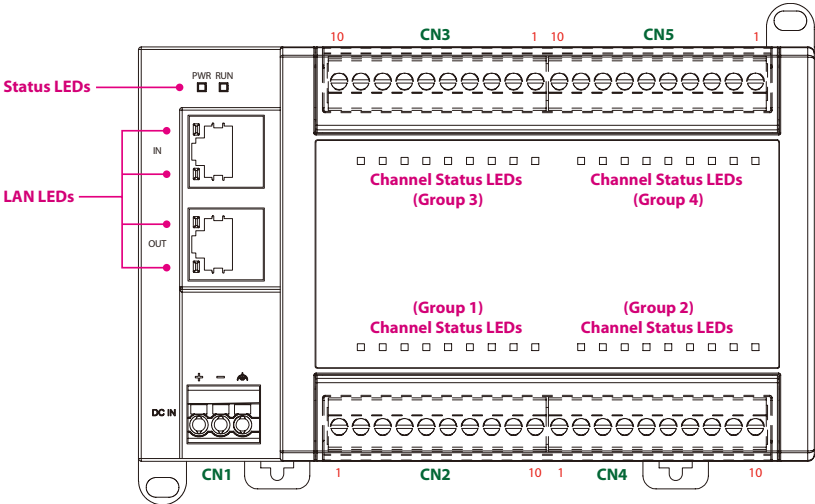# 3.2 NEIO-B1202 32-ch Digital Output (Source) EtherCAT Slave Module

3.2.1 Introduction

The NEIO-B1202 is a 32-channel source type digital output EtherCAT slave module. Its normal output voltage is $24V_{DC}$, and it supports three types of loads - resistive, inductive and capacitive. All of the NEIO modules are provided with high isolation protection, and verified by the EtherCAT conformance test tool. Therefore NEIO is a reliable module to implement in your applications.

3.2.2 Wiring Diagram

3.2.3 Pin Assignments

CN1: Power

Pin	Description
1	V +
2	V -
3	GND

CN2: Digital Output

Pin	Description
1	DO 0
2	DO 1
3	DO 2
4	DO 3
5	DO 4
6	DO 5
7	DO 6
8	DO 7
9	24V
10	GND

CN3: Digital Output

Pin	Description
1	GND
2	24V
3	DO 23
4	DO 22
5	DO 21
6	DO 20
7	DO 19
8	DO 18
9	DO 17
10	DO 16

CN4: Digital Output

Pin	Description
1	DO 8
2	DO 9
3	DO 10
4	DO 11
5	DO 12
6	DO 13
7	DO 14
8	DO 15
9	24V
10	GND

CN5: Digital Output

Pin	Description
1	GND
2	24V
3	DO 31
4	DO 30
5	DO 29
6	DO 28
7	DO 27
8	DO 26
9	DO 25
10	DO 24

3.2.4 LED Indicators

Status LEDs

LED	Status	Color	Description
PWR	On	Green	Power on (Power input range: 24 V_{DC}, ±20%).
	Off	-	Power off.
RUN	On	Green	The module is in the Operational state.
	Blinking	Green	The module is in the Safe-operational state.
	Blinking	Green	The module is in the Pre-operational state.
	Off	-	The module is in the Initial state.

LAN LEDs

LED	Communication Speed	Link	Act
LINK ACT	0	Off	Off
	10 Mbps	Off	Blinking (Yellow)
	100 Mbps	On (Green)	Blinking (Yellow)

Channel Status LEDs

LED	Status	Color	Description
DO 0 ~ DO 31	On	Green	Digital output signal is set.
	Off	-	No digital output signal.
24V	On	Orange	24V_{DC} external power supply for each DO group is connected.
	Off	-	24V_{DC} external power supply for each DO group is not connected.

Note: The NEIO series digital output modules all require a 24V_{DC} external power supply for each DO channel group. With the DO 24V_{DC} LEDs you can diagnose the status of external power supply.

3.2.5 Hardware Specifications

Power Input	
Nominal Voltage Input	24V_{DC}
Power Input Range	Minimum 19.2V_{DC} ~ Maximum 28.8V_{DC}
Power Consumption	2W
Electrical Isolation	2.5KV
Terminal Block	Spring type (3P, 5.00mm)
Cross Sections	0.2~2.5mm² / AWG 26 ~ 12
Digital Output	
Channels	32
Output Type	24V_{DC} (source)
Load Type	Resistive, Inductive and Capacitive
Inductive Switch-off Energy Dissipation	10 J/per channel; 1 J /all channel
Output Current	Maximum: 500mA/ch
Switching Time	OFF to ON: 100us ON to OFF: 150us
Output Protection	Over Current Limit Short Circuit Protection Reverse Voltage Protection
Short Circuit Protection	1.9 A/ Per Channel
Terminal Block	Detachable screw terminals (90°, 10P, 5.00mm)
Cross Sections	Solid wire: 0.2 ~ 4mm² / AWG 28 ~ 12 Stranded wire: 0.2 ~ 2.5mm² / AWG 30 ~ 12

3.2.6 Object Dictionary

The following table describes the Process Data Objects (PDOs) of NEIO-B1202. The PDOs are used to transmit the cyclic communication data which are also defined in the ESI File.

| Index	PDO Mapping Index	Bit Length	Description	Data Type
0x1a00	0x3101:01	8	Byte 0	BITARR8
0x1a01	0x3101:02	8	Byte 1	BITARR8
0x1a02	0x3101:03	8	Byte 2	BITARR8
0x1a03	0x3101:04	8	Byte 3	BITARR8

CHAPTER 4: MIXED DIGITAL INPUT/OUTPUT MODULE

4.1 NEIO-B1811 32-ch Digital Input/Output EtherCAT Slave Module (Sink)

4.1.1 Introduction

NEIO-B1811 is a sink type 16-ch digital input/16-ch digital output EtherCAT slave module. The voltage input of NEIO-B1811 is $24V_{DC}$ which complies with IEC-61131-2 Standard. Its normal output voltage is $24V_{DC}$, and it supports resistive, inductive types of loads. All of the NEIO modules are provided with high isolation protection, and verified by the EtherCAT conformance test tool. The mixed I/O module is usually used for fewer DI/O channels needed automation equipment. Mixed DI/O modules along with pure DI or DO modules provide more flexible module selection for users' applications.

4.1.2 Wiring Diagrams

DI (SINK)

DO (SINK)
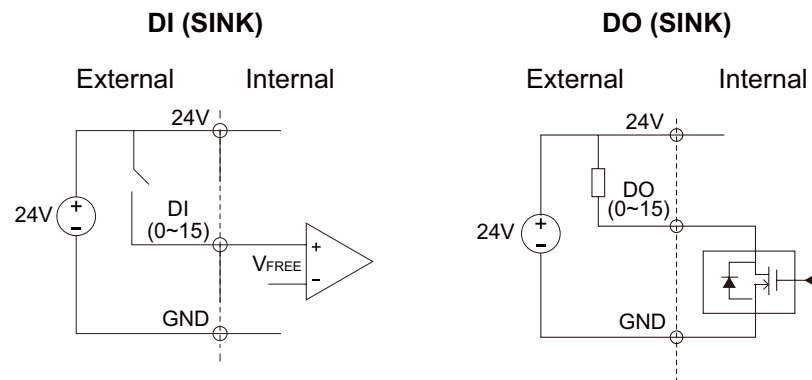
4.1.3 Pin Assignments
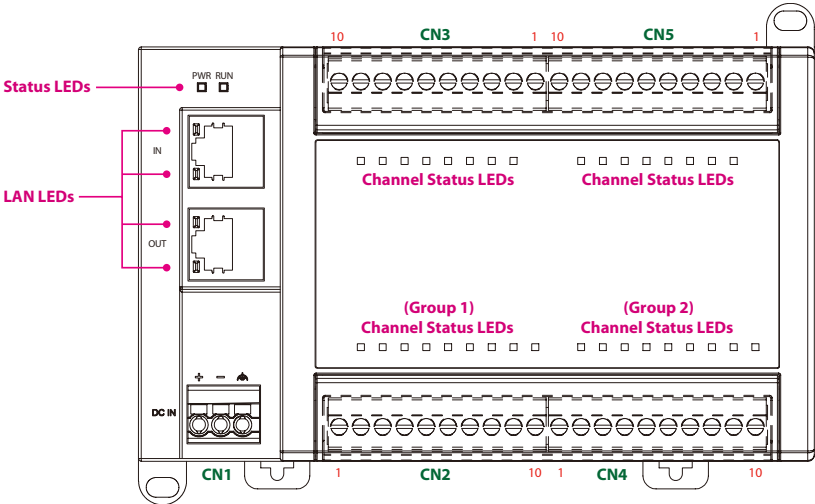
CN1: Power

Pin	Description
1	V +
2	V -
3	GND

CN3: Digital Input

Pin	Description
1	GND
2	24V
3	DI 7
4	DI 6
5	DI 5
6	DI 4
7	DI 3
8	DI 2
9	DI 1
10	DI 0

CN5: Digital Input

Pin	Description
1	GND
2	24V
3	DI 15
4	DI 14
5	DI 13
6	DI 12
7	DI 11
8	DI 10
9	DI 9
10	DI 8

CN2: Digital Output

Pin	Description
1	DO 0
2	DO 1
3	DO 2
4	DO 3
5	DO 4
6	DO 5
7	DO 6
8	DO 7
9	24V
10	GND

CN4: Digital Output

Pin	Description
1	DO 8
2	DO 9
3	DO 10
4	DO 11
5	DO 12
6	DO 13
7	DO 14
8	DO15
9	24V
10	GND

4.1.4 LED Indicators

Status LEDs

LED	Status	Color	Description
PWR	On	Green	Power on (Power input range: 24 V_{DC}, ±20%).
	Off	-	Power off.
RUN	On	Green	The module is in the Operational state.
	Blinking	Green	The module is in the Safe-operational state.
	Blinking	Green	The module is in the Pre-operational state.
	Off	-	The module is in the Initial state.

LAN LEDs

LED	Communication Speed	Link	Act
LINK ACT	0	Off	Off
	10 Mbps	Off	Blinking (Yellow)
	100 Mbps	On (Green)	Blinking (Yellow)

Channel Status LEDs

LED	Status	Color	Description
DI 0 ~ DI 15	On	Green	On-state voltage: 11~30V_{DC}
	Off	-	Off-state voltage: 0~5V_{DC}
DO 0 ~ DO 15	On	Green	Digital output signal is set.
	Off	-	No digital output signal.
24V	On	Orange	24V_{DC} external power supply for each DO group is connected.
	Off	-	24V_{DC} external power supply for each DO group is not connected.

Note: The NEIO series digital output modules all require a 24V_{DC} external power supply for each DO channel group. With the DO 24V_{DC} LEDs you can diagnose the status of external power supply.

4.1.5 Hardware Specifications

Power Input	
Nominal Voltage Input	$24V_{DC}$
Power Input Range	Minimum $19.2V_{DC}$ ~ Maximum $28.8V_{DC}$ ($24V_{DC}$, ±20%)
Power Consumption	2.2W
Electrical Isolation	2.5KV
Terminal Block	Spring type (3P, 5.00mm)
Cross Sections	$0.2~2.5mm^2$ / AWG 26 ~ 12
Digital Input	
Channels	16
Input Type	$24V_{DC}$, sinking
Input Filter	3ms
On-state Voltage, "1"	$15~30V_{DC}$ (IEC 61131-2 type 1) $11~30V_{DC}$ (IEC 61131-2 type 2/3)
Off-state Voltage, "0"	$0~5V_{DC}$ (IEC 61131-2 type 1/2/3)
Input Current	0.62 mA
Overvoltage Protection	$±30V_{DC}$
Electrical Isolation	2.75KV
Terminal Block	Detachable screw terminals (90°, 10P, 5.00mm)
Cross Sections	Solid wire: $0.2 ~ 4mm^2$ / AWG 28 ~ 12 Stranded wire: $0.2 ~ 2.5mm^2$ / AWG 30 ~ 12
Digital Output	
Channels	16
Output Type	$24V_{DC}$ (sink)
Load Type	Resistive, Inductive

4.1.5 Hardware Specifications Cont.

Digital Output	
Output Current	Maximum: 500mA/ch
Switching Time	OFF to ON: 100us ON to OFF: 150us
Output Protection	Over Current Limit Over Voltage Protection: 45V
Terminal Block	Detachable screw terminals (90°, 10P, 5.00mm)
Cross Sections	Solid wire: $0.2~4mm^2$ / AWG 28 ~ 12 Stranded wire: $0.2~2.5mm^2$ / AWG 30 ~ 12

4.1.6 Object Dictionary

The following table describes the Process Data Objects (PDOs) of NEIO-B1811. The PDOs are used to transmit the cyclic communication data which are also defined in the ESI File.

Index	Mapping Index	Bit Length	Description	Data Type
0x1600	0x7000	8	RxPdo Byte 1	BITARR8
0x1601	0x7010	8	RxPdo Byte 2	BITARR8
0x1a00	0x6000	8	TxPdo Byte 1	BITARR8
0x1a01	0x7010	8	TxPdo Byte 2	BITARR8

## 4.2 NEIO-B1812 32-ch Digital Input/Output EtherCAT Slave Module (Source)

4.2.1 Introduction

NEIO-B1812 is a source type 16-ch digital input/16-ch digital output EtherCAT slave module. The input filter of NEIO-B1812 is 1ms, and its normal input voltage is $24V_{DC}$. Its normal output voltage is $24V_{DC}$, and it supports three types of loads - resistive, inductive and capacitive. All of the NEIO modules are provided with high isolation protection, and verified by the EtherCAT conformance test tool. The mixed I/O module is usually used for fewer DI/O channels needed automation equipment. Mixed DI/O modules along with pure DI or DO modules provide more flexible module selection for users' applications.

4.2.2 Wiring Diagrams

DI (Sink/Source)

DO (Source)
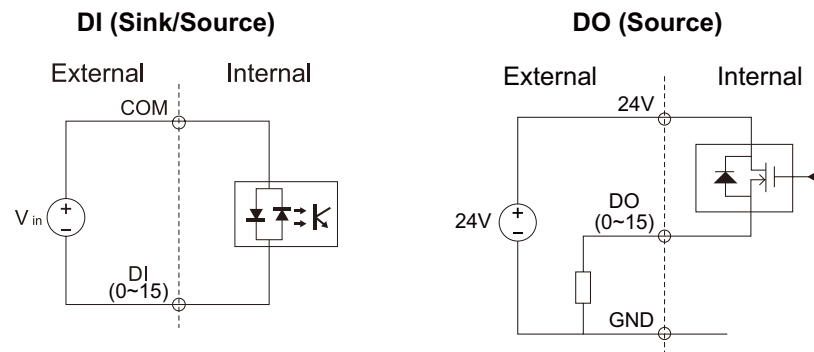
4.2.3 Pin Assignments
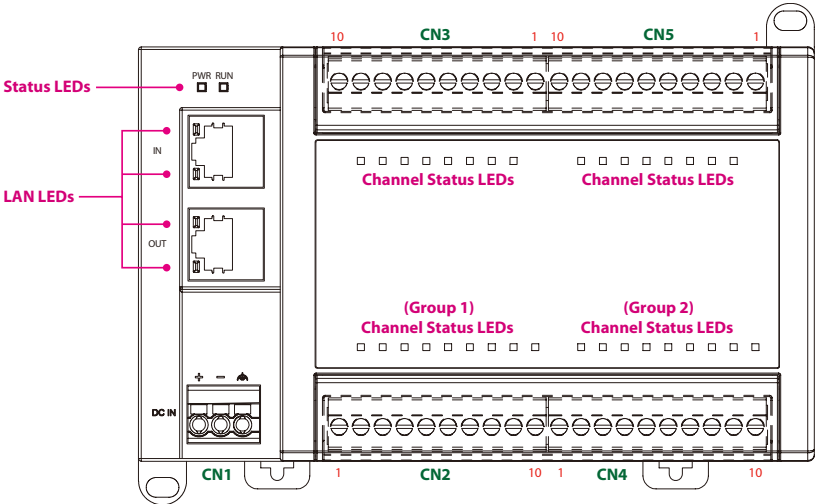
CN1: Power

Pin	Description
1	V +
2	V -
3	GND

CN3: Digital Input

Pin	Description
1	COM
2	COM
3	DI 7
4	DI 6
5	DI 5
6	DI 4
7	DI 3
8	DI 2
9	DI 1
10	DI 0

CN5: Digital Input

Pin	Description
1	COM
2	COM
3	DI 15
4	DI 14
5	DI 13
6	DI 12
7	DI 11
8	DI 10
9	DI 9
10	DI 8

CN2: Digital Output

Pin	Description
1	DO 0
2	DO 1
3	DO 2
4	DO 3
5	DO 4
6	DO 5
7	DO 6
8	DO 7
9	24V
10	GND

CN4: Digital Output

Pin	Description
1	DO 8
2	DO 9
3	DO 10
4	DO 11
5	DO 12
6	DO 13
7	DO 14
8	DO15
9	24V
10	GND

4.2.4 LED Indicators

Status LEDs

LED	Status	Color	Description
PWR	On	Green	Power on (Power input range: 24 V_{DC}, ±20%).
	Off	-	Power off.
RUN	On	Green	The module is in the Operational state.
	Blinking	Green	The module is in the Safe-operational state.
	Blinking	Green	The module is in the Pre-operational state.
	Off	-	The module is in the Initial state.

LAN LEDs

LED	Communication Speed	Link	Act
LINK ACT	0	Off	Off
	10 Mbps	Off	Blinking (Yellow)
	100 Mbps	On (Green)	Blinking (Yellow)

Channel Status LEDs

LED	Status	Color	Description
DI 0 ~ DI 15	On	Green	On-state voltage: 9~24V_{DC} (sink) 0~15V_{DC} (source)
	Off	-	Off-state voltage: 0~8V_{DC} (sink) 16~24V_{DC} (source)
DO 0 ~ DO 15	On	Green	Digital output signal is set.
	Off	-	No digital output signal.
24V	On	Orange	24V_{DC} external power supply for each DO group is connected.
	Off	-	24V_{DC} external power supply for each DO group is not connected.

Note: The NEIO series digital output modules all require a 24V_{DC} external power supply for each DO channel group. With the DO 24V_{DC} LEDs you can diagnose the status of external power supply.

4.2.5 Hardware Specifications

Power Input	
Nominal Voltage Input	$24V_{DC}$
Power Input Range	Minimum $19.2V_{DC}$ ~ Maximum $28.8V_{DC}$ ($24V_{DC}$, ±20%)
Power Consumption	2.2W
Electrical Isolation	2.5KV
Terminal Block	Spring type (3P, 5.00mm)
Cross Sections	0.2~2.5mm² / AWG 26 ~ 12
Digital Input	
Channels	16
Input Type	$24V_{DC}$ (sink/source)
Input Filter	1ms
On-state Voltage, "1"	$9~24V_{DC}$ (sink) $0~15V_{DC}$ (source)
Off-state Voltage, "0"	$0~8V_{DC}$ (sink) $16~24V_{DC}$ (source)
Input Current	3.6 mA
Electrical Isolation	3KV
Terminal Block	Detachable screw terminals (90°, 10P, 5.00mm)
Cross Sections	Solid wire: 0.2~4mm² / AWG 28 ~ 12 Stranded wire: 0.2~2.5mm² / AWG 30 ~ 12
Digital Output	
Channels	16
Output Type	$24V_{DC}$ (source)

4.2.5 Hardware Specifications Cont.

Digital Output	
Load Type	Resistive, Inductive and Capacitive
Inductive Switch-off Energy Dissipation	10 J/per channel; 1 J /all channel
Output Current	Maximum: 500mA/ch
Switching Time	OFF to ON: 100us ON to OFF: 150us
Output Protection	Over Current Limit Short Circuit Protection Reverse Voltage Protection
Short Circuit Protection	1.9 A/ Per Channel
Terminal Block	Detachable screw terminals (90°, 10P, 5.00mm)
Cross Sections	Solid wire: 0.2~4mm² / AWG 28 ~ 12 Stranded wire: 0.2~2.5mm² / AWG 30 ~ 12

4.2.6 Object Dictionary

The following table describes the Process Data Objects (PDOs) of NEIO-B1812. The PDOs are used to transmit the cyclic communication data which are also defined in the ESI File.

Index	PDO Mapping Index	Bit Length	Description	Data Type
0x1600	0x7000	8	RxPdo Byte 1	BITARR8
0x1601	0x7010	8	RxPdo Byte 2	BITARR8
0x1a00	0x6000	8	TxPdo Byte 1	BITARR8
0x1a01	0x6010	8	TxPdo Byte 1	BITARR8

Chapter 5: EtherCAT Communication

EtherCAT is an open technology of Fieldbus system. It has features of high performance communication, low infrastructure cost, and it only takes simple configuration for operation. You may follow the steps below to complete the communication configuration of NEIO modules.

1. Connect Ethernet cables between master controller and NEIO modules (the maximum distance between nodes is 100m).
2. Import ESI file of NEIO modules to the master controller.
3. Generate ENI file of the EtherCAT network to start EtherCAT operation.

EtherCAT Master Controller　　　**NEIO Modules**

EtherCAT Network Information File (ENI)

Ethernet Cable (Min. CAT 5)

Import

Generate

EtherCAT Slave Information File (ESI)

EtherCAT Network Topology

5.1 ESI and ENI File

The ESI file (EtherCAT Slave Information) is the EtherCAT device description in XML format. It contains all configuration information for setting slave modules. The ENI file (EtherCAT Network Information) describes the structure for the EtherCAT system, and it also comes in XML format.

The following section shows examples of configuring EtherCAT system with Beckhoff's TwinCAT and NEXCOM's nexECM EtherCAT configuration tool.

You can scan the QR code, which is on the right side of the module to find the ESI file more quickly. Alternatively, you can download the ESI files from the NEXCOM website. (http://www.nexcom.com.tw)

```
┌─────────────────────┐
│   Load ESI Files    │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│   Scan Available    │
│  Network Interface  │
│        Cards        │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│   Scan ECAT Slave   │
│      Devices        │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│   Set Parameters    │─ ─ ─ ┐
└─────────────────────┘      │
           │                 │
           ▼                 │
┌─────────────────────┐      │
│   Communication     │      │
│       Test          │      │
└─────────────────────┘      │
           │                 │
           ▼                 │
┌─────────────────────┐      │
│   Export ENI File   │◄─ ─ ─┘
└─────────────────────┘
```
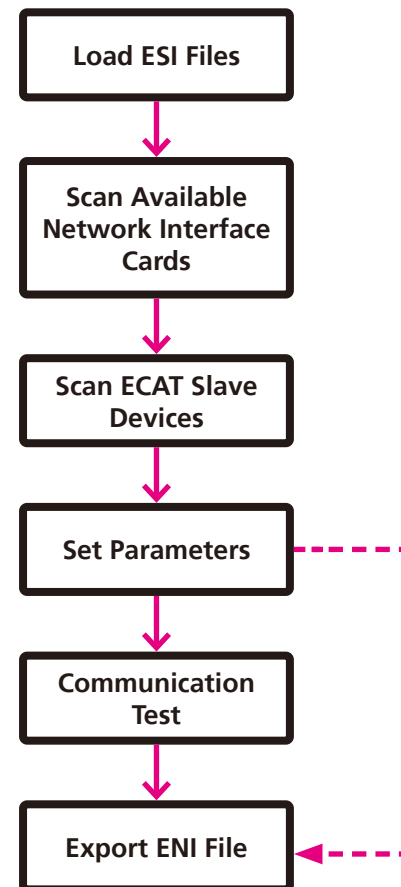
5.2 EtherCAT State Machine

The EtherCAT State Machine (ESM) defines the communication status of master and slave device during startup and operation.

The figure below describes the EtherCAT State Machine.

- Init
- Pre-Operational
- Safe-Operational
- Operational
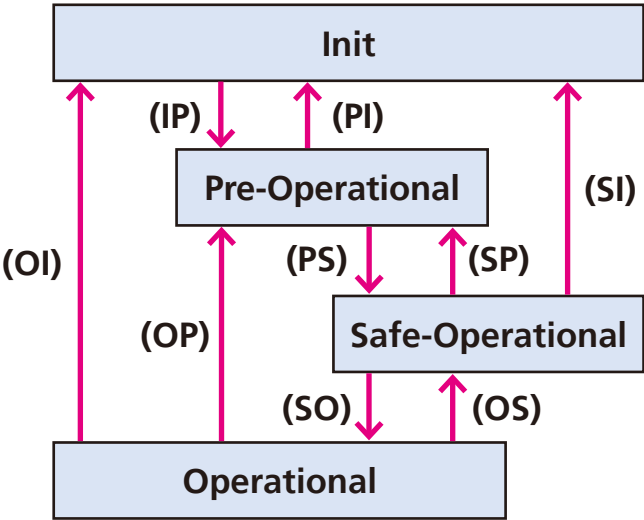
EtherCAT State Machine

State	EC-Master Service	EC-Slave Service
Init	▪ Cyclic callback function start ▪ No Process Data communication (To slaves) ▪ No Mailbox communication (To slaves)	▪ EC-Master not ready
Pre-Operational	▪ Cyclic callback function start ▪ Mailbox communication start (To slaves) ▪ No Process Data communication (To slaves)	▪ Mailbox communication start
Safe-Operational	▪ Cyclic callback function start ▪ Mailbox communication start (To slaves) ▪ Process Data Input communication start ▪ No Process Data Output communication	▪ Mailbox communication start ▪ Update the Input Data to Process Data Input
Operational	▪ Cyclic callback function start ▪ Mailbox communication start (To slaves) ▪ Process Data Input communication start ▪ Process Data Output communication start	▪ Mailbox communication start ▪ Update the Input Data to Process Data Input ▪ Get Process Data Output, Output data and transfer

5.3 NEIO Configuration

This section describes how to use Beckhoff's TwinCAT and NEXCOM's NexECM EtherCAT Configuration Tool for configuring the EtherCAT master controller and slave modules.

5.3.1 Operation with TwinCAT

Before starting the slave module setup, you should put the ESI file for the NEIO modules in the correct path of the EtherCAT master controller. In TwinCAT 2.x these files are located in `\TwinCAT\IO\EtherCAT`. In TwinCAT 3.x they are located in `\TwinCAT\3.x\Config\Io\EtherCAT`.
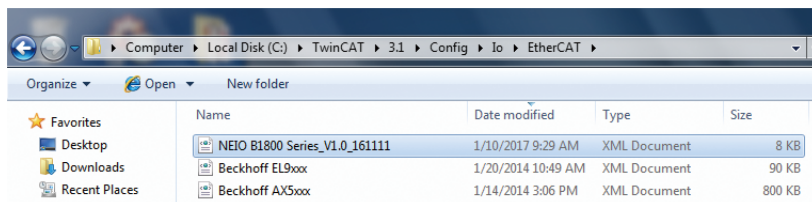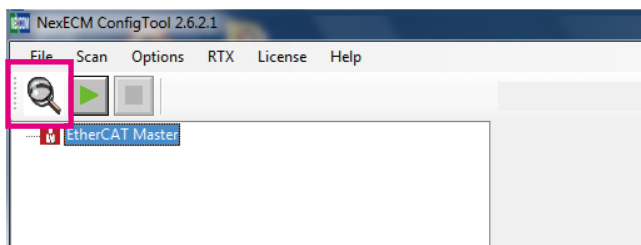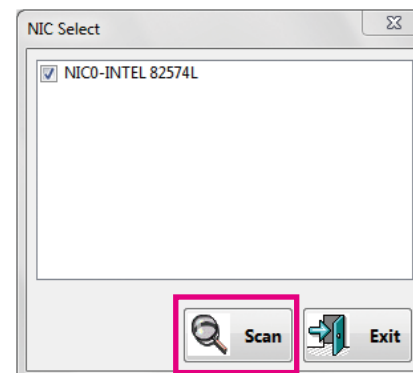

Scan Devices

1. Create a new TwinCAT project, and then right-click the **I/O Devices** and select **Scan**.
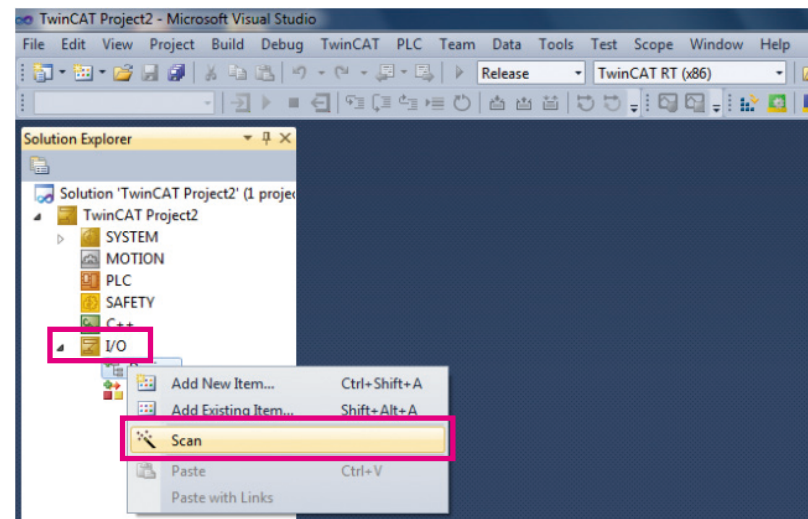
2. Click **OK** to continue the setup.
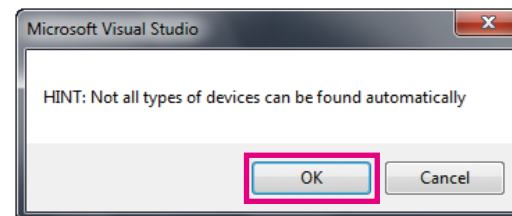
3. Choose the network interface card which you assigned to TwinCAT, and click **OK**.
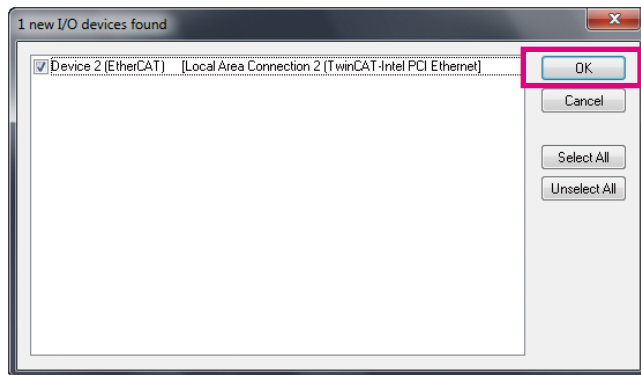
4. Click **Yes** to scan the slave modules, and then click **Yes** to activate the free run mode.
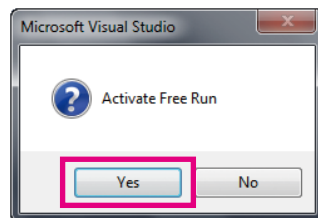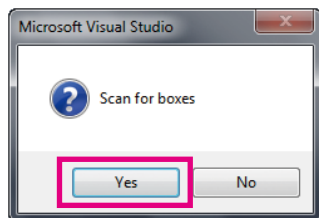
5. After successful scanning, you will see the NEIO device(s) in the TwinCAT project.
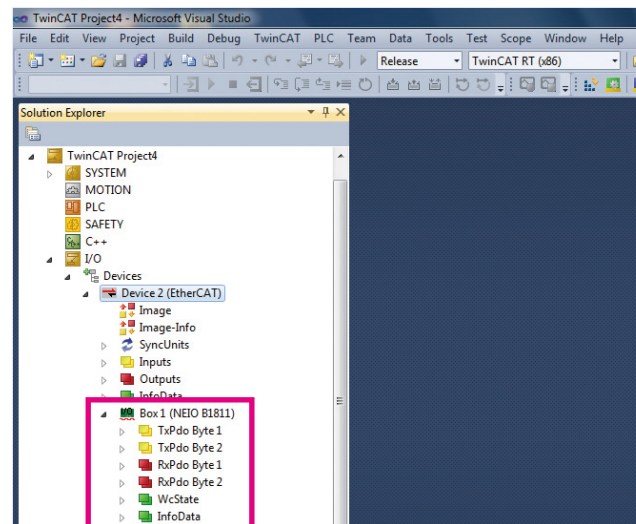
Set Parameters

Double-click the module. You can set the parameters in the window on the right.
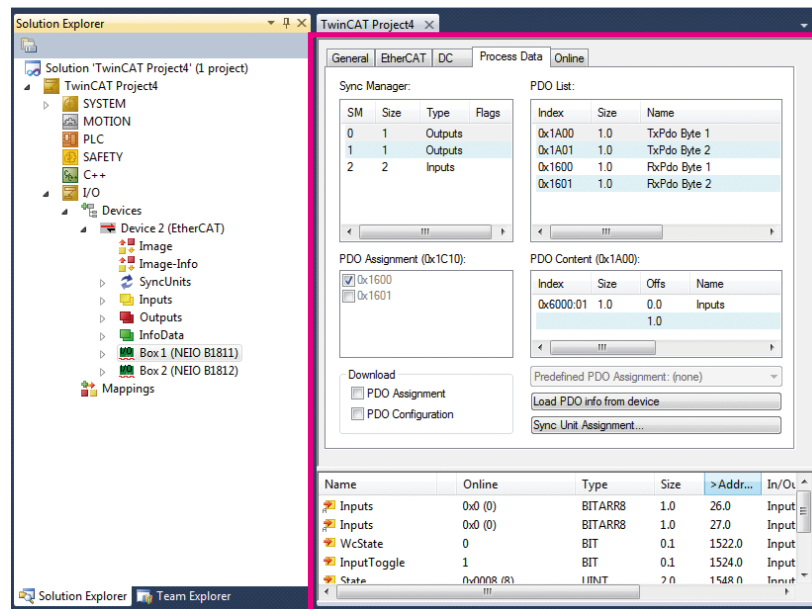
Test Communication

Select an output channel, and then right-click **Online Write '1'** to test the device. If the DO LED on the module is turned ON, the communication between the EtherCAT Master Controller and the NEIO module is working.
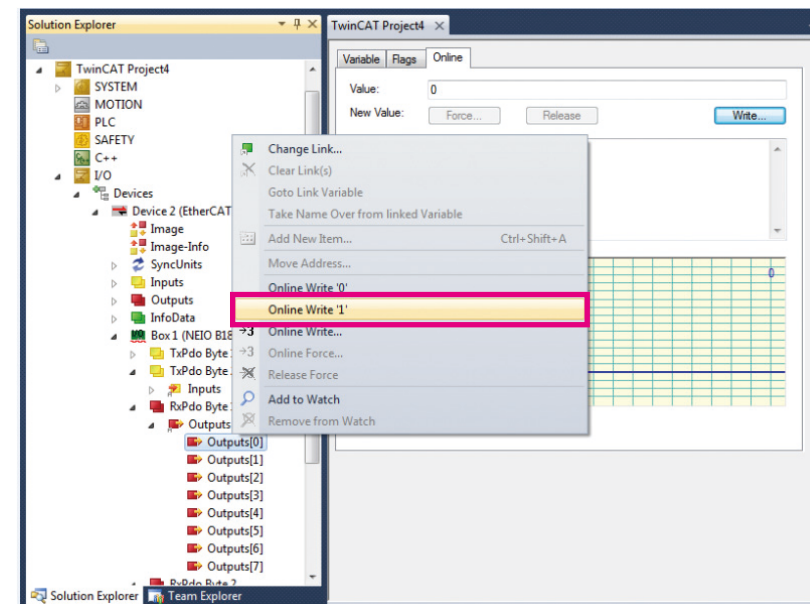
5.3.2 Operation with NexECM EtherCAT Configuration Tool

Before starting the slave module setup, you should put the ESI file for the NEIO module in the correct path of the EtherCAT master controller. In the NET series 32-bit systems these files are located in `\Program Files\ NEXCOM\NexECMRtx\tools\x32\ESI_File`. In 64-bit systems they are located in `\Program Files\NEXCOM\NexECMRtx\tools\x64\ ESI_File`.
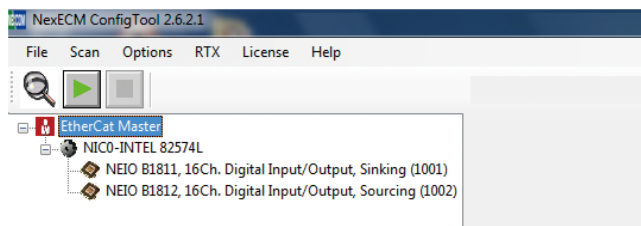
Scan Devices
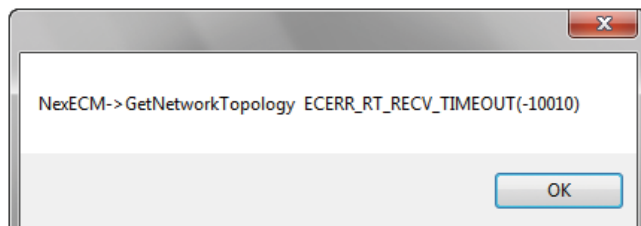
1. Click the 🔍 icon to search the network port for EtherCAT.

2. Click **Scan** to scan the EtherCAT slave devices connected to the LAN port.

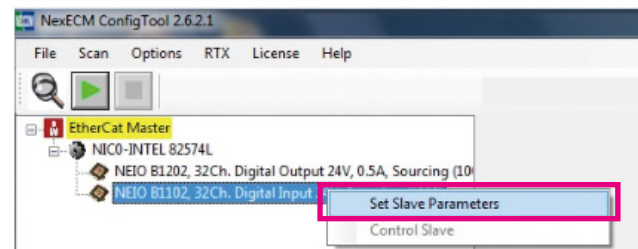3. After successful scanning, you will see the NEIO device(s) in the list.

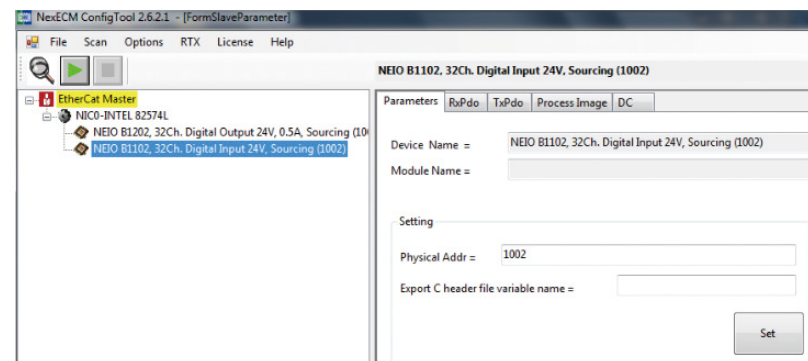**Note:** If the "-10010" error occurs, please check the connection of devices.

Set Parameters

1. Select the NEIO device and right-click ➜ **Set Slave Parameters**.

2. Then you can set the parameters in the window on the right.

Note: The slave device setting page **must be used before starting the network**, because all the parameters changed are valid only before starting the network. If users changed the setting after the network has been started, a network restart is required.

3. Click the ▶ icon to start the network.

Test Communication

1. Double-click the selected DI/O slave device which you want to test, and the DI/O operation window will appear.
2. You can click the DO button to operate DO, or you can use the **Cyclic function** to change DO status automatically.
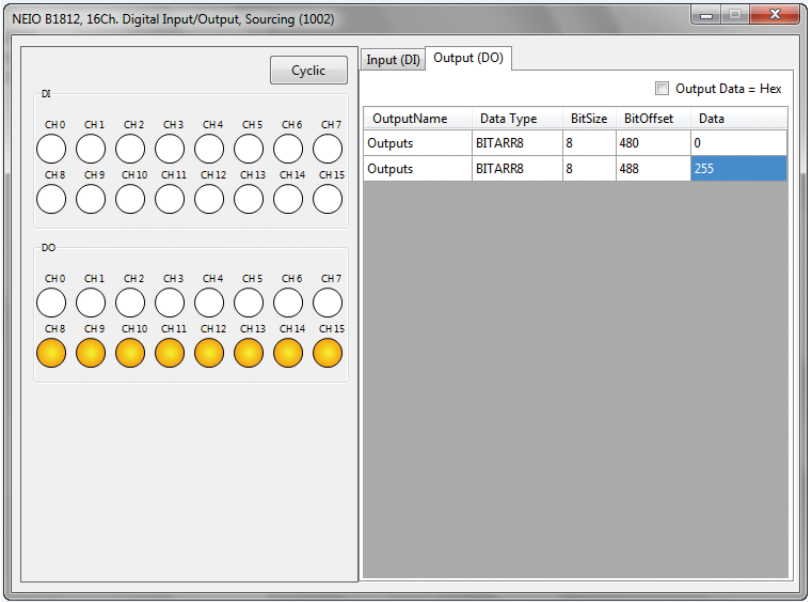
3. Otherwise, you can key in the data value directly in the **Data** column.
4. See if the DO LED(s) is working according to your operation in the NexECM Configuration Tool to check the communication between the EtherCAT Master Controller and the NEIO module.