OMRON

Machine Automation Controller

NX-series

IO-Link Master Unit

User's Manual

NX-ILM□□□

IO-Link Master Unit

SYSMAC
always in control

W567-E1-01

NOTE

Trademarks

Copyrights

Introduction

Thank you for purchasing an NX-series IO-Link Master Unit.

This manual contains information that is necessary to use the NX-series IO-Link Master Unit. Please read this manual and make sure you understand the functionality and performance of the NX-series IO-Link Master Unit before you attempt to use it in a control system.

Keep this manual in a safe place where it will be available for reference during operation.

Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of introducing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of installing and maintaining FA systems.
- Personnel in charge of managing FA systems and facilities.

For programming, this manual is intended for personnel who understand the programming language specifications in international standard IEC 61131-3 or Japanese standard JIS B 3503.

Applicable Products

This manual covers the following product.

- NX-series IO-Link Master Unit

  NX-ILM400

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Relevant Manuals

The table below provides the relevant manuals for the NX-series IO-Link Master Unit.

Read all of the manuals that are relevant to your system configuration and application to make the most of the NX-series IO-Link Master Unit.

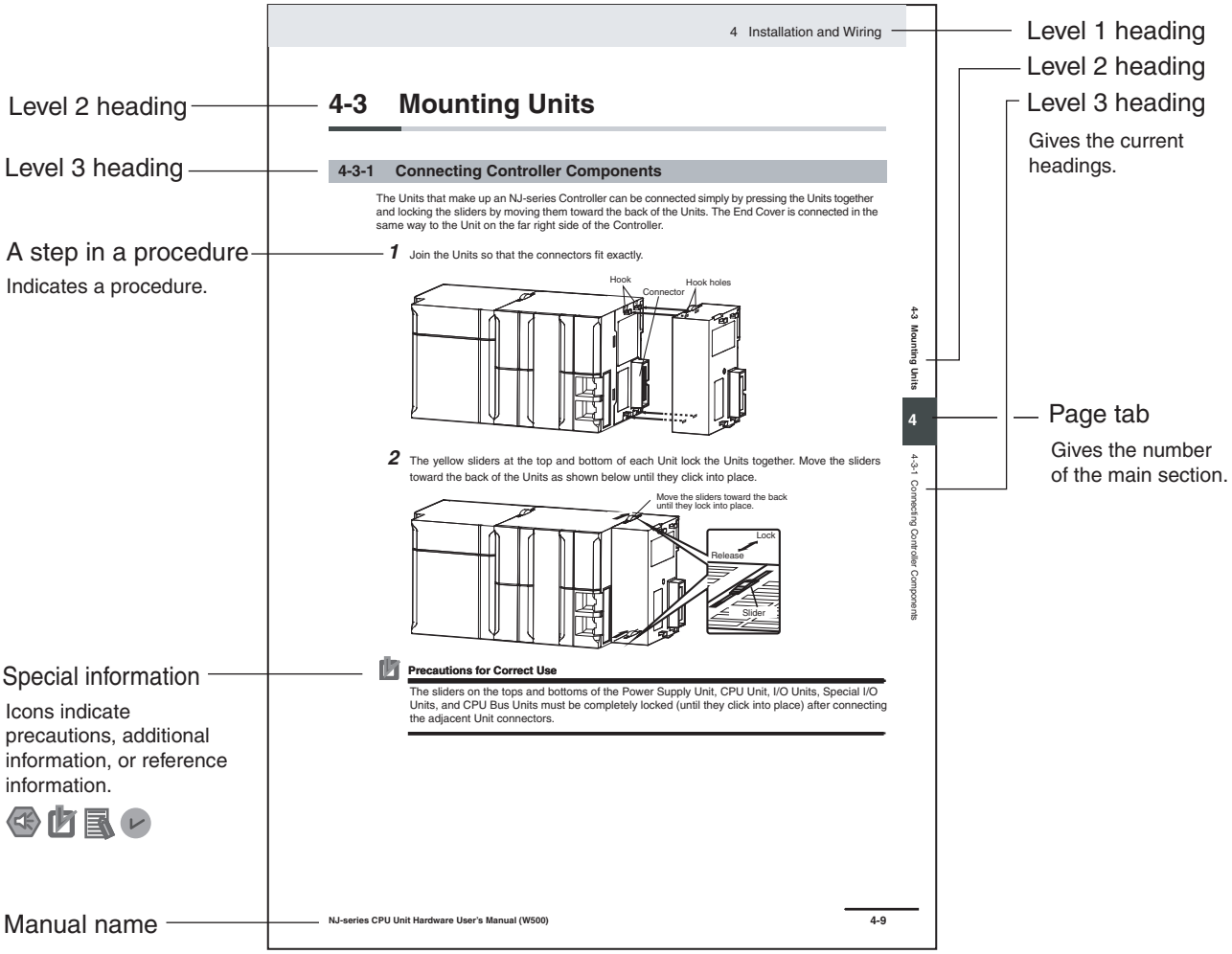
Other manuals, such as related product manuals, are necessary for specific system configurations and applications. Refer to *Related Manuals* on page 26 for the related manuals.

Manual name	Application
NX-series IO-Link Master Unit User's Manual	Learning how to use the NX-series IO-Link Master Unit
IO-Link System User's Manual	Learning general information on how to build IO-Link Systems that does not rely on the unique specifications of individual IO-Link Master Units and IO-Link devices.
NX-series Data Reference Manual	Referencing lists of the data that is required to configure systems with NX-series Units

Manual Structure

Page Structure and Icons

The following page structure and icons are used in this manual.



Note This illustration is provided only as a sample. It may not literally appear in this manual.

Special Information

Special information in this manual is classified as follows:

Precautions for Safe Use

Precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use

Precautions on what to do and what not to do to ensure proper operation and performance.

Additional Information

Additional information to read as required.

This information is provided to increase understanding or make operation easier.

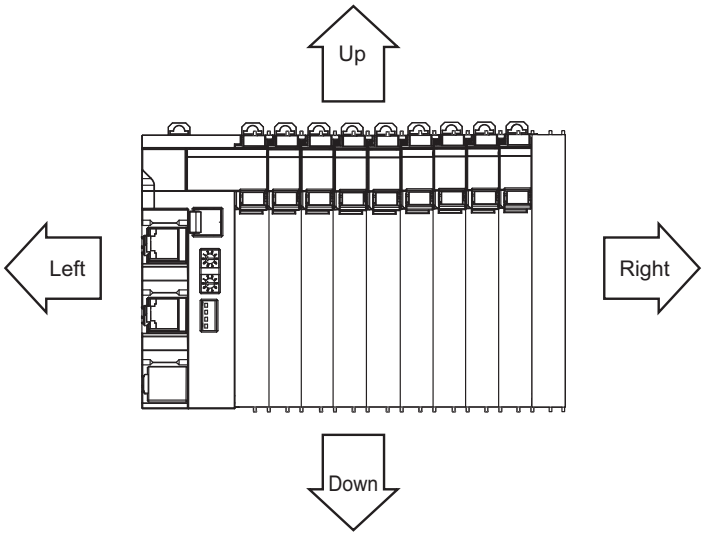
Version Information

Information on differences in specifications and functionality for CPU Units and Communications Coupler Units with different unit versions and for different versions of the Sysmac Studio is given.

Note References are provided to more detailed or related information.

Precaution on Terminology

- In this manual, “download” refers to transferring data from the Sysmac Studio to the physical Controller and “upload” refers to transferring data from the physical Controller to the Sysmac Studio.
  For the Sysmac Studio, synchronization is used to both upload and download data. Here, “synchronize” means to automatically compare the data for the Sysmac Studio on the computer with the data in the physical Controller and transfer the data in the direction that is specified by the user.
- In this manual, the directions in relation to the Units are given in the following figure, which shows upright installation.



Terms and Conditions Agreement

Warranty, Limitations of Liability

Warranties

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Disclaimers

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Change in Specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Safety Precautions

Definition of Precautionary Information

The following notation is used in this manual to provide precautions required to ensure safe usage of an NX-series IO-Link Master Unit.

The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.

The following notation is used.

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.
⚠ Caution	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

Symbols

	The circle and slash symbol indicates operations that you must not do. The specific operation is shown in the circle and explained in text. This example indicates prohibiting disassembly.
	The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a precaution for electric shock.
	The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a general precaution.
	The filled circle symbol indicates operations that you must do. The specific operation is shown in the circle and explained in text. This example shows a general precaution for something that you must do.

Warnings

⚠ WARNING

During Power Supply

Do not touch the terminal section while power is ON.

Electric shock may occur.

Do not attempt to take any Unit apart.

In particular, high-voltage parts are present in Units that supply power while power is supplied or immediately after power is turned OFF. Touching any of these parts may result in electric shock. There are sharp parts inside the Unit that may cause injury.

Fail-safe Measures

Provide safety measures in external circuits to ensure safety in the system if an abnormality occurs due to malfunction of the CPU Unit, other Units, or slaves or due to other external factors affecting operation.

Not doing so may result in serious accidents due to incorrect operation.

Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.

The CPU Unit will turn OFF all outputs from Basic Output Units in the following cases. The remote I/O slaves will operate according to the settings in the slaves.

- If a power supply error occurs.
- If the power supply connection becomes faulty.
- If a CPU watchdog timer error or CPU reset occurs.
- If a Controller error in the major fault level occurs.
- While the CPU Unit is on standby until RUN mode is entered after the power is turned ON

External safety measures must be provided to ensure safe operation of the system in such cases.

The outputs may remain ON or OFF due to deposition or burning of the output relays or destruction of the output transistors. As a countermeasure for such problems, external safety measures must be provided to ensure safe operation of the system.

If external power supplies for slaves or other devices are overloaded or short-circuited, the voltage will drop, outputs will turn OFF, and the system may be unable to read inputs. Provide external safety measures in control with monitoring of external power supply voltage as required so that the system operates safely in such a case.

You must take fail-safe measures to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.

Not doing so may result in serious accidents due to incorrect operation.

Voltage and Current Inputs

Make sure that the voltages and currents that are input to the Units and slaves are within the specified ranges.

Inputting voltages or currents that are outside of the specified ranges may cause accidents or fire.

Transferring

Always confirm safety at the destination node before you transfer Unit configuration information, parameters, settings, or other data from tools such as the Sysmac Studio.

The devices or machines may operate unexpectedly, regardless of the operating mode of the Controller.

Cautions

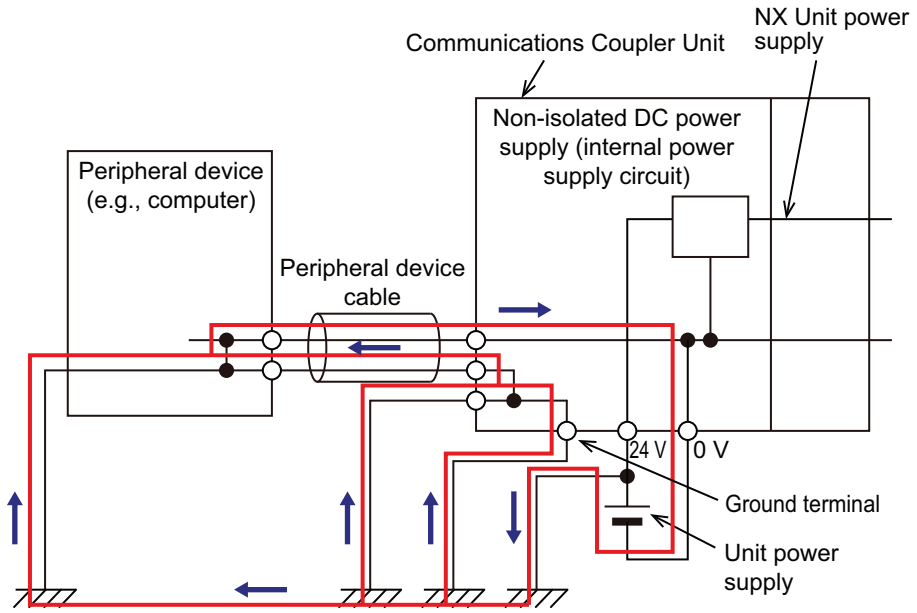
⚠ Caution

Wiring

When you connect a computer or other peripheral device to a Communications Coupler Unit that has a non-isolated DC power supply, either ground the 0-V side of the external power supply (i.e. Unit power supply) or do not ground it at all.

If the peripheral devices are grounded incorrectly, the external power supply (i.e. Unit power supply) may be short-circuited.

Never ground the 24-V side of the power supply, as shown in the following figure.



Be sure that all terminal screws and cable connector screws are tightened to the torque specified in the relevant manuals. The loose screws may result in fire or malfunction.

Online Editing

Execute online editing only after confirming that no adverse effects will be caused by deviations in the timing of I/O. If you perform online editing, the task execution time may exceed the task period, I/O may not be refreshed with external devices, input signals may not be read, and output timing may change.

Precautions for Safe Use

Transporting

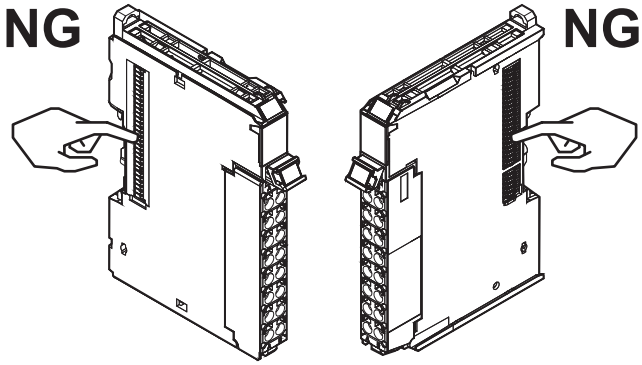
- When transporting any Unit, use the special packing box for it.
  Also, do not subject the Unit to excessive vibration or shock during transportation.
- Do not drop any Unit or subject it to abnormal vibration or shock.
  Doing so may result in Unit malfunction or burning.

Mounting

- Mount terminal blocks and connectors only after checking the mounting location carefully.
- Be sure that the terminal blocks, expansion cables, and other items with locking devices are properly locked into place.

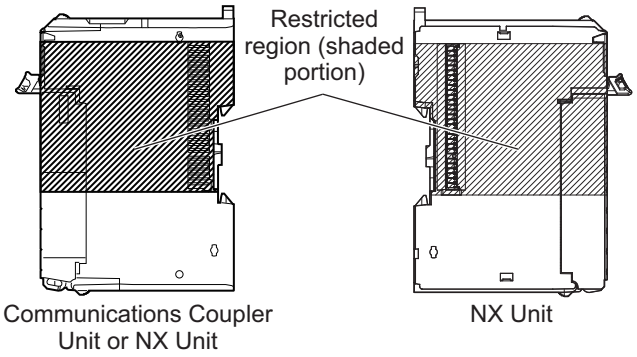
Installation

- Do not apply labels or tape to the Unit. When the Unit is installed or removed, adhesive or scraps may adhere to the pins in the NX bus connector, which may result in malfunctions.
- Do not touch the pins in the NX bus connector on the Unit. Dirt may adhere to the pins in the NX bus connector, which may result in malfunctions.

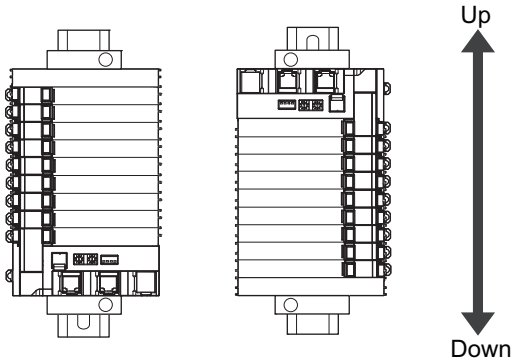


Example: NX Unit (12 mm width)

- Do not write on the Communications Coupler Unit or an NX Unit with ink within the restricted region that is shown in the following figure. Also do not get this area dirty. When the Unit is installed or removed, ink or dirt may adhere to the pins in the NX bus connector, which may result in malfunctions in the Slave Terminal.



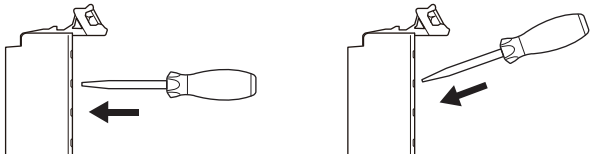
- For the installation orientations in the following figure, support the cables, e.g., with a duct, so that the End Plate on the bottom is not subjected to the weight of the cables. The weight of the cables may cause the bottom End Plate to slide downward so that the Slave Terminal is no longer secured to the DIN Track, which may result in malfunctions.



Wiring

- Double-check all switches and other settings and double-check all wiring to make sure that they are correct before turning ON the power supply.
- Use the correct wiring parts and tools when you wire the system.
- Do not pull on the cables or bend the cables beyond their natural limit. Also, do not place heavy objects on top of the cables or other wiring lines. Doing so may break the cable.
- When wiring or installing the Units, do not allow metal fragments to enter the Units.
- Do not press the flat-blade screwdriver straight into the release holes on a screwless clamping terminal block. Doing so may damage the terminal block.

NG **OK**



- When you insert a flat-blade screwdriver into a release hole on a screwless clamping terminal block, press it down with a force of 30N or less. Applying excessive force may damage the terminal block.
- Do not incline or twist the flat-blade screwdriver while it is in a release hole on a screwless clamping terminal block. Doing so may damage the terminal block.

NG **NG**

- If you use reed switches for the input contacts for AC Input Units, use switches with an allowable current of 1 A or greater. If the capacity of the reed switches is too low, inrush current may fuse the contacts.
- Use crimp terminals for wiring the M3 screw terminal blocks. Do not connect bare stranded wires directly to the M3 screw terminal blocks.

Power Supply Design

- Use all Units within the I/O power supply ranges that are given in the specifications.
- Supply sufficient power according to the contents of this manual.
- Use the power supply voltage that is specified in this manual.
- Do not apply voltages that exceed the rated value to any Input Unit.
- Do not apply voltages or connect loads to the Output Units or slaves in excess of the maximum ratings.
- Inrush current occurs when the power supply is turned ON. When selecting fuses or breakers for external circuits, consider their fusing and detection characteristics as well as the above precautions and allow sufficient margin in shut-off performance.
- Install external breakers and take other safety measures against short-circuiting and overcurrents in external wiring.

Turning ON the Power Supply

- When you set the Operating Mode at Startup, confirm that no adverse effect will occur in the system.

Actual Operation

- Before you start operation, always register the NX Units that are connected to the Communications Coupler Unit in the host communications master as the Unit Configuration Information.
- Check the user program, data, and parameter settings for proper execution before you use them for actual operation.
- If you change the fail-soft operation setting, the output status when the error occurs may also change. Confirm safety before you change the fail-soft operation setting.
- If you use fail-soft operation, write programming to determine whether Unit I/O data is valid. Without such programming, the user program cannot distinguish between Units for which I/O refreshing is continued and Units for which I/O refreshing is stopped.

Turning OFF the Power Supply

- Do not disconnect the cable or turn OFF the power supply to the Controller or a Slave Terminal when downloading data or the user program from Sysmac Studio.
- Always turn OFF the external power supply to the Units before attempting any of the following.

  Mounting or removing an NX Unit, Communications Coupler Unit, or CPU Unit
  Assembling Units
  Setting DIP switches or rotary switches
  Connecting or wiring cables
  Attaching or removing terminal blocks or connectors

  Units that supply power continue to supply power to the Units for up to several seconds after the power supply is turned OFF. The PWR indicator remains lit as long as power is supplied. Confirm that the PWR indicator is not lit before you perform any of the above.

Operation

- Confirm that the controlled system will not be adversely affected before you perform any of the following operations.

  Changing the operating mode of the CPU Unit (including changing the setting of the Operating Mode at Startup)
  Changing the user program or settings
  Changing set values or present values
  Forced refreshing

- Always sufficiently check the safety at the connected devices before you change the settings of a slave or Unit.

General Communications

- Do not exceed the ranges that are given in the specifications for the communications distance and number of connected Units.
- Refer to the user's manual for the Communications Coupler Unit for precautions for the safe use of communications with the connected Communications Coupler Unit.

Unit Replacement

- When you replace a Unit, start operation only after you transfer the settings and variables that are required for operation to the new Unit.

Disposal

- Dispose of the product according to local ordinances as they apply.

Precautions for Correct Use

Storage, Mounting, and Wiring

- Follow the instructions in this manual to correctly perform installation and wiring.
- Do not operate or store the Units in the following locations. Doing so may result in malfunction, in operation stopping, or in burning.

  Locations subject to direct sunlight
  Locations subject to temperatures or humidity outside the range specified in the specifications
  Locations subject to condensation as the result of severe changes in temperature
  Locations subject to corrosive or flammable gases
  Locations subject to dust (especially iron dust) or salts
  Locations subject to exposure to water, oil, or chemicals
  Locations subject to shock or vibration
- Take appropriate and sufficient countermeasures during installation in the following locations.

  Locations subject to strong, high-frequency noise
  Locations subject to static electricity or other forms of noise
  Locations subject to strong electromagnetic fields
  Locations subject to possible exposure to radioactivity
  Locations close to power lines
- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up.
- Use the rated power supply voltage for the Units that supply power. Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied in places where the power supply is unstable.
- Install the Units away from sources of heat and ensure proper ventilation. Not doing so may result in malfunction, in operation stopping, or in burning.
- Do not allow foreign matter to enter the openings in the Unit. Doing so may result in Unit burning, electric shock, or failure.

Turning OFF the Power Supply

- Do not turn OFF the power supply while data is being transferred.
- Do not turn OFF the power supply while parameters are being written to the Communications Coupler Unit or NX Units.

General Communications

- Refer to the user's manual for the Communications Coupler Unit for precautions for the correct use of communications with the connected Communications Coupler Unit.

Regulations and Standards

Conformance to EU Directives

Applicable Directives

- EMC Directives
- Low Voltage Directive

Concepts

● EMC Directives

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards.*1

Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer. EMC-related performance of the OMRON devices that comply with EC Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

*1. Applicable EMC (Electromagnetic Compatibility) standards are as follows:
EMS (Electromagnetic Susceptibility): EN 61131-2
EMI (Electromagnetic Interference): EN 61131-2 (Radiated emission: 10-m regulations).

● Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 VAC and 75 to 1,500 VDC meet the required safety standards. The applicable directive is EN 61131-2.

● Conformance to EU Directives

The NX-series Units comply with EU Directives. To ensure that the machine or device in which the NX-series Units are used complies with EU Directives, the following precautions must be observed.

- The NX-series Units must be installed within a control panel.
- The SELV requirements must be satisfied for the DC power supplies that are connected as the Unit power supplies and I/O power supplies for the NX-series Units.

  We recommend that you use the OMRON S8JX-series Power Supplies. EMC standard compliance was confirmed for the recommended Power Supplies.
- NX-series Units that comply with EU Directives also conform to the Common Emission Standard (EN 61131-2). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions.

  You must therefore confirm that the overall machine or equipment in which the NX-series Units are used complies with EU Directives.
- You must use power supplies with an output hold time of 10 ms or longer for the DC power supplies that are connected as the Unit power supplies and I/O power supplies for the NX-series Units.
- This is a Class A product (for industrial environments). In a residential environment, it may cause radio interference. If radio interference occurs, the user may be required to take appropriate measures.

Conformance to UL and CSA Standards

Some NX-series products comply with UL and CSA standards. If you use an NX-series product that complies with UL or CSA standards and the machinery or system in which you use the NX-series product must also comply with the standards, refer to the *Instruction Sheet* that is provided with the product. The *Instruction Sheet* provides the application conditions for complying with the standards.

Conformance to Shipbuilding Standards

Some NX-series products comply with shipbuilding standards. If you use an NX-series product that complies with shipbuilding standards and the machinery or system in which you use the NX-series product must also comply with the standards, consult with your OMRON representative. Application conditions are defined according to the installation location. Application may not be possible for some installation locations.

Usage Conditions for NK and LR Shipbuilding Standards

- The NX-series Units must be installed within a control panel.
- Gaps in the door to the control panel must be completely filled or covered with gaskets or other material.
- The following noise filter must be connected to the power supply line.

Name	Manufacturer	Model
Noise filter	Cosel Co., Ltd.	TAH-06-683

Conformance to KC Standards

Observe the following precaution if you use NX-series Units in Korea.

A 급 기기 (업무용 방송통신기자재)
이 기기는 업무용(A 급) 전자파적합기기로서 판매자
또는 사용자는 이 점을 주의하시기 바라며, 가정외의
지역에서 사용하는 것을 목적으로 합니다.

Class A Device (Broadcasting Communications Device for Office Use)

This device obtained EMC registration for office use (Class A), and it is intended to be used in places other than homes.

Sellers and/or users need to take note of this.

Software Licenses and Copyrights

This product incorporates certain third party software. The license and copyright information associated with this software is available at http://www.fa.omron.co.jp/nj_info_e/.

Unit Versions

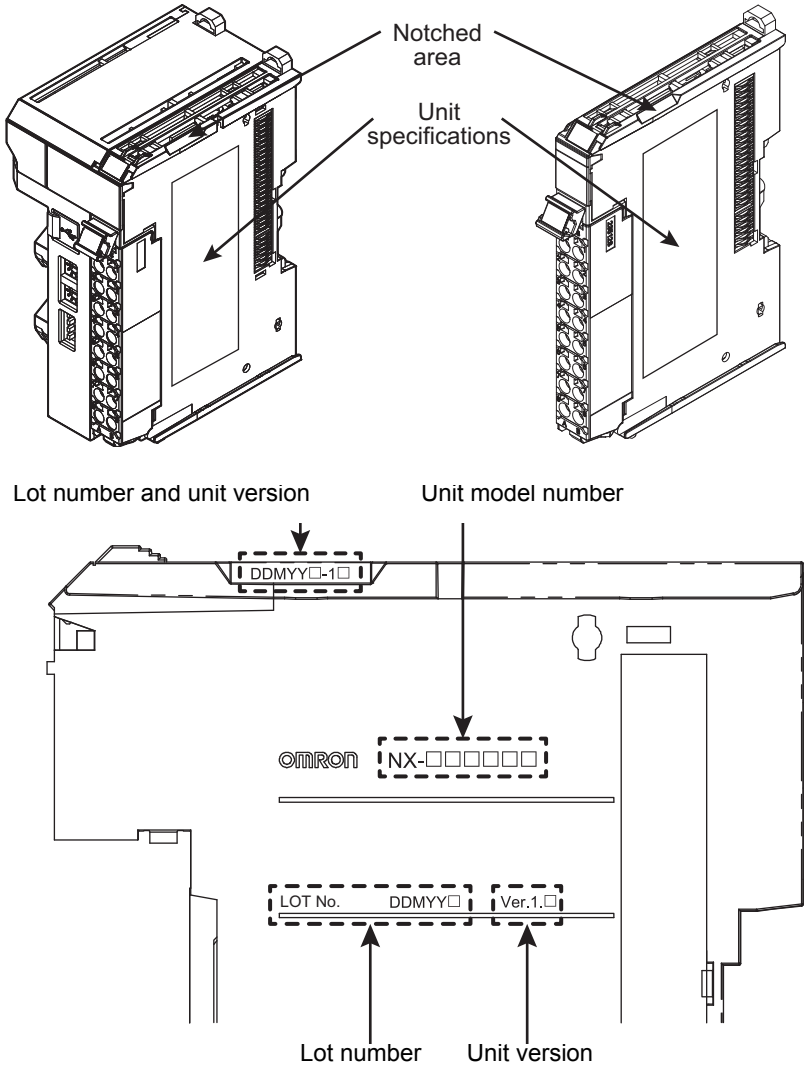
This section describes the notation that is used for unit versions, the confirmation method for unit versions, and the relationship between unit versions and Sysmac Studio versions.

Unit Versions

A “unit version” has been introduced to manage the Units in the NX Series according to differences in functionality accompanying Unit upgrades.

Notation of Unit Versions on Products

The unit version is given with the Unit specifications on the side of the Unit or in the notched area.



The following information is provided in the Unit specifications on the Unit.

Name	Function
Unit model number	Gives the model of the Unit.
Unit version	Gives the unit version of the Unit.
Lot number	Gives the lot number of the Unit. DDMYY□: Lot number, □: Used by OMRON. “M” gives the month (1 to 9: January to September, X: October, Y: November, Z: December)

The following information is provided in the notched area on the Unit.

Name	Function
Lot number and unit version	Gives the lot number and unit version of the Unit. • DDMYY☐: Lot number, ☐: Used by OMRON. “M” gives the month (1 to 9: January to September, X: October, Y: November, Z: December) • 1☐: Unit version The decimal portion of the unit version is omitted. (It is provided in the Unit specifications.)

Confirming Unit Versions with the Sysmac Studio

You can use the Production Information on the Sysmac Studio to check the unit versions of Communications Coupler Unit and NX Units.

The following example is for an EtherCAT Slave Terminal.

Refer to the user's manual for the connected Communications Coupler Unit for details on how to check the unit versions of the Units on any other type of Slave Terminal.

1 Select ***Configurations and Setup*** in the Multiview Explorer and then select EtherCAT. Double-click the EtherCAT Coupler Unit under **EtherCAT**. Or, right-click the EtherCAT Coupler Unit and select ***Edit*** from the menu.
The Edit Slave Terminal Configuration Tab Page is displayed.

You can also display the Edit Slave Terminal Configuration Tab Page with any of the following operations.

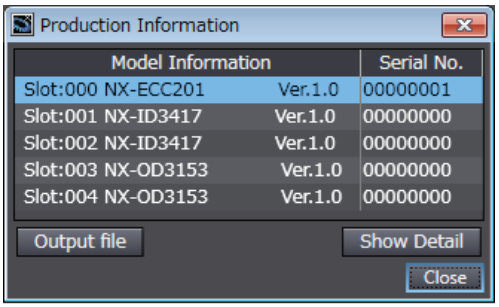
Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer, right-click the EtherCAT Coupler Unit in the EtherCAT Configuration Edit Tab Page, and select ***Edit Slave Terminal Configuration***.

Or, select the EtherCAT Coupler Unit on the EtherCAT Configuration Edit Tab Page click the **Edit Slave Terminal Configuration** Button.

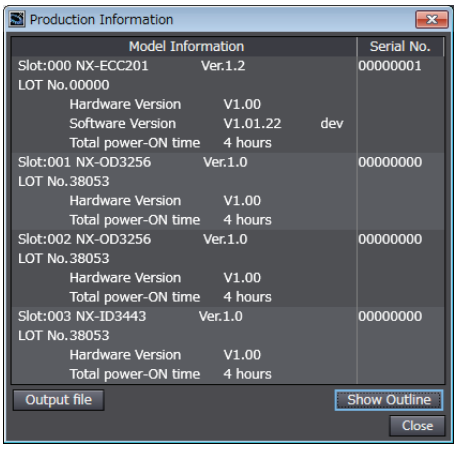
2 Go online.

3 Right-click the EtherCAT Coupler Unit and select ***Display Production Information*** from the menu.

The Production Information Dialog Box is displayed.



Simple Display



Detailed Display

In this example, “Ver.1.0” is displayed next to the Unit model.

The following items are displayed.

- Slot number
- Unit model number

- Unit version
- Serial number
- Lot number
- Hardware version
- Software version
- Total power-ON time

The software version is displayed only for Units that contain software.

Version Information

The total power-ON time is provided by function to monitor the total power-ON time. The function to monitor the total power-ON time was added for a version upgrade. Refer to the user's manual for the Communications Coupler Unit for the versions that support monitoring the total power-ON time.

Unit Versions and Sysmac Studio Versions

The functions that are supported depend on the unit version of the Unit. The version of Sysmac Studio that supports the functions that were added for an upgrade is also required to use those functions.

Refer to *A-5 Version Information* on page A-32 for the functions that are supported by each unit version.

Related Manuals

The following table shows related manuals. Use these manuals for reference.

Manual name	Cat. No.	Model numbers	Application	Description
NX-series IO-Link Master Unit (this manual)	W567	NX-ILM400	Learning hardware information, wiring, and specifications for the NX-series IO-Link Master Unit and checking a list of NX objects.	Describes part names, functions, installation, and wiring and also provides tables of specifications and NX objects for the NX-series IO-Link Master Unit.
IO-Link System User's Manual	W570	NX-ILM400 GX-ILM08C	Learning everything from an introduction to details about IO-Link Systems, including mainly software information common to all IO-Link masters, Support Software operating methods, and troubleshooting.	Provides an overview of IO-Link Systems and explains the system configuration, communications specifications, communications methods, I/O data, parameters, models, Support Software, and troubleshooting. Refer to the following manuals for the individual IO-Link Master Units for hardware information and specifications specific to each Master Unit and a list of the NX objects for each Master Unit. NX-series IO-Link Master Unit: W568 GX-series IO-Link Master Unit: W488-E1-05 or later
GX-series EtherCAT Slave Units	W488	GX-ID□□□□ GX-OD□□□□ GX-OC□□□□ GX-MD□□□□ GX-AD□□□□ GX-DA□□□□ GX-EC□□□□ GX-ILM□□□ XWT-ID□□ XWT-OD□□	Learning hardware information, wiring, and specifications for the NX-series IO-Link Master Unit and checking a list of NX objects (W488-E1-05 or later). Or, learning how to use GX-series EtherCAT Slave Terminals.	Describes part names, functions, installation, and wiring and also provides tables of specifications and NX objects for the NX-series IO-Link Master Unit (W488-E1-05 or later). Also describes the hardware, setup methods, and functions of the EtherCAT Remote I/O Terminals.
NX-series Digital I/O Units User's Manual	W521	NX-ID□□□□ NX-IA□□□□ NX-OC□□□□ NX-OD□□□□ NX-MD□□□□	Learning how to use NX-series Digital I/O Units	The hardware, setup methods, and functions of the NX-series Digital I/O Units are described.
NX-series Data Reference Manual	W525	NX-□□□□□□	Referencing lists of the data that is required to configure systems with NX-series Units	Lists of the power consumptions, weights, and other NX Unit data that is required to configure systems with NX-series Units are provided.

Manual name	Cat. No.	Model numbers	Application	Description
NX-series Analog I/O Units User's Manual	W522	NX-AD□□□□ NX-DA□□□□ NX-TS□□□□	Learning how to use NX-series Analog I/O Units and Temperature Input Units	The hardware, setup methods, and functions of the NX-series Analog I/O Units and Temperature Input Units are described.
NX-series System Units User's Manual	W523	NX-PD1□□□ NX-PF0□□□ NX-PC0□□□ NX-TBX01	Learning how to use NX-series System Units	The hardware and functions of the NX-series System Units are described.
NX-series Position Interface Units User's Manual	W524	NX-EC0□□□ NX-ECS□□□ NX-PG0□□□	Learning how to use NX-series Position Interface Units	The hardware, setup methods, and functions of the NX-series Incremental Encoder Input Units, SSI Input Units, and Pulse Output Unit are described.
NX-series Safety Control Unit User's Manual	Z930	NX-SL□□□□ NX-SI□□□□ NX-SO□□□□	Learning how to use NX-series Safety Control Units	The hardware, setup methods, and functions of the NX-series Safety Control Units are described.
NX-series Safety Control Unit Instructions Reference Manual	Z931	NX-SL□□□□	Learning about the specifications of instructions for the Safety CPU Unit.	The instructions for the Safety CPU Unit are described. When programming, use this manual together with the *NX-series Safety Control Unit User's Manual* (Cat. No. Z930).
Sysmac Studio Version 1 Operation Manual	W504	SYSMAC-SE2□□□	Learning about the operating procedures and functions of the Sysmac Studio.	Describes the operating procedures of the Sysmac Studio.
NJ/NX-series Troubleshooting Manual	W503	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning about the errors that may be detected in an NJ/NX-series Controller.	Concepts on managing errors that may be detected in an NJ/NX-series Controller and information on individual errors are described. Use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) or *NX-series CPU Unit Hardware User's Manual* (Cat. No. W535) and with the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501).
NX-series EtherCAT® Coupler Unit User's Manual	W519	NX-ECC20□	Learning how to use an NX-series EtherCAT Coupler Unit and EtherCAT Slave Terminals	The following items are described: the overall system and configuration methods of an EtherCAT Slave Terminal (which consists of an NX-series EtherCAT Coupler Unit and NX Units), and information on hardware, setup, and functions to set up, control, and monitor NX Units through EtherCAT.
NX-series EtherNet/IP™ Coupler Unit User's Manual	W536	NX-EIC202	Learning how to use an NX-series EtherNet/IP Coupler Unit and EtherNet/IP Slave Terminals.	The following items are described: the overall system and configuration methods of an EtherNet/IP Slave Terminal (which consists of an NX-series EtherNet/IP Coupler Unit and NX Units), and information on hardware, setup, and functions to set up, control, and monitor NX Units.

Manual name	Cat. No.	Model numbers	Application	Description
NX-series CPU Unit Hardware User's Manual	W535	NX701-□□□□	Learning the basic specifications of the NX-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NX-series system is provided along with the following information on the CPU Unit. • Features and system configuration • Overview • Part names and functions • General specifications • Installation and wiring • Maintenance and Inspection Use this manual together with the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501).
NJ-series CPU Unit Hardware User's Manual	W500	NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NJ-series system is provided along with the following information on the CPU Unit. • Features and system configuration • Overview • Part names and functions • General specifications • Installation and wiring • Maintenance and Inspection Use this manual together with the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501).
NJ/NX-series CPU Unit Software User's Manual	W501	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning how to program and set up an NJ/NX-series CPU Unit. Mainly software information is provided.	The following information is provided on an NJ/NX-series CPU Unit. • CPU Unit operation • CPU Unit features • Initial settings • Programming based on IEC 61131-3 language specifications Use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) or *NX-series CPU Unit Hardware User's Manual* (Cat. No. W535).
NJ/NX-series CPU Unit Built-in EtherCAT® Port User's Manual	W505	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Using the built-in EtherCAT port on an NJ/NX-series CPU Unit.	Information on the built-in EtherCAT port is provided. This manual provides an introduction and provides information on the configuration, features, and setup. Use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) or *NX-series CPU Unit Hardware User's Manual* (Cat. No. W535) and with the NJ/NX-*series CPU Unit Software User's Manual* (Cat. No. W501).

Manual name	Cat. No.	Model numbers	Application	Description
NJ/NX-series CPU Unit Motion Control User's Manual	W507	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning about motion control settings and programming concepts.	The settings and operation of the CPU Unit and programming concepts for motion control are described. When programming, use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) or *NX-series CPU Unit Hardware User's Manual* (Cat. No. W535) and with the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501).
NJ/NX-series Instructions Reference Manual	W502	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning detailed specifications on the basic instructions of an NJ/NX-series CPU Unit.	The instructions in the instruction set (IEC 61131-3 specifications) are described. When programming, use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) or *NX-series CPU Unit Hardware User's Manual* (Cat. No. W535) and with the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501).
NJ/NX-series Motion Control Instructions Reference Manual	W508	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning about the specifications of the motion control instructions.	The motion control instructions are described. When programming, use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) or *NX-series CPU Unit Hardware User's Manual* (Cat. No. W535), with the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501), and with the *NJ/NX-series CPU Unit Motion Control User's Manual* (Cat. No. W507).

Terminology

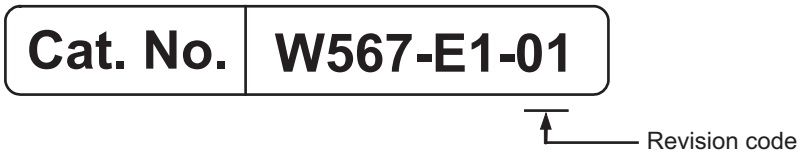
The following table describes terms used for NX Units. Refer to the *IO-Link System User's Manual* (Cat. No. W570) for information on terms used for IO-Link Master Units.

Term	Abbre-viation	Description
application layer status, AL status	---	Status for indicating information on errors that occur in an application on a slave.
CAN application protocol over Ether-CAT	CoE	A CAN application protocol service implemented on EtherCAT.
CAN in Automation	CiA	CiA is the international users' and manufacturers' group that develops and supports higher-layer protocols.
Communications Coupler Units	---	The generic name of an interface unit for remote I/O communications on a network between NX Units and a host network master.
DC time	---	EtherCAT slaves that support distributed clock synchronization have a clock that is shared by all slaves in the network. The time that is based on this distributed clock is called the DC time.
device profile	---	A collection of device dependent information and functionality providing consistency between similar devices of the same device type.
device variable	---	A variable in the NJ/NX-series CPU Unit to which process data on an EtherCAT slave is allocated. Slave process data is accessed by directly reading and writing device variables from user applications on the NJ/NX-series CPU Unit.
distributed clock	DC	Clock distribution mechanism used to synchronize EtherCAT slaves and the EtherCAT master.
EtherCAT slave controller	ESC	A controller for EtherCAT slave communications.
EtherCAT slave information	ESI	An XML file that contains setting information for an EtherCAT slave.
EtherCAT state machine	ESM	An EtherCAT communications state machine.
EtherCAT Technology Group	ETG	The ETG is a global organization in which OEM, end users, and technol-ogy providers join forces to support and promote the further technology development.
I/O map settings	---	Settings that assign variables to I/O ports. Assignment information between I/O ports and variables.
I/O port	---	A logical interface that is used by the CPU Unit to exchange data with an external device (slave or Unit).
I/O refreshing	---	Cyclic data exchange with external devices that is performed with prede-termined memory addresses.
index	---	Address of an object within an application process.
network configuration information	---	The EtherCAT network configuration information held by the EtherCAT master.
NX bus	---	The NX-series internal bus.
object	---	An abstract representation of a particular component within a device, which consists of data, parameters, and methods.
object dictionary	OD	Data structure that contains description of data type objects, communi-cation objects and application objects.
Operational	---	A state in EtherCAT communications where SDO communications and I/O are possible.
PDO communications	---	An acronym for process data communications.
Pre-Operational	---	A state in EtherCAT communications where only SDO communications are possible with the slaves, i.e., no I/O can be performed.
primary periodic task	---	The task with the highest priority.
process data	---	Collection of application objects designated to be downloaded cyclically or acyclically for the purpose of measurement and control.

Term	Abbre-viation	Description
process data communications	---	One type of EtherCAT communications in which process data objects (PDOs) are used to exchange information cyclically and in realtime. This is also called PDO communications.
process data object	PDO	A structure that describes the mappings of parameters that have one or more process data entities.
receive PDO	RxPDO	A process data object received by an EtherCAT slave.
Safe-Operational	---	A state in EtherCAT communications where only SDO communications and reading input data from slaves are possible. Outputs from slaves are not performed.
SDO communications	---	One type of EtherCAT communications in which service data objects (SDOs) are used to transmit information whenever required.
service data object	SDO	CoE asynchronous mailbox communications where all objects in the object dictionary can be read and written.
Slave Information Interface	SII	Slave information that is stored in non-volatile memory in the slave.
Slave Terminal	---	A building-block remote I/O terminal to which a Communications Coupler Unit and NX Units are mounted
subindex	---	Sub-address of an object within the object dictionary.
Sync0	---	A signal that gives the interrupt timing based on the distributed clock (DC) in EtherCAT communications. The slaves execute controls according to this interrupt timing.
Sync Manager	SM	Collection of control elements to coordinate access to concurrently used objects.
task period	---	The interval at which the primary periodic task or a periodic task is executed.
transmit PDO	TxPDO	A process data object sent from an EtherCAT slave.

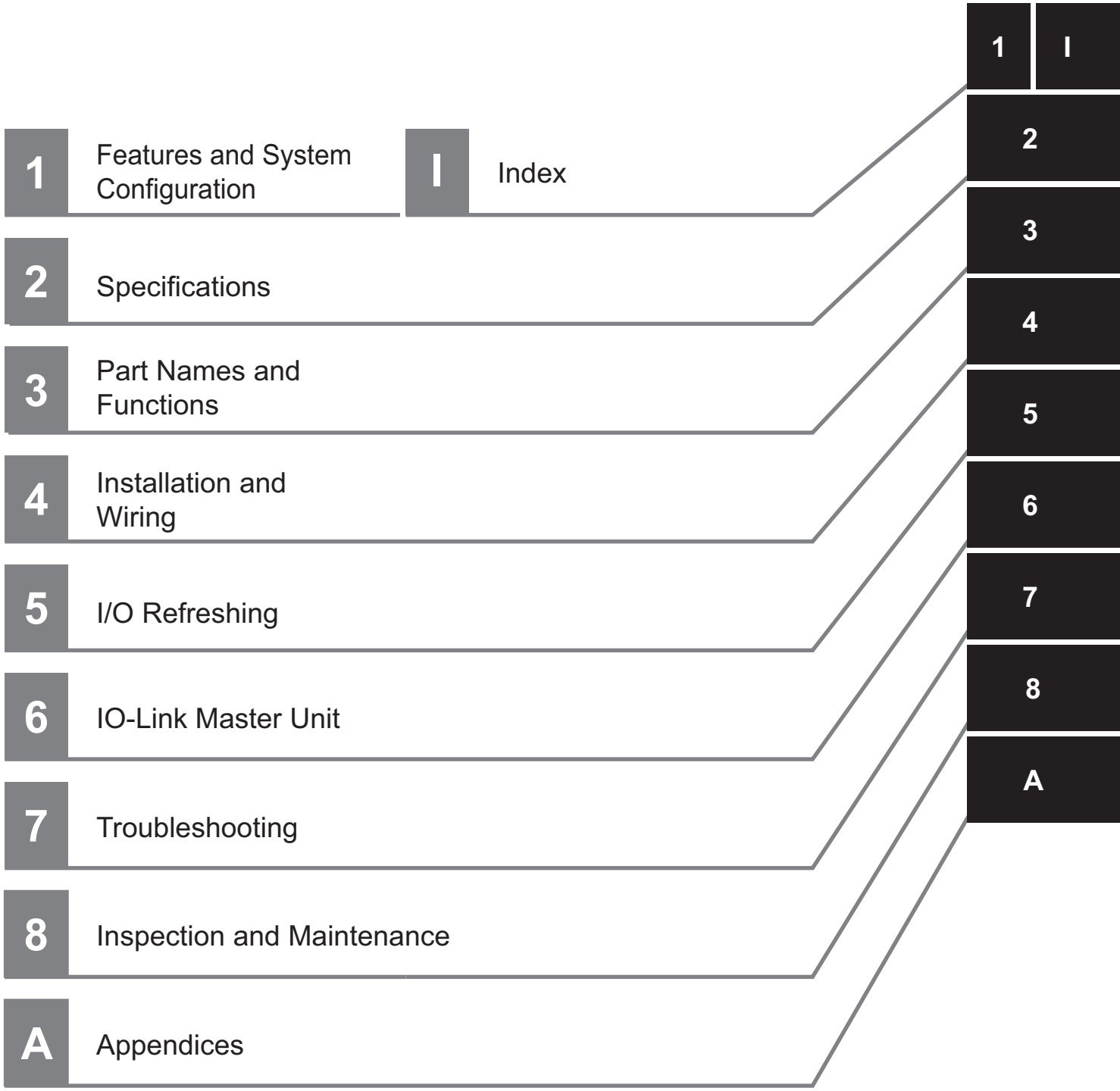
Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.



Revision code	Date	Revised content
01	July 2016	Original production

Sections in this Manual



1

Features and System Configuration

This section describes the NX system configuration and the features of IO-Link Master Units.

1-1 Features of the IO-Link Master Units 1-2
1-1-1 Introduction 1-2
1-2 System Configuration of Slave Terminals 1-4
1-2-1 Overview 1-4
1-2-2 System Configuration 1-4
1-3 Model List 1-6
1-3-1 Model Notation 1-6
1-4 List of Functions 1-7
1-5 Support Software 1-8

1-1 Features of the IO-Link Master Units

This section describes the features of IO-Link Master Units.

1-1-1 Introduction

An IO-Link Master Unit is an NX Unit that has I/O processing functions for IO-Link communications with IO-Link devices and I/O processing functions for digital I/O data (ON/OFF signals) with non-IO-Link devices.

1-1-2 Features

The NX-series IO-Link Master Unit has the following features.

Reading of Control Signals, Status, Wiring, and Power Supply Status of IO-Link Devices from the Host Controller

The host controller can read the following information as IO-Link Master Unit status.

- Signals and status of the IO-Link devices (examples for photoelectric sensor: unstable detection and sensor errors)
- Disconnections, short-circuits, I/O power ON status, etc., between the IO-Link master and devices

Inputting Digital Signals from Sensors and Other IO-Link Devices during IO-Link Communications

With IO-Link devices that support digital inputs for pin 2,*1 the IO-Link Master Unit can simultaneously perform both IO-Link communications and receive the digital inputs.

This enables rapid input during IO-Link communications.

*1. Digital inputs that use pin 2 of IO-Link Master Unit ports.

Combining IO-Link Devices with General-purpose Sensors and Actuators

- You can connect a combination of IO-Link devices and non-IO-Link devices, such as general-purpose sensors and actuators, to the same IO-Link Master Unit. This allows a single master to function as an IO-Link communications terminal, a digital input terminal, and a digital output terminal.
- When you change from an existing system to an IO-Link System, there is no need to replace the cables of existing general-purpose sensors or actuators.

Checking for Incorrect Connections of IO-Link Devices When IO-Link Communications Start

You can register in advance ID information on the IO-Link devices that should connect to the ports of the IO-Link Master Unit to enable verifying the connections of the IO-Link devices when IO-Link communications start. This lets you reduce commissioning and maintenance work.

Easy Replacement of IO-Link Devices

● Simple Backup and Restoration of IO-Link Device Parameters

For OMRON’s IO-Link Master Units, you can back up parameter settings of the IO-Link devices in the IO-Link Master Unit.

When you replace IO-Link devices, you can automatically restore those backup parameters in the new IO-Link devices.

This eliminates the need for software tools when replacing IO-Link devices.

Status on Noise Influence on Cables Connected to IO-Link Devices

OMRON's IO-Link Master Units record the total number of retries in cyclic communications. You can use this value to check for the influences of noise and other problems.

For other features, refer to the *IO-Link System User’s Manual* (Cat. No. W570).

1-2 System Configuration of Slave Terminals

1-2-1 Overview

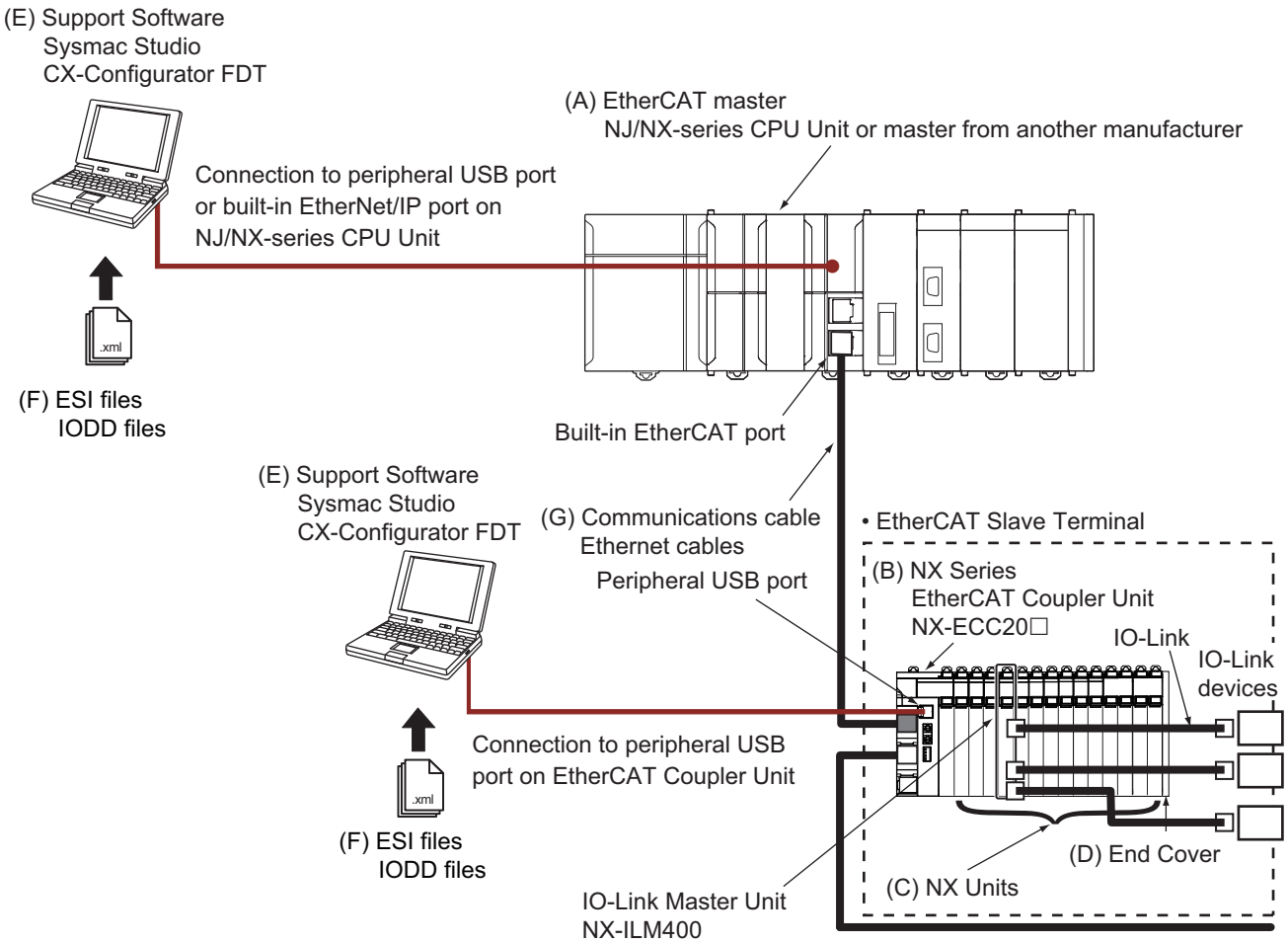
The Slave Terminal is a building-block remote I/O slave that is created by mounting a group of NX Units to a Communications Coupler Unit.

The NX Units can be flexibly combined with a Communications Coupler Unit to achieve the optimum remote I/O slave for the application with less wiring, less work, and less space.

1-2-2 System Configuration

The following figure shows an example of the system configuration when an EtherCAT Coupler Unit is used as a Communications Coupler Unit.

Refer to the user's manual for the connected Communications Coupler Unit for details on how to configure the system when any other type of Communications Coupler Unit is used.



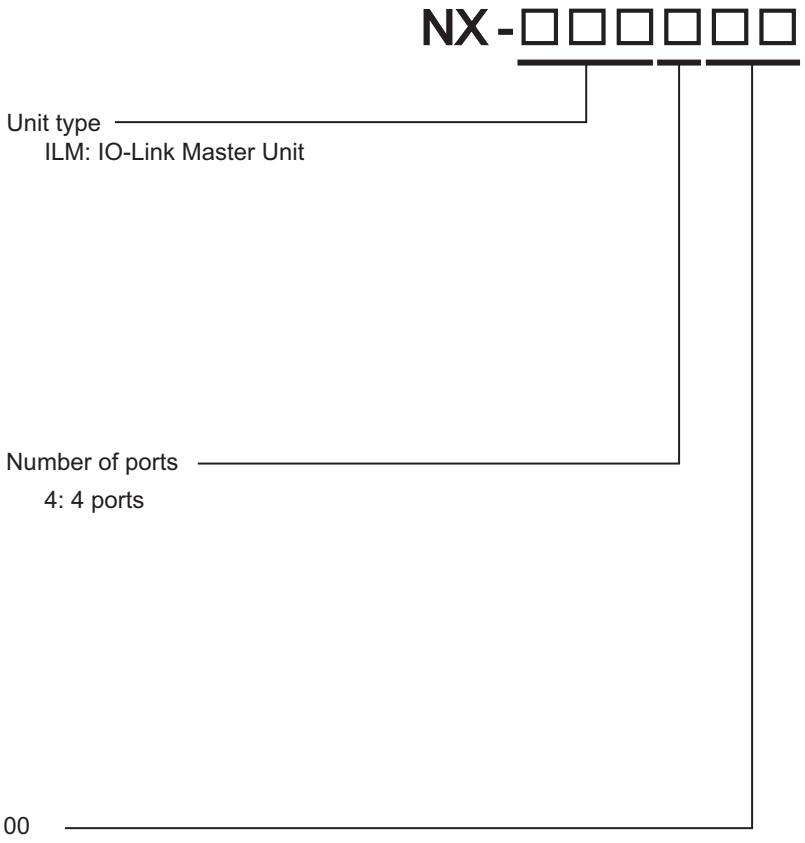
Letter	Item	Description
(A)	EtherCAT master *1	The EtherCAT master manages the network, monitors the status of slaves, and exchanges I/O data with slaves.
(B)	EtherCAT Coupler Unit	The EtherCAT Coupler Unit serves as an interface for process data communications on the EtherCAT network between the NX Units and the EtherCAT master. The I/O data for the NX Units is accumulated in the EtherCAT Coupler Unit and then all of the data is exchanged with the EtherCAT master at the same time. The EtherCAT Coupler Unit can also perform message communications (SDO communications) with the EtherCAT master.
(C)	NX Units	The NX Units perform I/O processing with connected external devices. The NX Units perform process data communications with the EtherCAT master through the EtherCAT Coupler Unit.
	IO-Link Master Unit	IO-Link devices are connected to Screwless Clamping Terminal Blocks.
(D)	End Cover	The End Cover is attached to the end of the Slave Terminal.
(E)	Sysmac Studio Support Software	The Sysmac Studio runs on a personal computer and it is used to configure the EtherCAT network and EtherCAT Slave Terminal, and to program, monitor, and troubleshoot the Controllers. You can connect the computer, in which the Sysmac Studio is installed, to the peripheral USB port or built-in EtherNet/IP port on an NJ/NX-series CPU Unit to set up the EtherCAT Slave Terminal. Or you can connect it to the peripheral USB port on the EtherCAT Coupler Unit to set up the EtherCAT Slave Terminal.
	Support Software (CX-Configurator FDT)	The CX-ConfiguratorFDT is used to set the parameters of the IO-Link devices.
(F)	ESI (EtherCAT Slave Information) file	The ESI file contains information that is unique to the EtherCAT Slave Terminal in XML format. You can load the ESI file into the Sysmac Studio to easily allocate Slave Terminal process data and configure other settings. The ESI files for OMRON EtherCAT slaves are already installed in the Sysmac Studio. You can update the Sysmac Studio to get the ESI files for the most recent models.
	IODD (IO Device Description) files	These files contain IO-Link device definitions. The IODD files for OMRON's IO-Link devices are automatically installed when you install CX-ConfiguratorFDT. If you use IO-Link devices from another company, you must install the IODD files for the IO-Link devices of that company in CX-ConfiguratorFDT.
(G)	Communications cable	Use a double-shielded cable with aluminum tape and braiding of Ethernet category 5 (100Base-TX) or higher, and use straight wiring.

*1. An EtherCAT Slave Terminal cannot be connected to any of the OMRON CJ1W-NC□81/□82 Position Control Units even though they can operate as EtherCAT masters.

1-3 Model List

1-3-1 Model Notation

The IO-Link Master Unit models are assigned based on the following rules.



1-4 List of Functions

Refer to the *IO-Link System User's Manual* (Cat. No. W570) for the functions of IO-Link Master Units.

Refer to *A-1 Data Sheet* on page A-2 for the specifications of each model and for details on the functions.

1-5 Support Software

Refer to the *IO-Link System User's Manual* (Cat. No. W570) for information on the Support Software used for the IO-Link Master Units.

Refer to *A-5 Version Information* on page A-32 for information on the Support Software that can perform the settings of the Slave Terminal.

2

Specifications

This section gives the general specifications and individual specifications of the IO-Link Master Units.

2-1 General Specifications **2-2**
2-2 Individual Specifications **2-3**

2-1 General Specifications

The general specifications of the IO-Link Master Unit are shown below.

Item		Specification
Enclosure		Mounted in a panel
Grounding methods		Ground of 100 Ω or less
Operating environment	Ambient operating temperature	0 to 55°C
	Ambient operating humidity	10 to 95% RH (with no icing or condensation)
	Atmosphere	Must be free from corrosive gases.
	Ambient storage temperature	-25 to 70°C (with no icing or condensation)
	Altitude	2,000 m max.
	Pollution degree	Pollution degree 2 or less: Conforms to JIS B 3502 and IEC 61131-2.
	Noise immunity	Conforms to IEC 61000-4-4, 2 kV (power supply line)
	Overvoltage category	Category II: Conforms to JIS B 3502 and IEC 61131-2.
	EMC immunity level	Zone B
	Vibration resistance	Conforms to IEC 60068-2-6. 5 to 8.4 Hz with amplitude of 3.5 mm, 8.4 to 150 Hz, acceleration of 9.8 m/s^2 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)
	Shock resistance	Conforms to IEC 60068-2-27, 147 m/s^2, 3 times each in X, Y, and Z directions
	Insulation resistance	*1
	Dielectric strength	*1
Applicable standards*2		cULus: Listed (UL 61010-2-201), ANSI/ISA 12.12.01, EU: EN 61131-2, RCM, and KC: KC Registration

*1. Varies with NX Unit Models. Refer to *A-1 Data Sheet* on page A-2 for the specifications of individual NX Units.

*2. Refer to the OMRON website (www.ia.omron.com) or ask your OMRON representative for the most recent applicable standards for each model.

2-2 Individual Specifications

Refer to *A-1 Data Sheet* on page A-2 for the specifications of individual IO-Link Master Units.

3

Part Names and Functions

This section describes the names and functions of the IO-Link Master Unit.

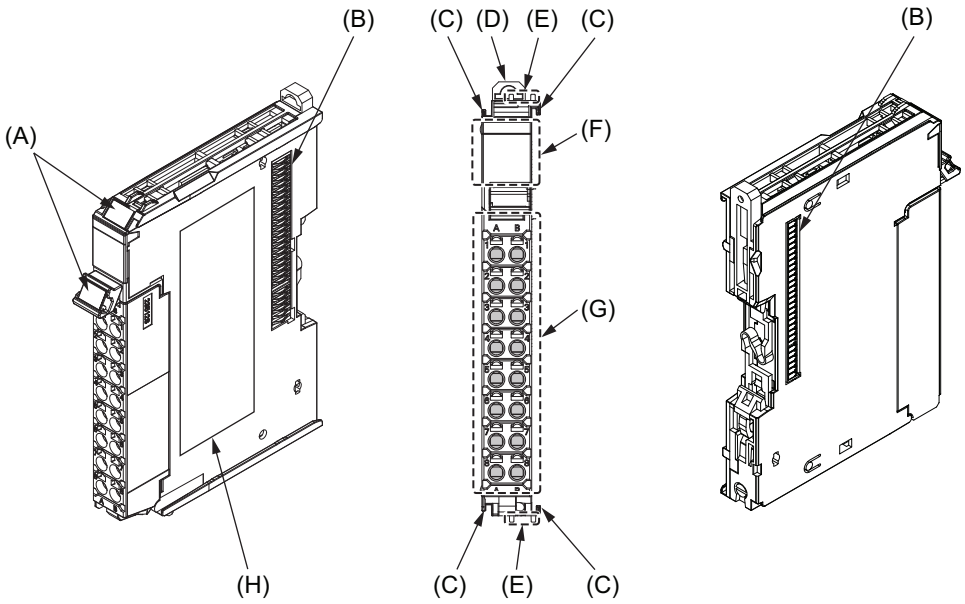
3-1 Part Names 3-2
3-1-1 IO-Link Master Unit 3-2
3-2 Indicators 3-4
3-2-1 TS Indicator 3-4
3-2-2 C Indicator 3-5
3-2-3 E Indicator 3-5
3-2-4 C/Q Indicator 3-5

3-1 Part Names

This section describes the names and functions of the components of the IO-Link Master Unit.

3-1-1 IO-Link Master Unit

NX-ILM400

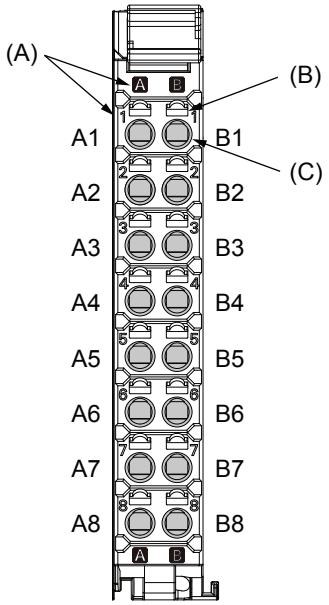


Letter	Name	Function
(A)	Marker attachment locations	The locations where markers are attached. The markers made by OMRON are installed for the factory setting. Commercially available markers can also be installed. Refer to *4-1-2 Attaching Markers* on page 4-4
(B)	NX bus connector	This connector is used to connect each Unit.
(C)	Unit hookup guides	These guides are used to connect two Units.
(D)	DIN Track mounting hooks	These hooks are used to mount the NX Unit to a DIN Track.
(E)	Protrusions for removing the Unit	The protrusions to hold when removing the Unit.
(F)	Indicators	The indicators show the current operating status of the Unit. Refer to *3-2 Indicators* on page 3-4
(G)	Terminal block	The terminal block is used to connect external devices. The number of terminals depends on the type of Unit.
(H)	Unit specifications	The specifications of the Unit are given.

Terminal Blocks

The NX-TBA162 Screwless Clamping Terminal Block is used for the 16-pin terminal block.

● NX-TBA162



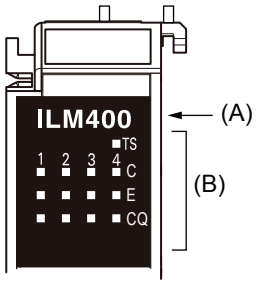
Sixteen-pin Terminal Block

Letter	Name	Function
(A)	Terminal number indications	Terminal numbers for which A and B indicate the column, and 1 to 8 indicate the line are displayed. The terminal number is a combination of column and line, i.e. A1 to A8 and B1 to B8. The terminal number indications are the same regardless of the number of terminals on the terminal block.
(B)	Release holes	Insert a flat-blade screwdriver into these holes to connect and remove the wires.
(C)	Terminal holes	The wires are inserted into these holes.

3-2 Indicators

There are indicators on the IO-Link Master Unit to show the current operating status of the Unit, the IO-Link communications status, and the signal I/O status.

● NX Units (12 mm Width)



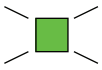
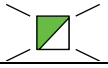
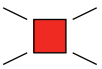
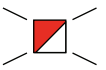
NX-ILM400

Letter	Name	Function
(A)	Model number indication	The model number of the NX Unit is displayed. For the NX-ILM400, *ILM400* is given. The colors of NX Units indicate their I/O specifications. • IO-Link Master Unit: Green
(B)	Indicators	The indicators show the current operating status of the NX Unit or the signal I/O status.

The following section describes the specifications of each indicator.

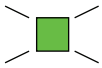
3-2-1 TS Indicator

The meanings of the indicator are given below.

Color	Status		Description
Green		Lit	• The Unit is operating normally. • The Unit is ready for I/O refreshing.
		Flashing at 2-s intervals	Initializing (changing from Init state to SafeOpe or Ope state)
Red		Lit	A hardware failure, WDT error, or other fatal error that is common to all I/O Units occurred.
		Flashing at 1-s intervals	A communications error or other NX bus-related error that is common to all I/O Units occurred.
---		Not lit	• No Unit power supply • Restarting is in progress for the Slave Terminal. • Waiting for initialization to start

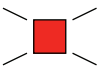
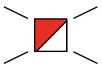
3-2-2 C Indicator

The meanings of the indicator are given below.

Color	Status		Description
Green		Lit	Initial processing is in progress or IO-Link communications are in progress during operation in IO-Link Mode.
		Not lit	• IO-Link communications are stopped during operation in IO-Link Mode. • Operation is currently performed in SIO (DI) or SIO (DO) Mode. • The port is disabled.

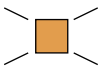
3-2-3 E Indicator

The meanings of the indicator are given below.

Color	Status		Description
Red		Lit	A hardware error or other critical error has occurred.
		Flashing at 1-s intervals	There is an IO-Link communications error during operation in IO-Link Mode.
		Not lit	• There are no IO-Link communications errors during operation in IO-Link Mode. • Operation is currently performed in SIO (DI) or SIO (DO) Mode. • The port is disabled.

3-2-4 C/Q Indicator

The meanings of the indicator are given below.

Color	Status		Description
Yellow		Lit	• The pin-2 input signal is ON during operation in IO-Link Mode. • The I/O signal is ON during operation in SIO (DI) Mode or SIO (DO) Mode.
		Not lit	• The pin-2 input signal is OFF during operation in IO-Link Mode. • The I/O signal is OFF during operation in SIO (DI) Mode or SIO (DO) Mode. • The port is disabled.

4

Installation and Wiring

This section describes how to install the NX Units, the types of power supplies used in the Slave Terminal, their wiring methods, and how to wire the NX Units.

4-1 Installing NX Units 4-2
4-1-1 Installing NX Units 4-2
4-1-2 Attaching Markers 4-4
4-1-3 Removing NX Units 4-5
4-1-4 Installation Orientation 4-7

4-2 Wiring the Power Supply to the Slave Terminal 4-8
4-2-1 Power Supply Types 4-8
4-2-2 Supplying Each Power Supply and Wiring 4-9
4-2-3 Calculating the Total Current Consumption from I/O Power Supply 4-11
4-2-4 Power Supply-related Units for the NX-series 4-12

4-3 Wiring the Terminals 4-15
4-3-1 Wiring to the Screwless Clamping Terminal Block 4-15
4-3-2 Checking the Wiring 4-32

4-4 Wiring Examples and Wiring Precautions 4-33
4-4-1 IO-Link Mode 4-33
4-4-2 SIO (DI) Mode 4-33
4-4-3 SIO (DO) Mode 4-34

4-5 Wiring Precautions 4-35
4-5-1 Wiring Precautions for SIO (DI) Mode 4-35
4-5-2 Wiring Precautions for SIO (DO) Mode 4-35

4-1 Installing NX Units

This section describes how to install NX Units.

Refer to the user's manual for the Communications Coupler Unit for information on preparations of installation and installation in a control panel.

4-1-1 Installing NX Units

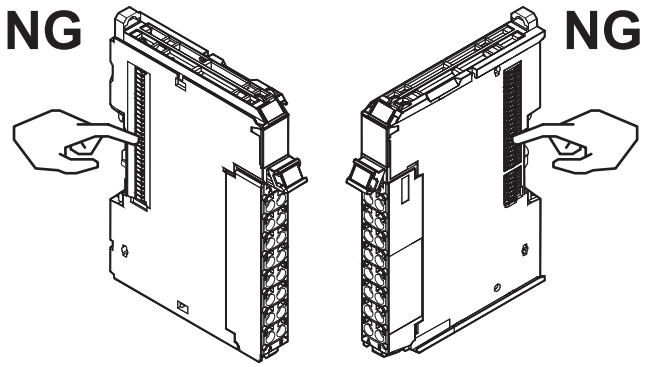
This section describes how to mount two NX Units to each other.

Always turn OFF the power supply before you mount NX Units.

Always mount NX Units one at a time. If you attempt to mount multiple NX Units that are already connected together, the connections between the NX Units may separate from each other and fall.

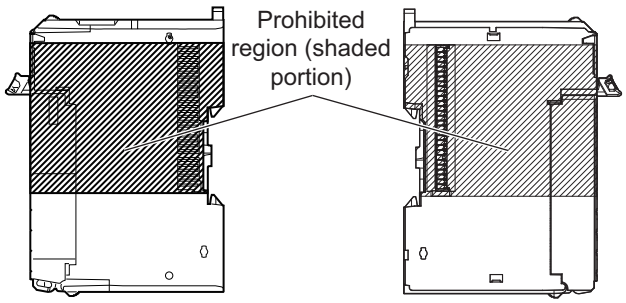
Precautions for Safe Use

- Do not apply labels or tape on the NX Units. When the Unit is installed or removed, adhesive or scrap may adhere to the pins of the NX bus connector, which may cause malfunctions.
- Do not touch the pins in the NX bus connector on the Unit. Dirt may adhere to the pins in the NX bus connector, which may result in malfunctions.



Example: NX Unit (12 mm width)

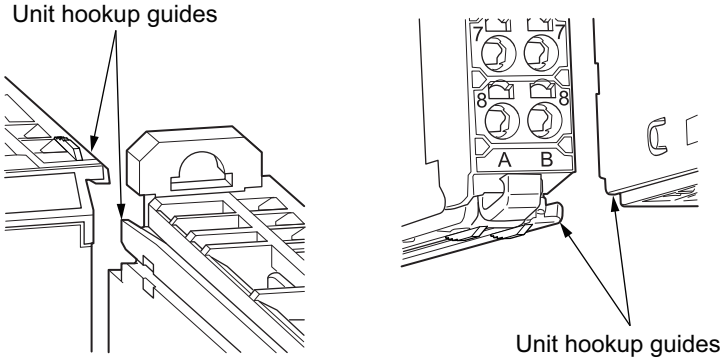
- Do not write with ink or soil within the prohibited region that is shown in the following figure. When the Unit is installed or removed, ink or dirt may adhere to the pins of the NX bus connector, which may cause malfunctions in the Slave Terminal.



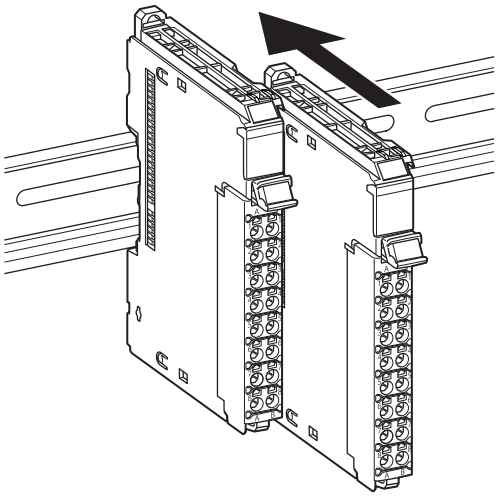
Precautions for Correct Use

- When you install an NX Unit, do not touch or bump the pins in the NX bus connector.
- When you handle an NX Unit, be careful not to apply any stress to the pins in the NX bus connector. If you install an NX Unit and turns ON the power supply when the pins in the NX bus connector are deformed, a contact defect may cause malfunctions.

1 From the front of the previously mounted NX Unit, engage the Unit hookup guides on a new Unit with the Unit hookup guides on the previously mounted NX Unit.



2 Slide the NX Unit in on the hookup guides.



3 Press the NX Unit with a certain amount of force against the DIN Track until you hear the DIN Track mounting hook lock into place.

When you mount the NX Unit, it is not necessary to release the DIN track mounting hook on the NX Unit.

After you mount the NX Unit, make sure that it is locked to the DIN Track.

Additional Information

- Normally, it is not necessary to release the DIN track mounting hook when you mount the NX Unit. However, if you mount the NX Unit on a DIN Track that is not a recommended DIN Track, the DIN track mounting hook may not lock correctly. If that happens, first unlock the DIN track mounting hook, mount the NX Unit to the DIN Track, then lock the DIN track mounting hook.
- Refer to the user's manual for the Communications Coupler Unit for information on how to mount the Communications Coupler Unit, and how to mount the NX Unit to the Communications Coupler Unit.

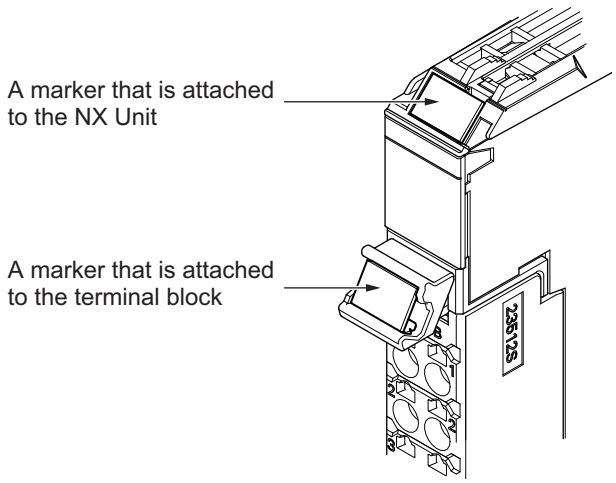
4-1-2 Attaching Markers

You can attach markers to the NX Units to identify them.

The plastic markers made by OMRON are installed for the factory setting. The ID information can be written on them.

Commercially available markers can also be installed.

Replace the markers made by OMRON if you use commercially available markers now.

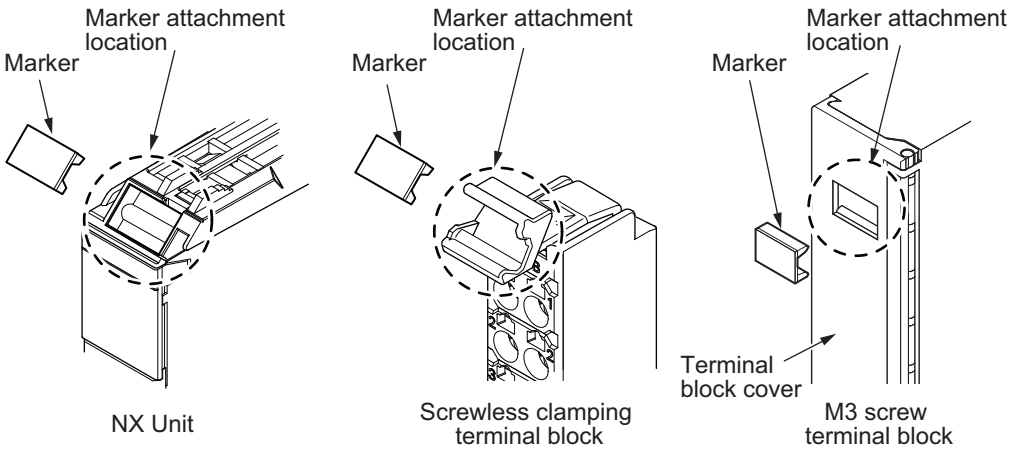


The marker attachment locations vary depending on the type of the external connection terminals on the NX Units.

External connection terminals on NX Units	Marker attachment location
Screwless clamping terminal block	NX Unit and terminal block
M3 screw terminal block	
MIL connector	NX Unit only
Fujitsu connector	

● Installation Method

Insert the protrusions on the markers into the marker attachment locations.



● Commercially Available Markers

Commercially available markers are made of plastic and can be printed on with a special printer.

To use commercially available markers, purchase the following products.

Product name	Model number	
	Manufactured by Phoenix Contact	Manufactured by Weidmuller
Markers	UC1-TMF8	DEK 5/8
Special marker printer	UM EN BLUEMARK X1	PrintJet PRO

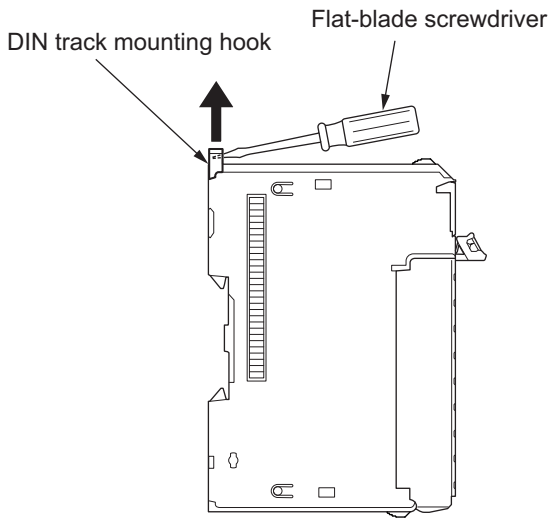
The markers made by OMRON cannot be printed on with commercially available special printers.

4-1-3 Removing NX Units

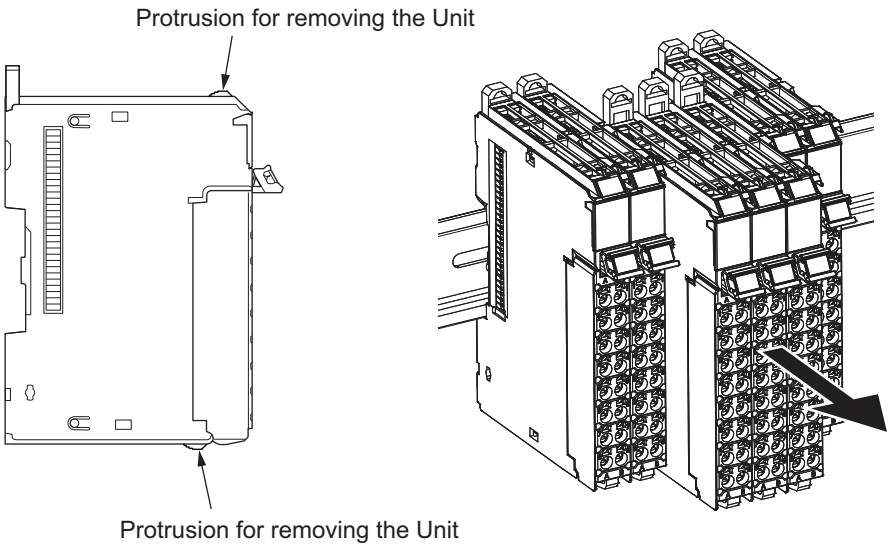
Precautions for Safe Use

Always turn OFF the Unit power supply and I/O power supply before you remove the NX Unit.

1 Use a flat-blade screwdriver to pull up the DIN Track mounting hook on the Unit to remove.



2 Put your fingers on the protrusions for removing multiple NX Units including the Unit to be removed, then pull out straight forward to remove.



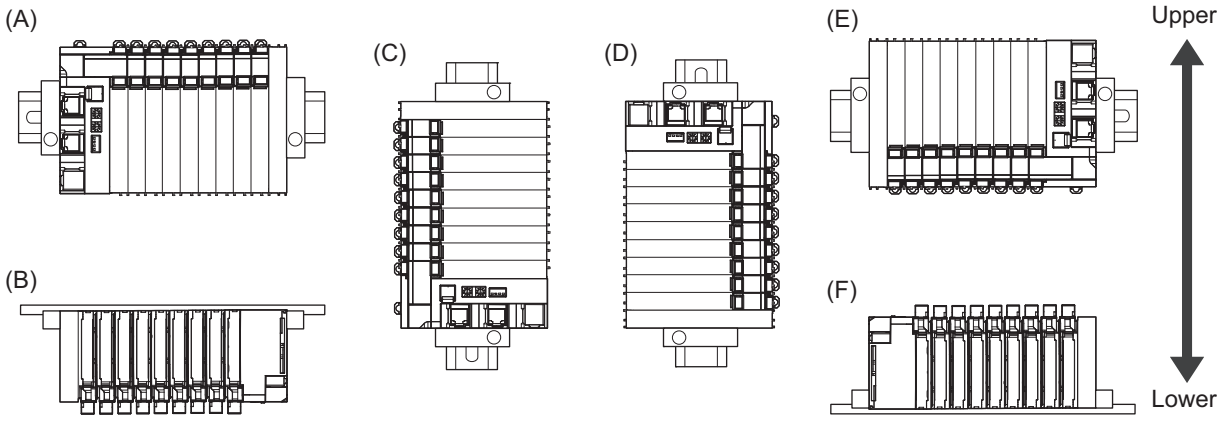
Precautions for Correct Use

- When removing an NX Unit, remove multiple Units together which include the one you want to remove. If you attempt to remove only one Unit, it is stuck and hard to pull out.
- Do not unlock the DIN track mounting hooks on all of the NX Units at the same time. If you unlock the DIN Track mounting hooks on all of the NX Units at the same time, all of the Units may come off.

4-1-4 Installation Orientation

Orientation is possible in the following six directions.

(A) is the upright orientation and (B) to (F) are other orientations.



However, there are restrictions on the installation orientation and restrictions to specifications that can result from the Communications Coupler Units and NX Units that are used.

Refer to the user's manuals for the Communications Coupler Units, NX Units and System Units that you will use for details on restrictions.

Precautions for Safe Use

For installation orientations (C) and (D) in the above figure, support the cables, e.g., with a duct, so that the End Plate on the bottom is not subjected to the weight of the cables. The weight of the cables may cause the bottom End Plate to slide downward so that the Slave Terminal is no longer secured to the DIN Track, which may cause malfunctions.

4-2 Wiring the Power Supply to the Slave Terminal

This section describes how to supply power to the Slave Terminal and wiring.

4-2-1 Power Supply Types

There are the following two types of power supplies that supply power to the Slave Terminal.

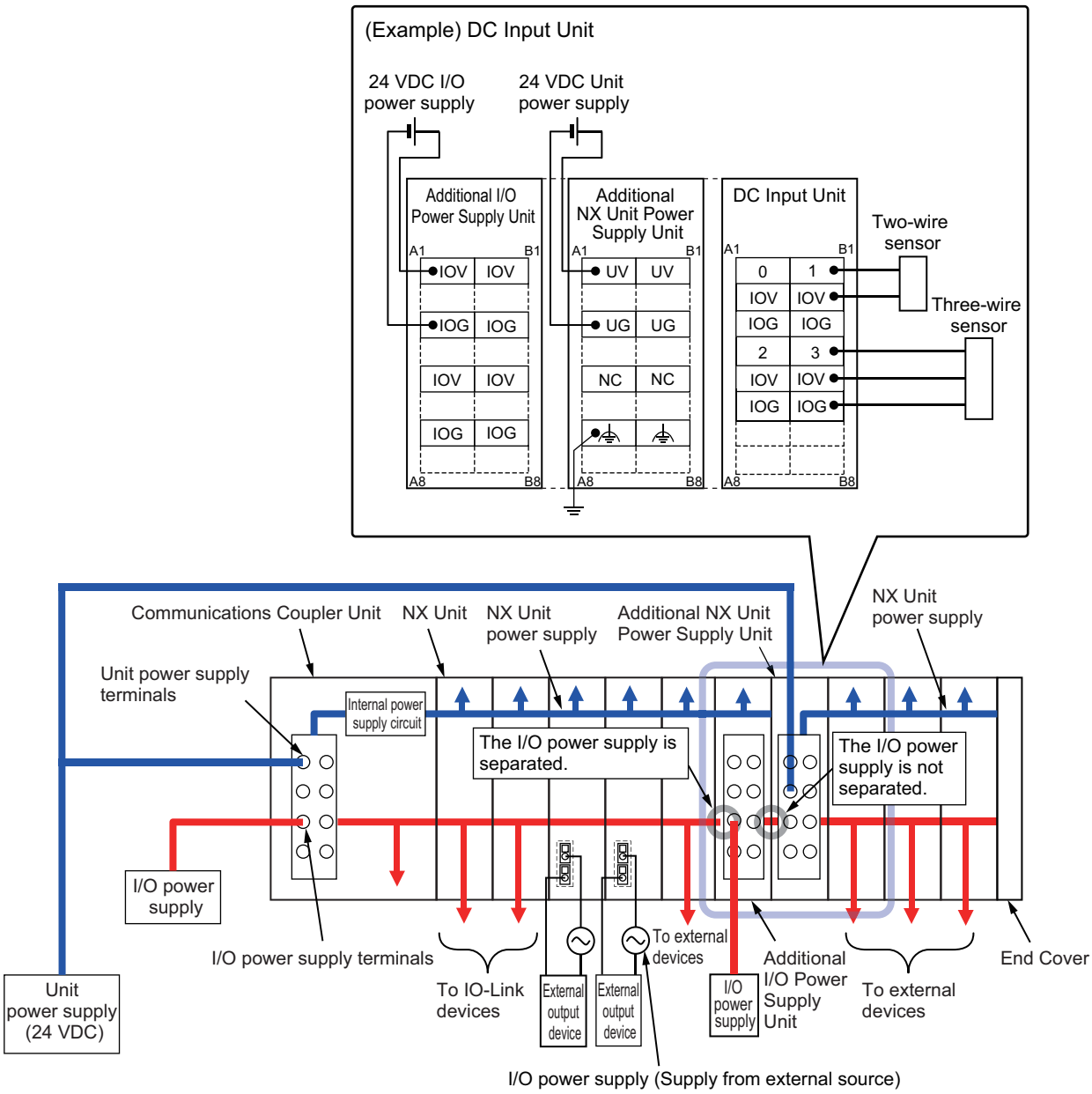
Power supply name	Description
Unit power supply	This is the power supply for generating the NX Unit power supply required for the Slave Terminal to operate. This is connected to the Unit power supply terminal on the Communications Coupler Unit or on the Additional NX Unit Power Supply Unit. The internal power supply circuit in the Communications Coupler Unit or the Additional NX Unit Power Supply Unit generates the NX Unit power supply from the Unit power supply. The internal circuits of the Communications Coupler Unit and NX Units operate by the NX Unit power supply. The NX Unit power supply is supplied to the NX Units in the Slave Terminal through the NX bus connectors.
I/O power supply	This power supply is used for driving the I/O circuits of the NX Units and for the connected external devices. This is connected to the I/O power supply terminal on the Communications Coupler Unit or the Additional I/O Power Supply Unit. The I/O power supply is used for the following applications. • IO-Link device power supply • I/O circuit operation • Input current in SI Mode • External load current in SO Mode The I/O power supply is supplied to the NX Units from the I/O power supply terminals and through the NX bus connectors.

4-2-2 Supplying Each Power Supply and Wiring

The supply method for each power supply to the NX Units is as follows.

Power supply name	Description
NX Unit power supply	This power is supplied to the NX Units through the NX bus connectors by connecting a Unit power supply to the Unit power supply terminals on the Communications Coupler Unit or Additional NX Unit Power Supply Units.
I/O power supply	This power is supplied by one of the following two methods. Refer to *A-1 Data Sheet* on page A-2 for the supply method of each NX Unit. • Supply from the NX bus This power is supplied through the NX bus connectors by connecting an I/O power supply to the I/O power supply terminals on the Communications Coupler Unit or Additional I/O Power Supply Units. • Supply from external source This power is supplied to the Units from an external source. I/O power is supplied by connecting an I/O power supply to the I/O power supply terminals on the Units.

The following are wiring diagrams (examples) for each power supply.



Precautions for Correct Use

Always use separate power supplies for the Unit power supply and the I/O power supply. If you supply power from the same power supply, noise may cause malfunctions.

Additional Information

Refer to the user's manual for the Communications Coupler Unit on design for power supply to the Slave Terminal.

4-2-3 Calculating the Total Current Consumption from I/O Power Supply

The total current consumption of I/O power supplied from the NX bus must be within the range of the maximum I/O power supply current of the Communications Coupler Unit or the Additional I/O Power Supply Unit.

To confirm this and to calculate the I/O power supply capacity, calculate the total current consumption from I/O power supply from the NX bus.

The total current consumption from I/O power supply from the NX bus is the total sum of current consumption from I/O power supply of the NX Unit that supplies the I/O power from the NX bus, the current consumption of each applicable I/O circuit, and current consumption of any connected external devices.

Note that the current consumption from I/O power supply indicated in the data sheet for each Unit type does not include the load current of any external connection load and current consumption of any connected external devices.

The current consumption from I/O power supply of the IO-Link Master Unit is calculated as described below.

- **Total Current Consumption of the IO-Link Master Unit from the I/O Power Supply**

  = (Current consumption from I/O power supply of the IO-Link Master Unit) + (Input current × Number of input points used) + (Load current × Number of output points used) + (Total current consumption of connected external devices)

Refer to *A-1 Data Sheet* on page A-2 for the current consumption from the I/O power supply and input current for each model of the IO-Link Master Units.

4-2-4 Power Supply-related Units for the NX-series

A Communications Coupler Unit supplies the NX Unit power supply and I/O power supply to the NX Units in the Slave Terminal.

There are the following types of NX-series power supply-related Units other than Communications Coupler Units.

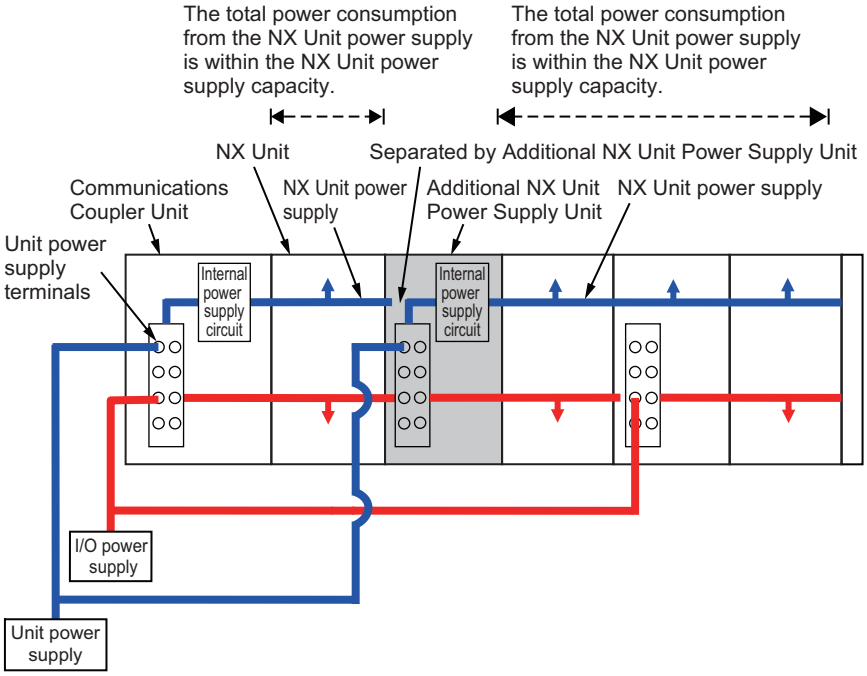
Refer to the *NX-series System Unit User's Manual* (Cat. No. W523) for details on NX-series power supply-related Units.

Refer to NX-series catalogs or OMRON websites, or ask your OMRON representative for information on the most recent lineup of NX Units.

Additional NX Unit Power Supply Unit

This NX Unit provides NX Unit power supply.

This NX Unit is used when the total power consumption of the NX Units in the Slave Terminal exceeds the NX Unit power supply capacity of the Communications Coupler Unit.



The I/O power supply for the Additional NX Unit Power Supply Unit is connected to the NX Unit on the left through the NX bus connector.

Additional I/O Power Supply Unit

This NX Unit provides additional I/O power supply.

Use this NX Unit in the following cases.

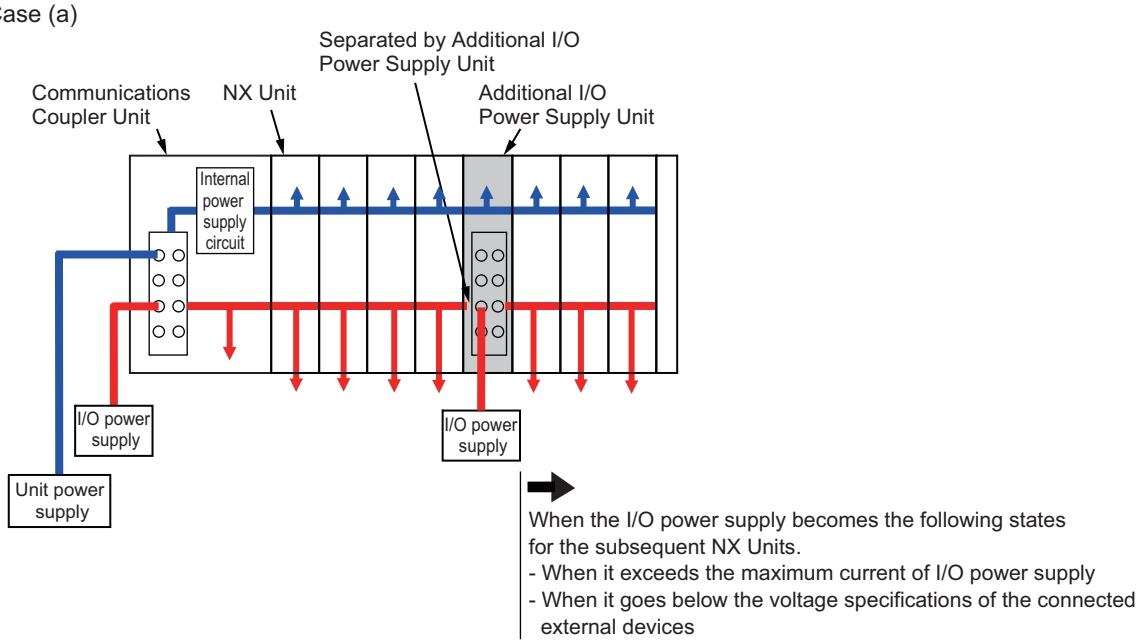
(a) When the I/O power supply capacity is insufficient

- When the total current consumption for the I/O power supply exceeds the maximum current of I/O power supply of the Communications Coupler Unit
- When a voltage drop in the I/O power supply causes the voltage of the I/O power supply to go below the voltage specifications of the I/O circuits or connected external devices

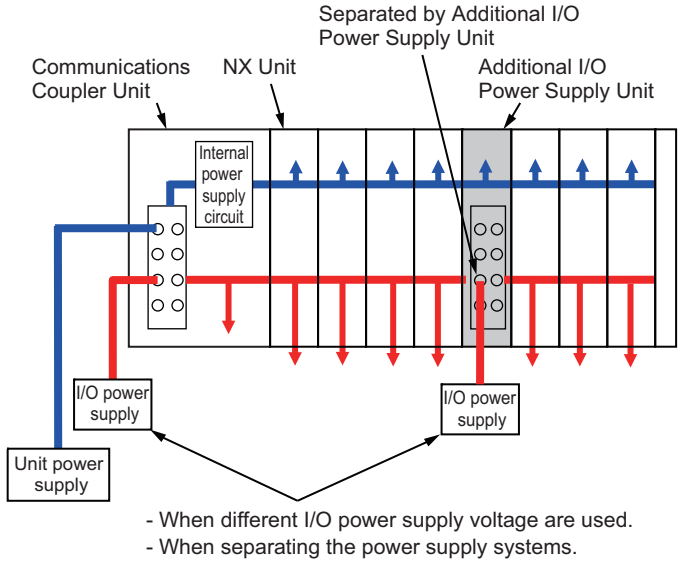
(b) Separating the I/O power supply

- When connected external devices have different I/O power supply voltages
- When separating the power supply systems

Case (a)



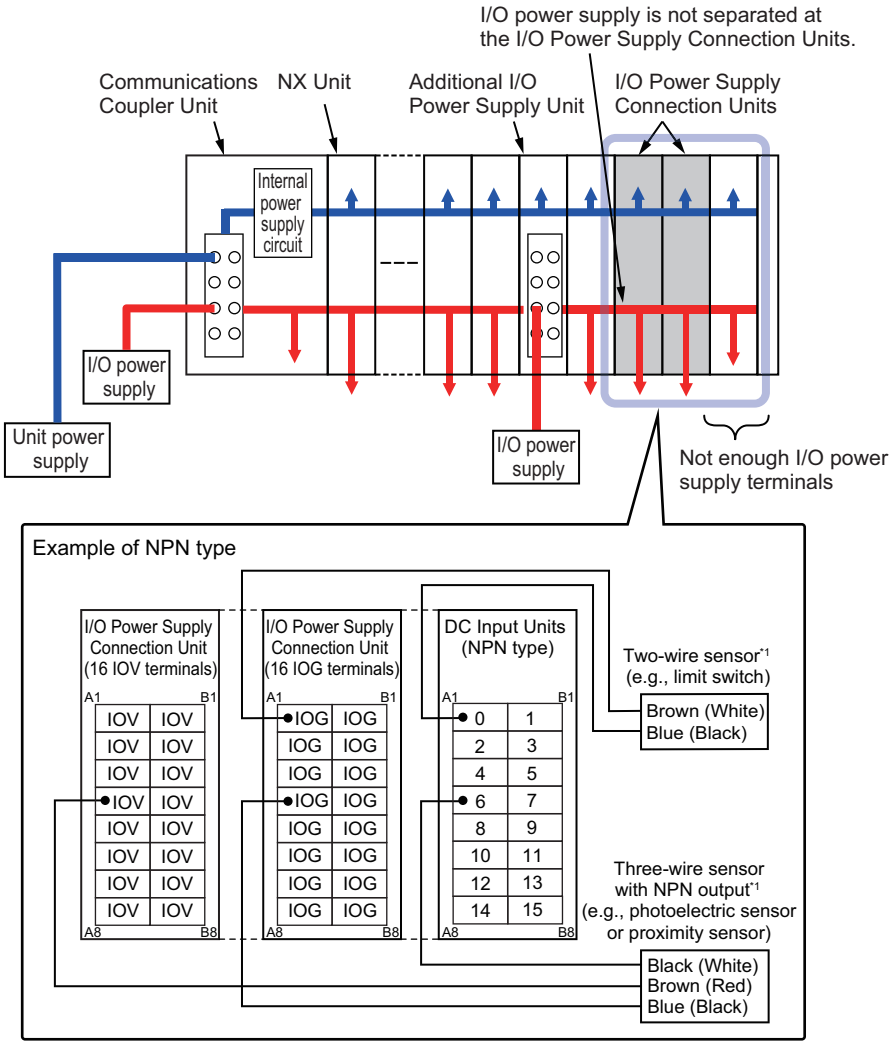
Case (b)



The NX Unit power supply of the Additional I/O Power Supply Unit is connected to the NX Unit on the left through the NX bus connector.

I/O Power Supply Connection Unit

This NX Unit is used when there are not enough I/O power supply terminals for the connected external devices that are connected to NX Units such as Digital I/O Units and Analog I/O Units.



*1. Wire colors have been changed according to revisions in the JIS standards for photoelectric and proximity sensors. The colors in parentheses are the wire colors prior to the revisions.

4-3 Wiring the Terminals

This section describes how to wire the terminals on the IO-Link Master Unit.

⚠ WARNING

Make sure that the voltages and currents that are input to the Units and slaves are within the specified ranges.

Inputting voltages or currents that are outside of the specified ranges may cause accidents or fire.

⚠ Caution

Be sure that all terminal screws and cable connector screws are tightened to the torque specified in the relevant manuals. The loose screws may result in fire or malfunction.

4-3-1 Wiring to the Screwless Clamping Terminal Block

This section describes how to connect wires to the screwless clamping terminal block, the installation and removing methods, and functions for preventing incorrect attachment.

You can connect ferrules that are attached to the twisted wires to the screwless clamping terminal block. You can also connect the twisted wires or the solid wires to the screwless clamping terminal block. If you connect the ferrules, all you need to do to connect the wires is to insert the ferrules into the terminal holes.

Wiring Terminals

The terminals to be wired are as follows.

- I/O power supply terminals
- I/O terminals

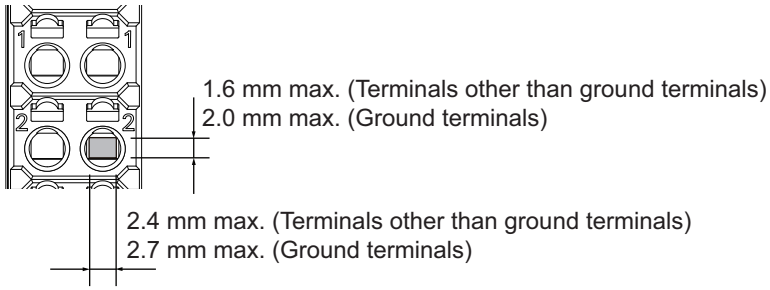
Applicable Wires

The wires that you can connect to the screwless clamping terminal block are twisted wires, solid wires, and ferrules that are attached to the twisted wires. The following section describes the dimensions and processed methods for applicable wires.

Dimensions of Wires Connected to the Terminal Block

The dimensions of wires that you can connect into the terminal holes of the screwless clamping terminal block are as in the figure below.

Process the applicable wires that are specified in the following description to apply the dimensions.



Using Ferrules

If you use ferrules, attach the twisted wires to them.

Observe the application instructions for your ferrules for the wire stripping length when attaching ferrules.

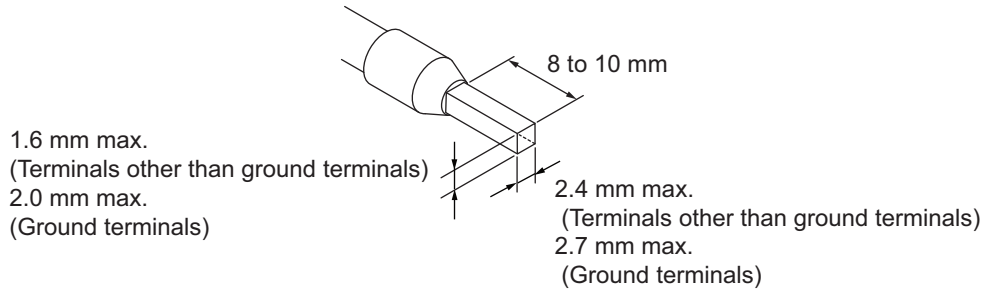
Always use plated one-pin ferrules. Do not use unplated ferrules or two-pin ferrules.

The applicable ferrules, wires, and crimping tools are listed in the following table.

Terminal types	Manufacturer	Ferrule model	Applicable wire (mm^2 (AWG))	Crimping tool
Terminals other than ground terminals	Phoenix Contact	AI0,34-8	0.34 (#22)	Phoenix Contact (The figure in parentheses is the applicable wire size.) CRIMPFOX 6 (0.25 to 6 mm^2, AWG24 to 10)
		AI0,5-8	0.5 (#20)	
		AI0,5-10		
		AI0,75-8	0.75 (#18)	
		AI0,75-10		
		AI1,0-8	1.0 (#18)	
		AI1,0-10		
		AI1,5-8	1.5 (#16)	
		AI1,5-10		
Ground terminals		AI2,5-10	2.0 *1	
Terminals other than ground terminals	Weidmuller	H0.14/12	0.14 (#26)	Weidmuller (The figure in parentheses is the applicable wire size.) PZ6 Roto (0.14 to 6 mm^2, AWG26 to 10)
		H0.25/12	0.25 (#24)	
		H0.34/12	0.34 (#22)	
		H0.5/14	0.5 (#20)	
		H0.5/16		
		H0.75/14	0.75 (#18)	
		H0.75/16		
		H1.0/14	1.0 (#18)	
		H1.0/16		
		H1.5/14	1.5 (#16)	
		H1.5/16		

*1. Some AWG14 wires exceed 2.0 mm^2 and cannot be used in the screwless clamping terminal block.

When you use any ferrules other than those in the above table, crimp them to the twisted wires so that the following processed dimensions are achieved.

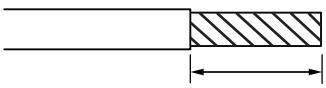


● Using Twisted Wires/Solid Wires

If you use twisted wires or solid wires, use the following table to determine the correct wire specifications.

Terminals		Wire type		Wire plating		Wire size	Conductor length (stripping length)
Classification	Current capacity	Twisted wires	Solid wire	Plated	Unplated		
All terminals except ground terminals	2 A max.	Possible	Possible	Possible	Possible	0.08 to 1.5 mm^2 (AWG 28 to 16)	8 to 10 mm
	Greater than 2 A and 4 A or less				Not possible		
	Greater than 4 A		Not possible				
Ground terminals*1	---		Possible		Possible	2.0 mm^2	9 to 10 mm

*1. When you use the NX-TB□□□1 Terminal Block, use twisted wires to connect the ground terminal. Do not use solid wires.



Conductor length (stripping length)

Precautions for Correct Use

- Use cables with suitable wire sizes for the carrying current. There are also restrictions on the current due to the ambient temperature. Refer to the manuals for the cables and use the cables correctly for the operating environment.
- For twisted wires, strip the sheath and twist the conductor portion. Do not unravel or bend the conductor portion of twisted wires or solid wires.

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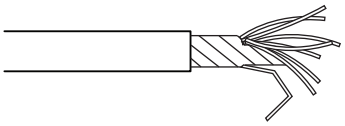

Unravel wires

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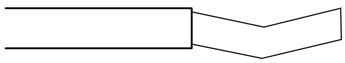


Bend wires

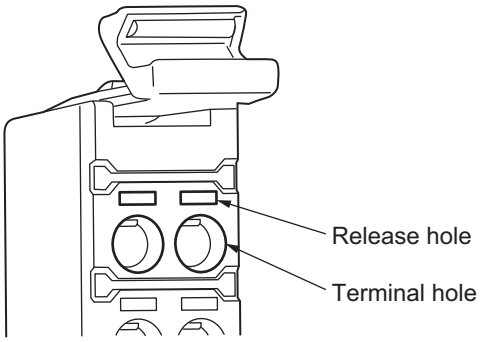
Additional Information

If more than 2 A will flow on the wires, use plated wires or use ferrules.

Connecting/Removing Wires

This section describes how to connect and remove wires.

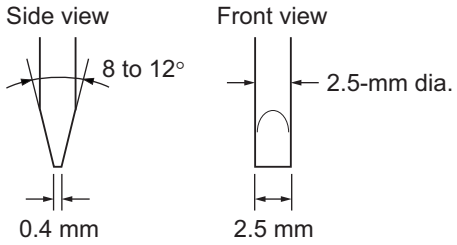
● Terminal Block Parts and Names



Required Tools

Use a flat-blade screwdriver to connect and remove wires.

Use the following flat-blade screwdriver.



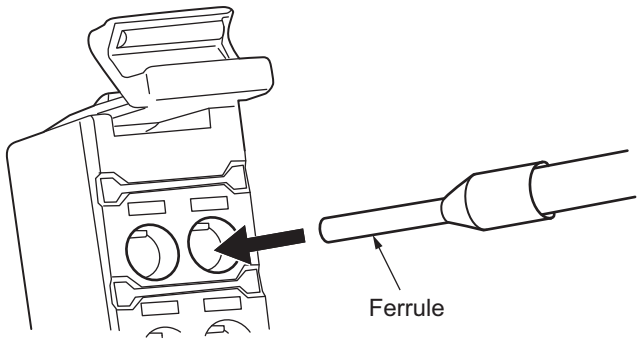
Recommended screwdriver

Model	Manufacturer
SZF 0-0,4×2,5	Phoenix Contact

Connecting Ferrules

Insert the ferrule straight into the terminal hole.

It is not necessary to press a flat-blade screwdriver into the release hole.



After you make a connection, make sure that the ferrule is securely connected to the terminal block.

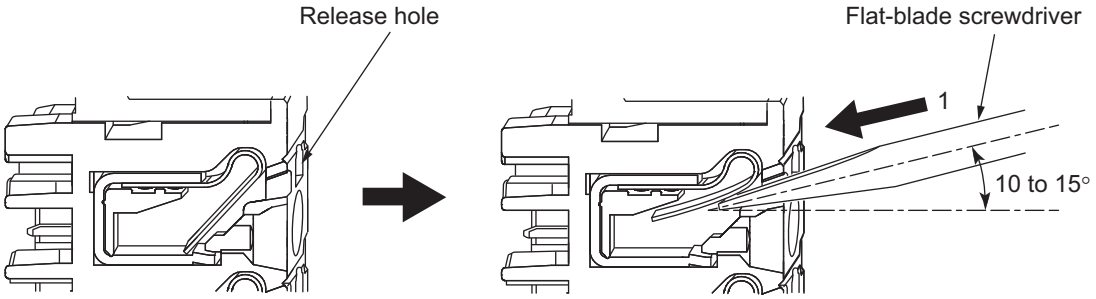
Connecting Twisted Wires/Solid Wires

Use the following procedure to connect the twisted wires or solid wires to the terminal block.

1 Press a flat-blade screwdriver diagonally into the release hole.

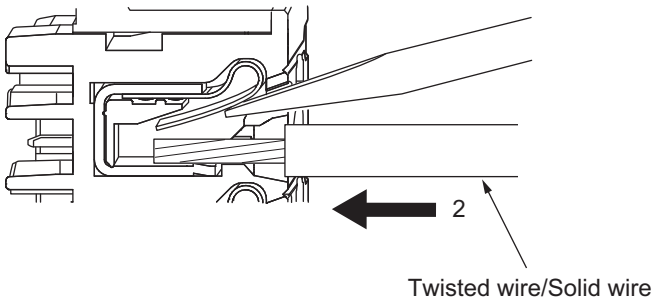
Press at an angle of 10° to 15°.

If you press in the screwdriver correctly, you will feel the spring in the release hole.

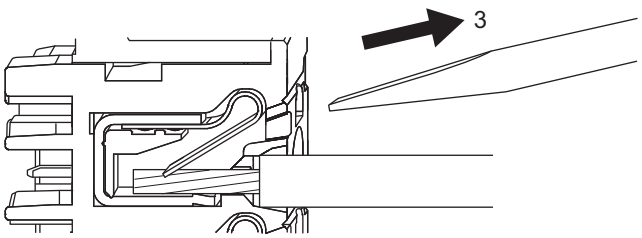


2 Leave the flat-blade screwdriver pressed into the release hole and insert the twisted wire or the solid wire into the terminal hole.

Insert the twisted wire or the solid wire until the stripped portion is no longer visible to prevent shorting.



3 Remove the flat-blade screwdriver from the release hole.



After you make a connection, make sure that the twisted wire or the solid wire is securely connected to the terminal block.

Precautions for Safe Use

- Do not press the flat-blade screwdriver straight into the release hole. Doing so may break the terminal block.

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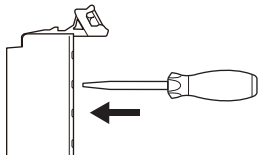
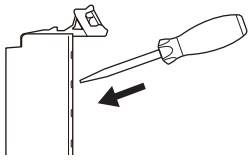
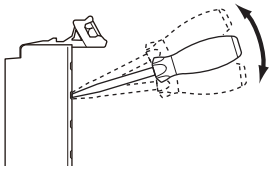


OK



- When you insert a flat-blade screwdriver into a release hole, press it down with a force of 30 N max. Applying excessive force may damage the terminal block.
- Do not tilt or twist the flat-blade screwdriver while it is pressed into the release hole. Doing so may break the terminal block.

NG



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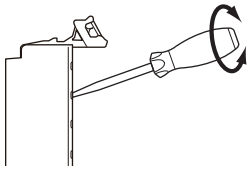


- Make sure that all wiring is correct.
- Do not bend the cable forcibly. Doing so may sever the cable.

Securing Wires

Depending on the type of wire that is used and the current carried by the wire, it is sometimes necessary to secure the wire to the Screwless Clamping Terminal Block.

The following table shows when securing the wire is necessary.

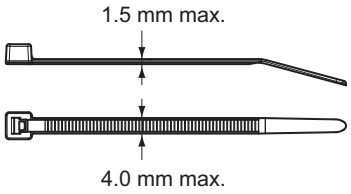
Terminal		Wire type				
		Ferrule	Twisted wires		Solid wire	
Classification	Current capacity		Plated	Not plated	Plated	Not plated
All terminals except ground terminals	2 A max.	Not required.	Not required.	Not required.	Not required.	Not required.
	Greater than 2 A and 4 A or less			Not possible	Required.	Not possible
	Greater than 4 A		Required.		Not possible	
Ground terminal	–		Not required.	Not required.	Not required.	Not required.

Secure the wires as described below.

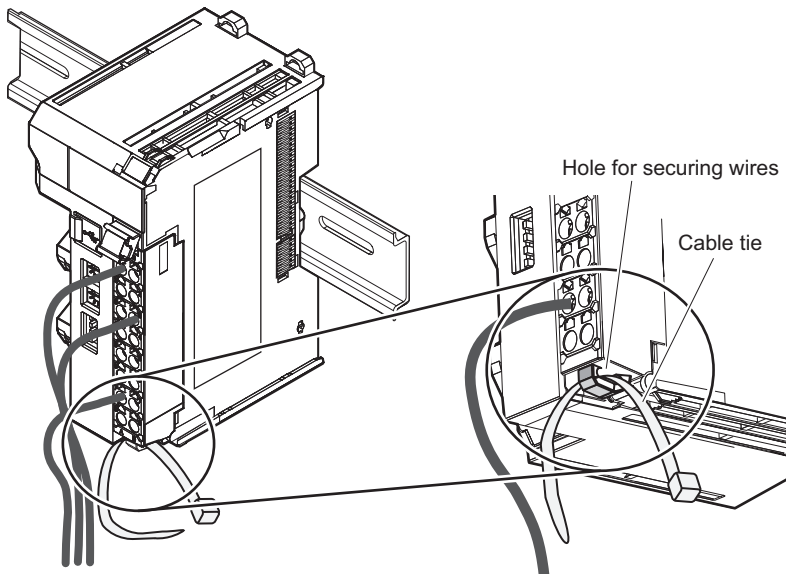
1 Prepare cable ties.

You can use cable ties that are 4 mm or less in width and 1.5 mm or less in thickness.

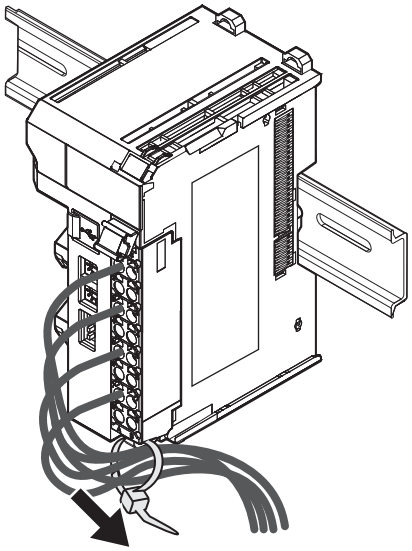
Select suitable cable ties for the application environment.



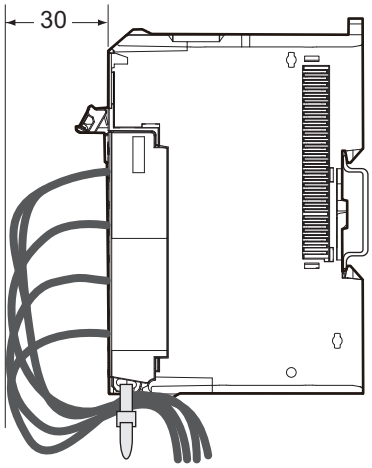
2 Insert the cable tie through the hole for securing wires at the bottom of the Screwless Clamping Terminal Block.



3 Tie up the wires with the cable tie and secure them to the Screwless Clamping Terminal Block.



Secure the wires so that they extend no more than 30 mm from the Screwless Clamping Terminal Block.



Removing Wires

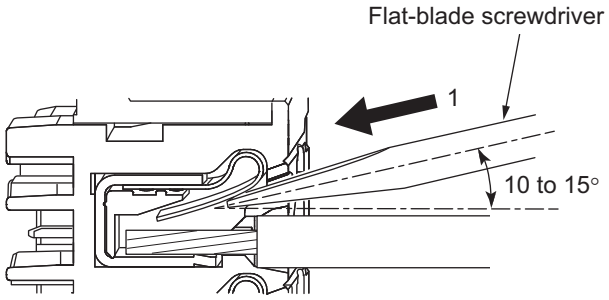
Use the following procedure to remove the wires from the terminal block.

The removal method is the same for ferrules, twisted wires, and solid wires.

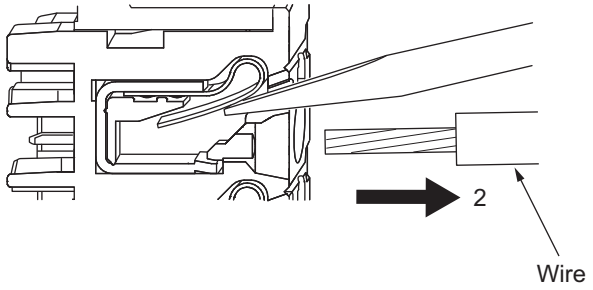
1 Press the flat-blade screwdriver diagonally into the release hole.

Press at an angle of 10° to 15°.

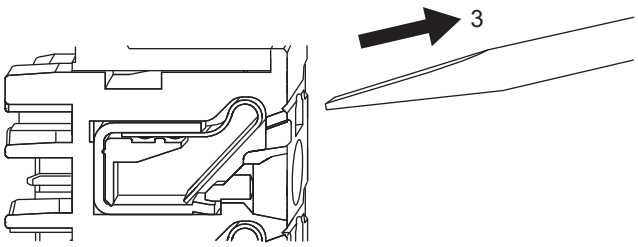
If you press in the screwdriver correctly, you will feel the spring in the release hole.



2 Leave the flat-blade screwdriver pressed into the release hole and pull out the wire.



3 Remove the flat-blade screwdriver from the release hole.



Precautions for Safe Use

- Do not press the flat-blade screwdriver straight into the release hole. Doing so may break the terminal block.

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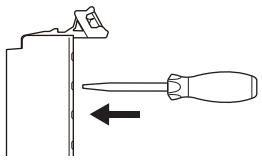
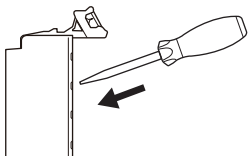
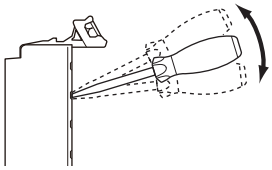


OK



- When you insert a flat-blade screwdriver into a release hole, press it down with a force of 30 N max. Applying excessive force may damage the terminal block.
- Do not tilt or twist the flat-blade screwdriver while it is pressed into the release hole. Doing so may break the terminal block.

NG



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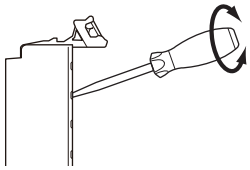
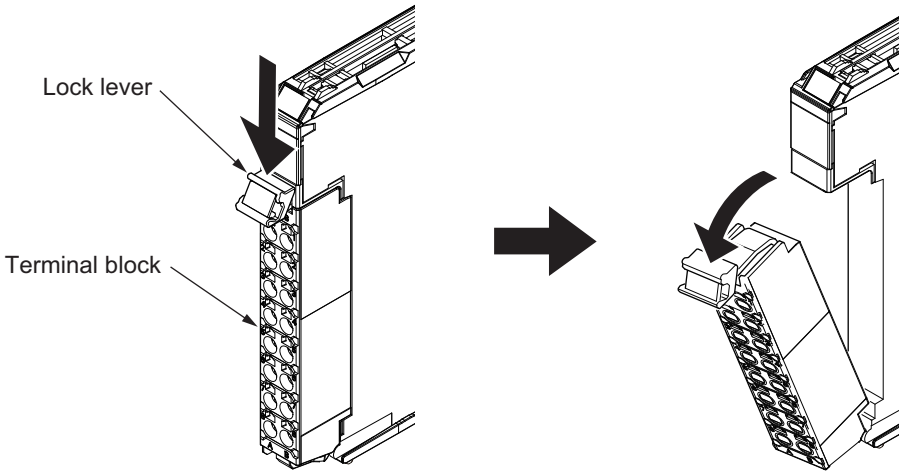


- Make sure that all wiring is correct.
- Do not bend the cable forcibly. Doing so may sever the cable.

Removing a Terminal Block

1 Press the lock lever on the terminal block and pull out the top of the terminal block to remove it.

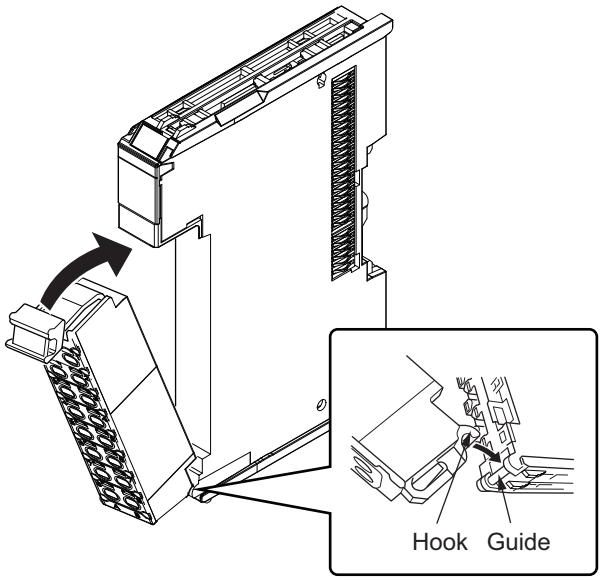


Attaching a Terminal Block

1 Mount the terminal block hook on the guide at the bottom of the NX Unit, lift up the terminal block, and press in on the top of the terminal block until you hear it engage.

The terminal block will click into place on the Unit.

After you mount the terminal block, make sure that it is locked to the Unit.



Mount a Terminal Block that is applicable to each Unit model.

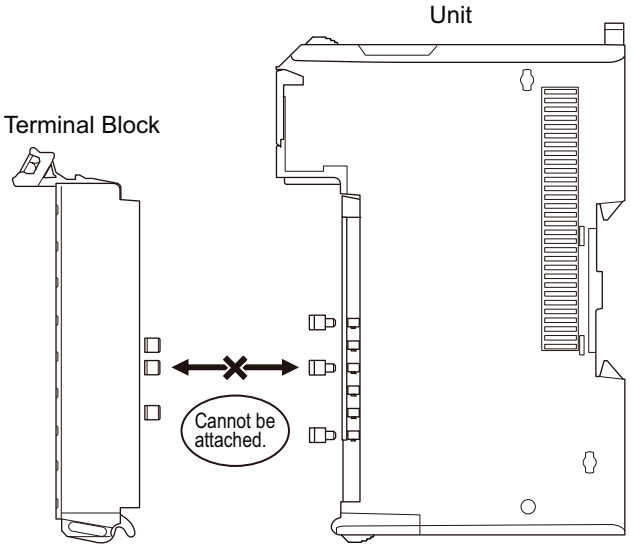
Refer to *A-4 List of Screwless Clamping Terminal Block Models* on page A-31 for the applicable Terminal Blocks.

Preventing Incorrect Attachment of Terminal Blocks

In order to prevent unintentionally installing the wrong terminal block, you can limit the combination of a Unit and a terminal block.

Insert three Coding Pins (NX-AUX02) into three of the six incorrect attachment prevention holes on the Unit and on the terminal block. Insert these pins into positions so that they do not interfere with each other when the Unit and terminal block are connected to each other.

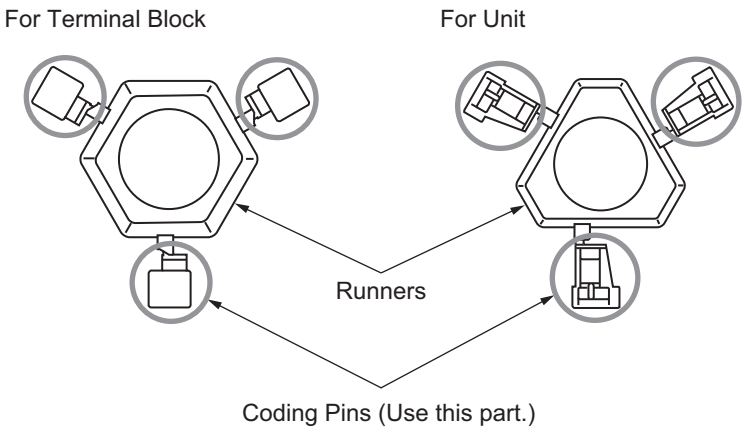
You can use these pins to create a combination in which the wrong terminal block cannot be attached because the pin patterns do not match.



Types of Coding Pins

There are two types of Coding Pins, both with their own unique shape: one for terminal blocks and one for Units.

Three pins come with each runner.



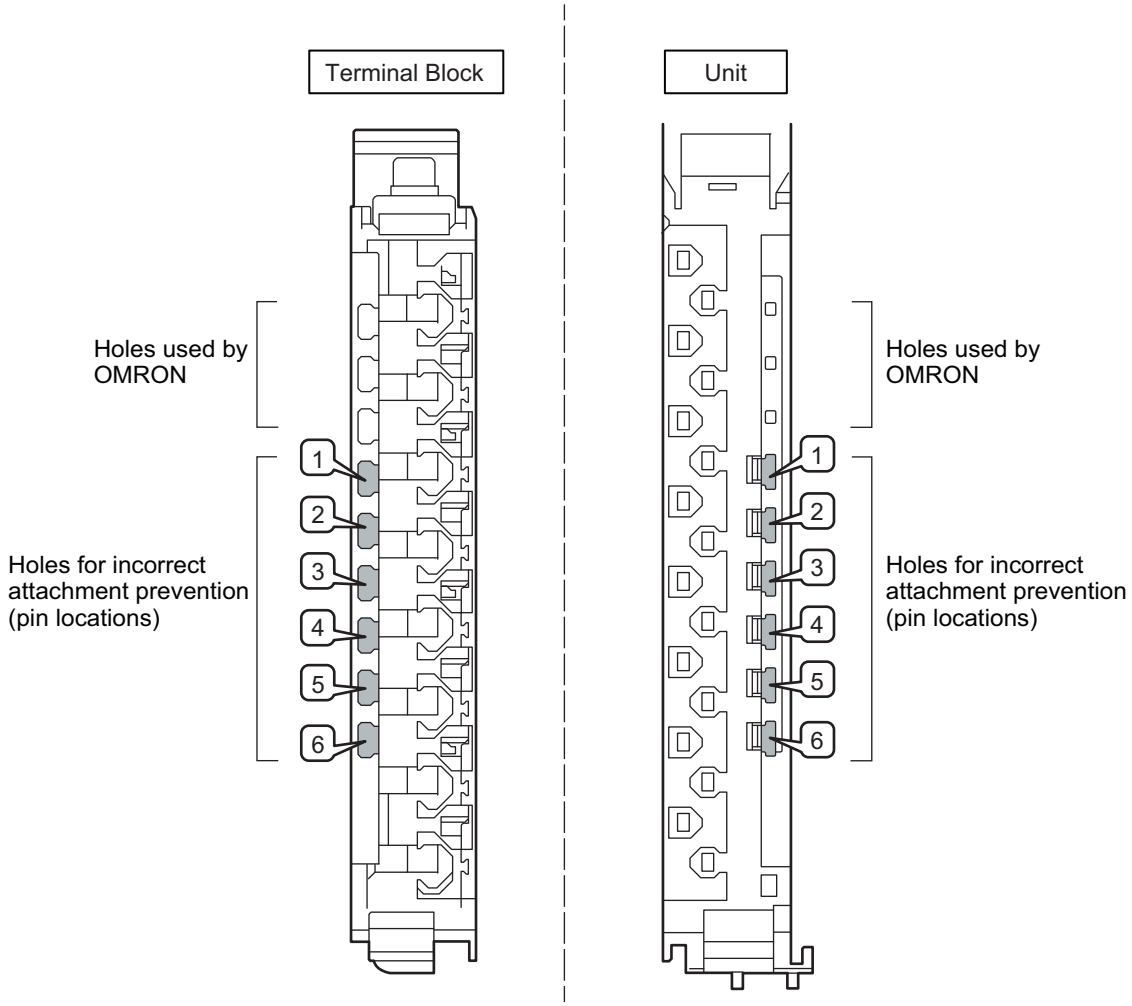
Use the following Coding Pins.

Name	Model	Specification
Coding Pin	NX-AUX02	For 10 Units (Terminal Block: 30 pins, Unit: 30 pins)

Insertion Locations and Patterns of Coding Pins

Insert three Coding Pins of each on the terminal block and on the Unit at the positions designated by the numbers 1 through 6 in the figure below.

As shown in the following table, there are 20 unique pin patterns that can be used.



○: Pin inserted

Pattern	Pin locations for Terminal Block						Pin locations for Unit					
	1	2	3	4	5	6	1	2	3	4	5	6
No.1	○	○	○							○	○	○
No.2	○	○		○					○		○	○
No.3	○	○			○				○	○		○
No.4	○	○				○			○	○	○	
No.5	○		○	○				○			○	○
No.6	○		○		○			○		○		○
No.7	○		○			○		○		○	○	
No.8	○			○	○			○	○			○
No.9	○			○		○		○	○		○	
No.10	○				○	○		○	○	○		
No.11		○	○	○			○				○	○
No.12		○	○		○		○			○		○
No.13		○	○			○	○			○	○	
No.14		○		○	○		○		○			○
No.15		○		○		○	○		○		○	
No.16		○			○	○	○		○	○		
No.17			○	○	○		○	○				○
No.18			○	○		○	○	○			○	
No.19			○		○	○	○	○		○		
No.20				○	○	○	○	○	○			

To make the maximum of 20 patterns, purchase two sets of NX-AUX02 Pins. (One set for 10 Units.)

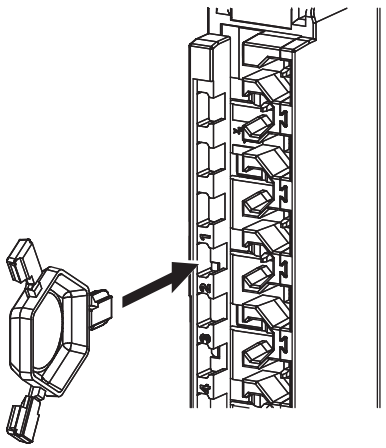
Precautions for Correct Use

- OMRON uses the holes other than No. 1 to 6 in the figure on the previous page. If you insert a Coding Pin into one of the holes used by OMRON on the terminal block side, this makes it impossible to mount the terminal block on a Unit.
- Do not use Coding Pins that have been attached and removed.

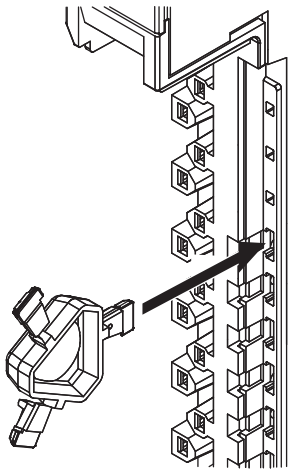
● Inserting the Coding Pins

1 Hold the pins by the runner and insert a pin into one of the incorrect attachment prevention holes on the terminal block or on the Unit.

Terminal Block

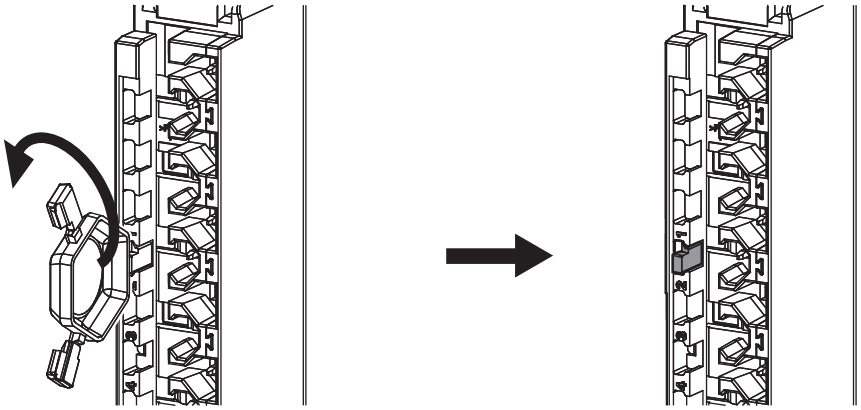


Unit

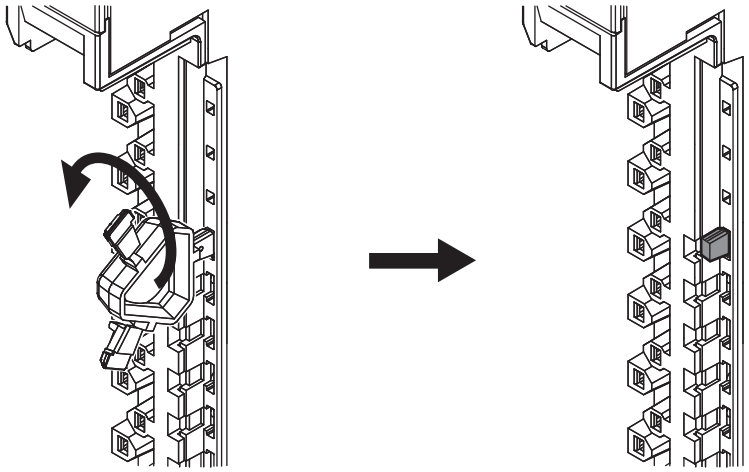


2 Rotate the runner to break off the Coding Pin.

Terminal Block



Unit



4-3-2 Checking the Wiring

Check the wiring from the I/O Map or Watch Tab Page of the Sysmac Studio.

For inputs in SI Mode or digital inputs for pin 2, you can turn ON and OFF the input from the external device that is connected to the Unit you need to check and monitor the results.

For SIO (DO) Mode, you can use forced refreshing to control the output to the Unit you need to check to confirm the operation of the connected external device.

If you use the I/O Map, you can also monitor and perform forced refreshing even if does not define the variables and create the algorithms. Therefore, you can check the wiring.

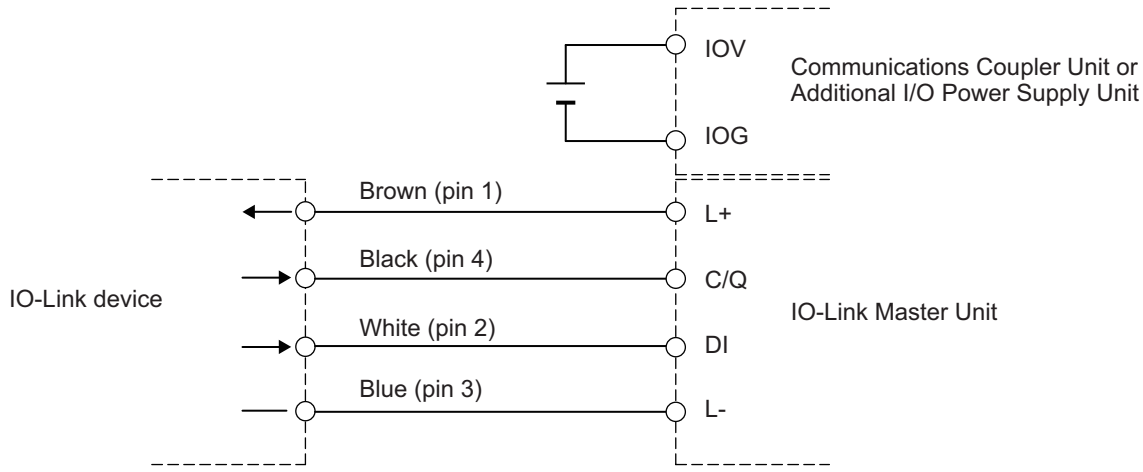
Refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for details on monitoring and forced refreshing operations.

4-4 Wiring Examples and Wiring Precautions

This section gives some wiring examples for the IO-Link Master Unit and precautions for wiring.

4-4-1 IO-Link Mode

IO-Link Mode

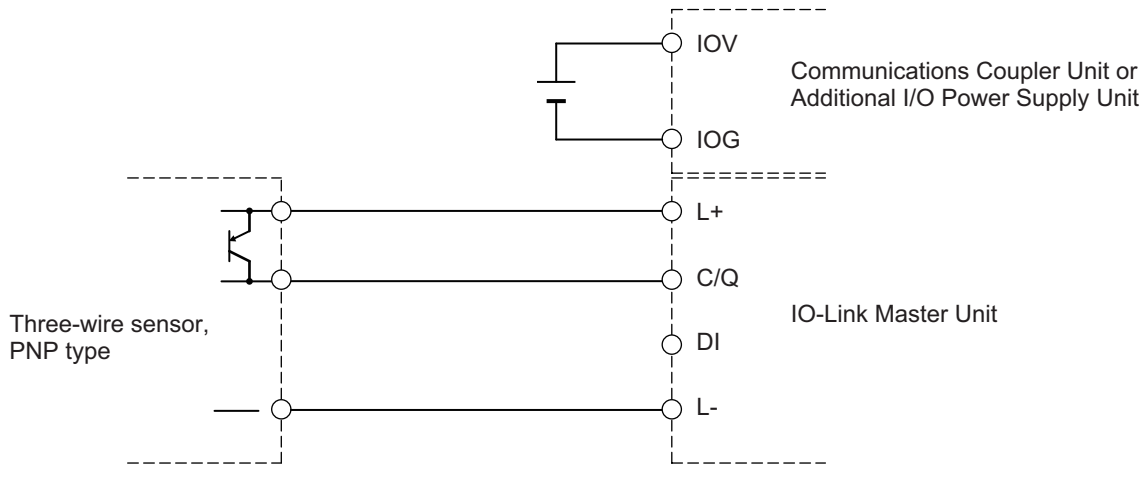


Note If you do not use a signal connection for digital inputs for pin 2, a DI (white) connection is not required.

4-4-2 SIO (DI) Mode

Wiring Three-wire Sensors

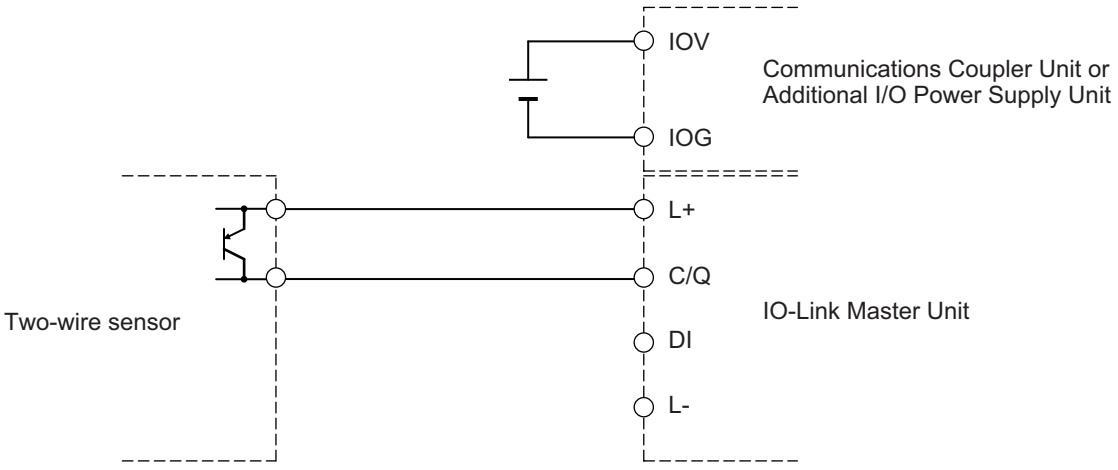
Power is supplied to the sensors from the IO-Link Master Unit.



Note The DI terminal cannot be used.

Wiring Two-wire Sensors

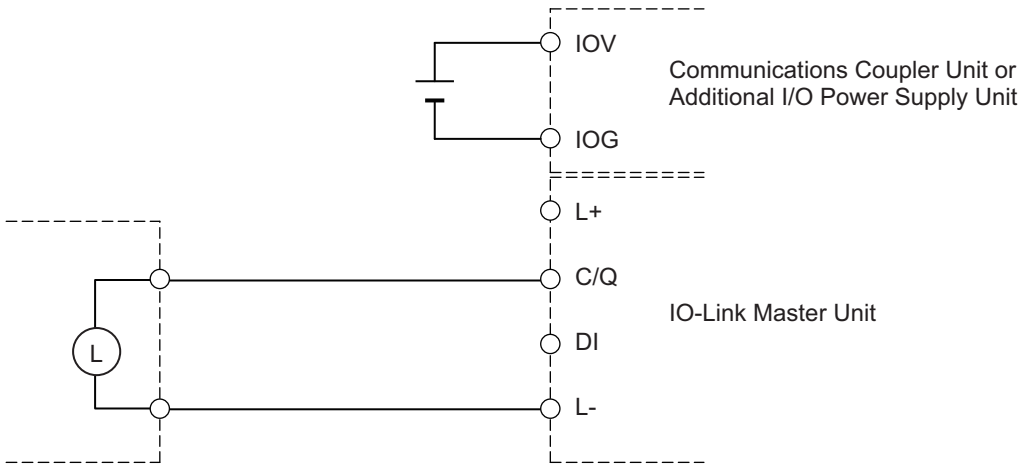
Power is supplied to the sensors from the IO-Link Master Unit.



Note The DI terminal cannot be used.

4-4-3 SIO (DO) Mode

Wiring Output Devices



The DI terminal cannot be used.

4-5 Wiring Precautions

4-5-1 Wiring Precautions for SIO (DI) Mode

Precautions on Sensor Surge Current

An incorrect input may occur due to sensor inrush current if a sensor is turned ON after the DC Input Unit has started up to the point where inputs are possible.

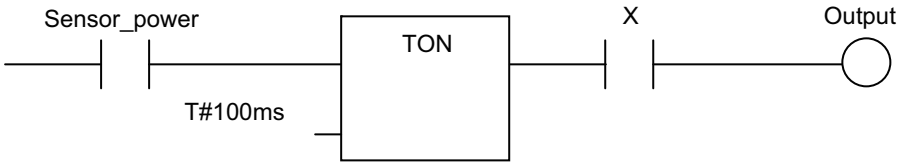
Determine the time required for sensor operation to stabilize after the sensor is turned ON and take appropriate measures, such as inserting an ON delay into the user program after turning ON the sensor.

A programming example is shown below.

The sensor's power supply voltage is used as the input bit to Sensor_power.

A 100-ms timer delay (the time required for an OMRON Proximity Sensor to stabilize) is created in the user program.

After the timer changes to TRUE, input bit X causes the output Output to change to TRUE after the input of the sensor changes to TRUE.



4-5-2 Wiring Precautions for SIO (DO) Mode

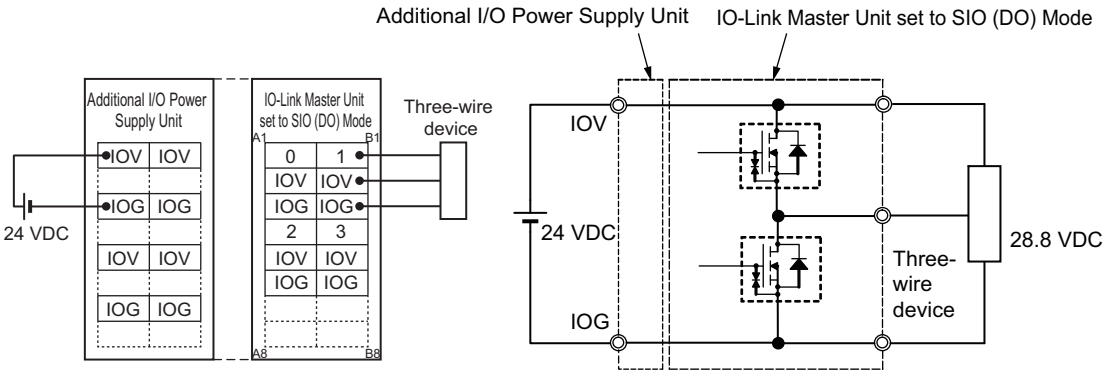
Push-pull Outputs

When the communications mode of an IO-Link Master Unit port is set to SIO (DO) Mode, a push-pull output is used to increase the speed of the output ON/OFF response.

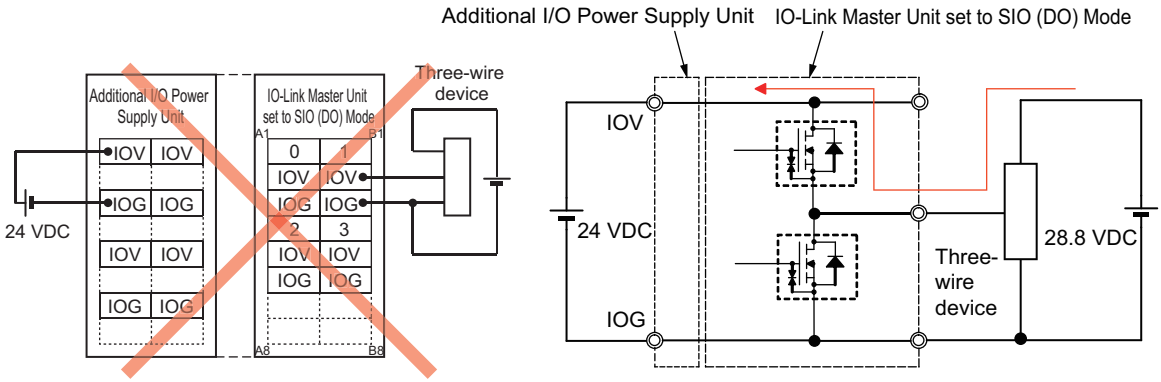
When the communications mode of an IO-Link Master Unit port is set to SIO (DO) Mode, use the same load power supply for the I/O power supply and the connected external device.

If different power supplies are used, the current may flow into the output bit via the diode built into the I/O circuit and cause the Output Unit to malfunction.

● Good Example



● Bad Example



5

I/O Refreshing

This section describes the types and functions of I/O refreshing for the NX Units.

5-1 I/O Refreshing for Slave Terminals 5-2
5-1-1 I/O Refreshing from CPU Unit to Slave Terminal 5-2
5-2 I/O Refreshing Methods 5-4
5-2-1 Types of I/O Refreshing Methods 5-4
5-2-2 Setting the I/O Refreshing Methods 5-5
5-2-3 Refreshing Operation of the IO-Link Master Unit 5-5
5-3 Communications Performance 5-6
5-3-1 Maximum I/O Response Time When the EtherCAT Coupler Unit Is Connected 5-6
5-3-2 Maximum I/O Response Time When the EtherNet/IP Coupler Unit Is Connected 5-7
5-3-3 Determining the IO-Link Communications Cycle 5-9

5-1 I/O Refreshing for Slave Terminals

This section describes I/O refreshing for NX-series Slave Terminals.

5-1-1 I/O Refreshing from CPU Unit to Slave Terminal

The CPU Unit cyclically performs I/O refreshing with the Slave Terminal through the Communications Master and Communications Coupler Units.

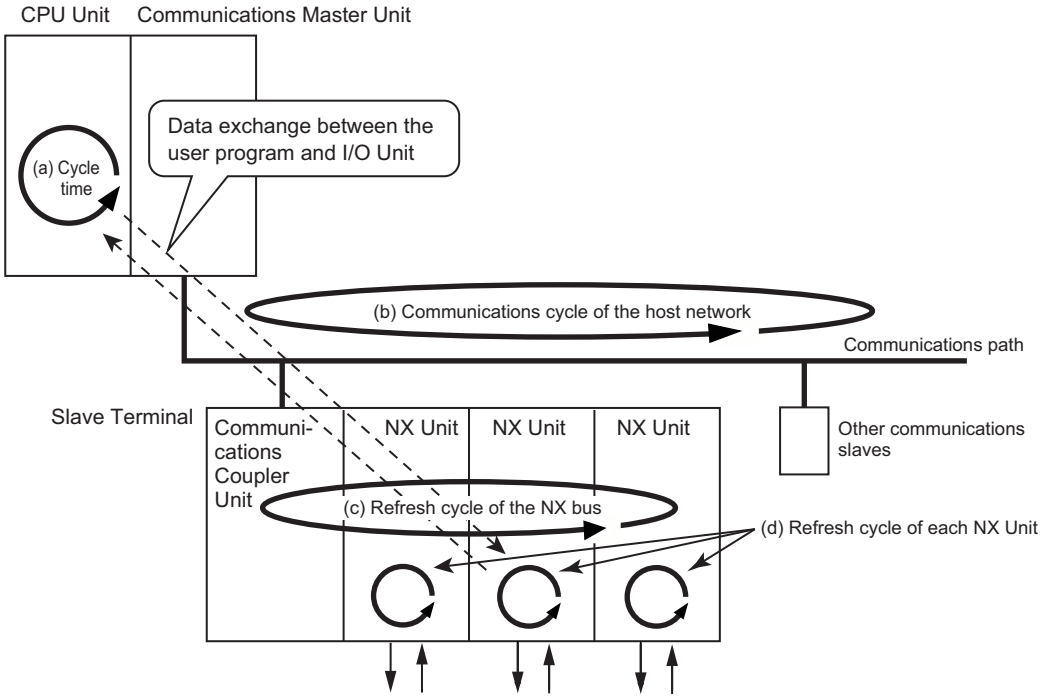
There are the following four cycles that affect I/O refresh operations between the NX Unit on a Slave Terminal and the CPU Unit.

(a) Cycle time of the CPU Unit

(b) Communications cycle of the host network

(c) Refresh cycle of the NX bus

(d) Refresh cycle of each NX Unit



The cycle time of the CPU Unit and communications cycle of the host network and the I/O refresh cycle of the NX bus are determined by the CPU Unit types and the communications types.

The following explains operations when the built-in EtherCAT port on the NJ/NX-series CPU Unit is used for communications with an EtherCAT Slave Terminal, with symbols in the figure.

Operation of I/O Refreshing with NX-series CPU Unit

The following shows the operation of I/O refreshing when the built-in EtherCAT port on the NX-series CPU Unit is used for communications with an EtherCAT Slave Terminal.

- The process data communications cycle in item (b) and the refresh cycle of the NX bus in item (c) are automatically synchronized with the primary period or the task period of the priority-5 periodic task of the CPU Unit in item (a).*1
- The refresh cycle of each NX Unit in item (d) depends on the I/O refreshing method which is given below.

*1. This applies when the distributed clock is enabled in the EtherCAT Coupler Unit.

Operation of I/O Refreshing with NJ-series CPU Unit

The following shows the operation of I/O refreshing when the built-in EtherCAT port on the NJ-series CPU Unit is used for communications with an EtherCAT Slave Terminal.

- The process data communications cycle in item (b) and the refresh cycle of the NX bus in item (c)*1 are automatically synchronized with the primary period of the CPU Unit in item (a).
- The refresh cycle of each NX Unit in item (d) depends on the I/O refreshing method which is given below.

*1. This applies when the distributed clock is enabled in the EtherCAT Coupler Unit.

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519-E1-05 or later) for detailed information on I/O refreshing between the built-in EtherCAT port on the NJ/NX-series CPU Unit and EtherCAT Slave Terminals.

Additional Information

- You can use the priority-5 periodic task only with the NX-series CPU Unit.
- With the NX-series CPU Unit, you can perform process data communications in the primary periodic task and the priority-5 periodic task. If these two process data communications cycles need to be identified, the following notifications are given.
  - Process data communications cycle 1: Communications cycle for the primary periodic task
  - Process data communications cycle 2: Communications cycle for the priority-5 periodic task
- With the NJ-series CPU Unit, you can perform process data communications only in the primary periodic task.

5-2 I/O Refreshing Methods

This section describes I/O refreshing methods for the IO-Link Master Unit.

5-2-1 Types of I/O Refreshing Methods

The I/O refreshing methods that you can use between the Communications Coupler Unit and the NX Units are determined by the Communications Coupler Unit that is used.

When an EtherCAT Coupler Unit is connected to the built-in EtherCAT port on the NJ/NX-series CPU Unit, you must use the Free-Run I/O refreshing method between the EtherCAT Coupler Unit and the IO-Link Master Unit.

I/O refreshing method name	Outline of operation
Free-Run refreshing	With this I/O refreshing method, the refresh cycle of the NX bus and the I/O refresh cycles of the NX Units are asynchronous.

Since the EtherCAT Coupler Unit can execute all I/O refreshing methods at the same time, you can use NX Units with different I/O refreshing methods together in the EtherCAT Slave Terminal.

The only I/O refreshing method that you can use between the EtherNet/IP Coupler Unit and the NX Units (including the IO-Link Master Unit) is Free-Run refreshing.

5-2-2 Setting the I/O Refreshing Methods

The I/O refreshing method between the EtherCAT Coupler Unit and each NX Unit is determined by whether the distributed clock is enabled or disabled in the EtherCAT Coupler Unit.

Distributed clock enable/disable setting in the EtherCAT Coupler Unit	NX-series IO-Link Master Unit
Enabled (DC Mode)	Free-Run refreshing
Disabled (Free-Run Mode)	Free-Run refreshing

The only I/O refreshing method that you can use between the EtherNet/IP Coupler Unit and the NX Units is Free-Run refreshing, so it is not necessary to set the I/O refreshing method.

5-2-3 Refreshing Operation of the IO-Link Master Unit

An NX-series IO-Link Master Unit uses Free-Run refreshing to refresh I/O data with the Communications Coupler Unit (i.e., either an EtherCAT Coupler Unit or EtherNet/IP Coupler Unit). Refer to the *IO-Link System User's Manual* (Cat. No. W570) for information on the overall operation of communications including I/O refreshing between the NX-series IO-Link Master Unit and the Communications Coupler Unit.

5-3 Communications Performance

This section describes the I/O response times of the IO-Link Master Unit.

The I/O response time is the time required for the following processing: The CPU Unit processes an external signal input to one NX Unit, and another NX Unit outputs the processed result as an external signal.

5-3-1 Maximum I/O Response Time When the EtherCAT Coupler Unit Is Connected

This section describes the maximum I/O response time of the IO-Link Master Unit when an EtherCAT Coupler Unit is connected.

For information on timing charts and calculation methods for I/O response times for NX Units in EtherCAT Slave Terminals, refer to *12-1-4 Free-Run Refreshing I/O Response Times* in the *NX-series EtherCAT Coupler Unit User's Manual* (W519).

The following NX Unit parameters are necessary to calculate I/O response times.

- Tnx-InProc: Input data processing time of the NX Unit
- Tnx-Indelay: Input delay time of the NX Unit
- Tnx-OutProc: Output data processing time of the NX Unit
- Tnx-Outdelay: Output delay time of the NX Unit

The parameter values and calculation methods for the IO-Link Master Unit are given below.

● Input Data

I/O data type / Parameter	IO-Link input data from IO-Link communications in IO-Link Mode	Digital input data for pin 2 in IO-Link Mode	Digital input data in SIO (DI) Mode
Tnx-InProc	0[ms]		
Tnx-Indelay	0.072 × (Total size (in bytes) of IO-Link input data from IO-Link communications from port 1 to port 4) + 2.61+ IO-Link communications cycle[*1] [ms]	0.072 × (Total size (in bytes) of IO-Link input data from IO-Link communications from port 1 to port 4) + 2.61+ Input filter time [ms]	
	Example: When port 1 through port 4 are all used by IO-Link devices (sensors) with an IO-Link input data size of 2 bytes, and the IO-Link communications cycle for those IO-Link devices (sensors) is 2.1 [ms]: 0.072 × 2 bytes × 4 devices + 2.61 + 2.1 = 5.286 [ms]	Example: When port 1 through port 4 are all used by IO-Link devices (sensors) with an IO-Link input data size of 2 bytes and no input filter is used: 0.072 × 2 bytes × 4 devices + 2.61 = 3.186 [ms]	Example: When port 1 through port 3 are used by IO-Link devices with an IO-Link input data size of 2 bytes and port 4 is used by a non-IO-Link device with no input filter: 0.072 × 2 bytes × 3 devices + 2.61 = 3.042 [ms]

*1. For information on how to determine the IO-Link communications cycle, refer to *Determining the IO-Link Communications Cycle* on page 5-9.

● Output Data

I/O data type Parameter	IO-Link output data from IO-Link communications in IO-Link Mode	Digital output data in SIO (DO) Mode
Tnx-OutProc	0[ms]	
Tnx-Outdelay	0.044 × (Total size (in bytes) of IO-Link output data from IO-Link communications from port 1 to port 4) + 1.47 + IO-Link communications cycle*1 [ms]	0.044 × (Total size (in bytes) of IO-Link output data from IO-Link communications from port 1 to port 4) + 1.47 [ms]
	Example: When only port 4 is used by an IO-Link device (actuator) with an IO-Link output data size of 2 bytes, and the IO-Link communications cycle for that IO-Link device (actuator) is 2.1 [ms]: 0.044 × 2 bytes × 1 device + 1.47 + 2.1 = 3.658 [ms]	Example: When port 1 through port 3 are used by IO-Link devices with an IO-Link input data size of 2 bytes and port 4 is used by a non-IO-Link actuator: 0 + 1.47 = 1.47 [ms]

*1. For information on how to determine the IO-Link communications cycle, refer to *Determining the IO-Link Communications Cycle* on page 5-9.

5-3-2 Maximum I/O Response Time When the EtherNet/IP Coupler Unit Is Connected

This section describes the maximum I/O response time when an EtherNet/IP Coupler Unit is connected.

For information on timing charts and calculation methods for I/O response times for NX Units in EtherNet/IP Slave Terminals, refer to *10-2-1 I/O Response Times* in the *NX-series EtherNet/IP Coupler Unit User's Manual* (W536).

The following NX Unit parameters are necessary to calculate I/O response times.

- Tin: Input response time of the NX Unit
- Tout: Output response time of the NX Unit

The parameter values and calculation methods for the IO-Link Master Unit are given below.

● Input Data

I/O data type / Parameter	IO-Link input data from IO-Link communications in IO-Link Mode	Digital input data for pin 2 in IO-Link Mode	Digital input data in SIO (DI) Mode
Tin	0.072 × (Total size (in bytes) of IO-Link input data from IO-Link communications from port 1 to port 4) + 2.61+ IO-Link communications cycle*1 [ms]	0.072 × (Total size (in bytes) of IO-Link input data from IO-Link communications from port 1 to port 4) + 2.61+ Input filter time [ms]	
	Example: When port 1 through port 4 are all used by IO-Link devices (sensors) with an IO-Link input data size of 2 bytes, and the IO-Link communications cycle for those IO-Link devices (sensors) is 2.1 [ms]: 0.072 × 2 bytes × 4 devices + 2.61 + 2.1 = 5.286 [ms]	Example: When port 1 through port 4 are all used by IO-Link devices (sensors) with an IO-Link input data size of 2 bytes and no input filter is used: 0.072 × 2 bytes × 4 devices + 2.61 = 3.186 [ms]	Example: When port 1 through port 3 are used by IO-Link devices with an IO-Link input data size of 2 bytes and port 4 is used by a non-IO-Link device with no input filter: 0.072 × 2 bytes × 3 devices + 2.61 = 3.042 [ms]

*1. For information on how to determine the IO-Link communications cycle, refer to *5-3-3 Determining the IO-Link Communications Cycle* on page 5-9.

● Output Data

I/O data type / Parameter	IO-Link output data from IO-Link communications in IO-Link Mode	Digital output data in SIO (DO) Mode
Tout	0.044 × (Total size (in bytes) of IO-Link output data from IO-Link communications from port 1 to port 4) + 1.47 + IO-Link communications cycle*1 [ms]	0.044 × (Total size (in bytes) of IO-Link output data from IO-Link communications from port 1 to port 4) + 1.47 [ms]
	Example: When only port 4 is used by an IO-Link device (actuator) with an IO-Link output data size of 2 bytes, and the IO-Link communications cycle for that IO-Link device (actuator) is 2.1 [ms]: 0.044 × 2 bytes × 1 device + 1.47 + 2.1 = 3.658 [ms]	Example: When port 1 through port 3 are used by IO-Link devices with an IO-Link input data size of 2 bytes and port 4 is used by a non-IO-Link actuator: 0 + 1.47 = 1.47 [ms]

*1. For information on how to determine the IO-Link communications cycle, refer to *5-3-3 Determining the IO-Link Communications Cycle* on page 5-9.

5-3-3 Determining the IO-Link Communications Cycle

The IO-Link communications cycle depends on the baud rate of the IO-Link devices, as described below.

Refer to the handling instructions for individual IO-Link devices for the IO-Link device baud rates.

When the IO-Link Device Baud Rate Is COM3 (230.4 kbps)

The IO-Link communications cycle depends on whether the minimum cycle time of the IO-Link devices is less than or equal to 1.1 ms or greater than 1.1 ms, as described below.

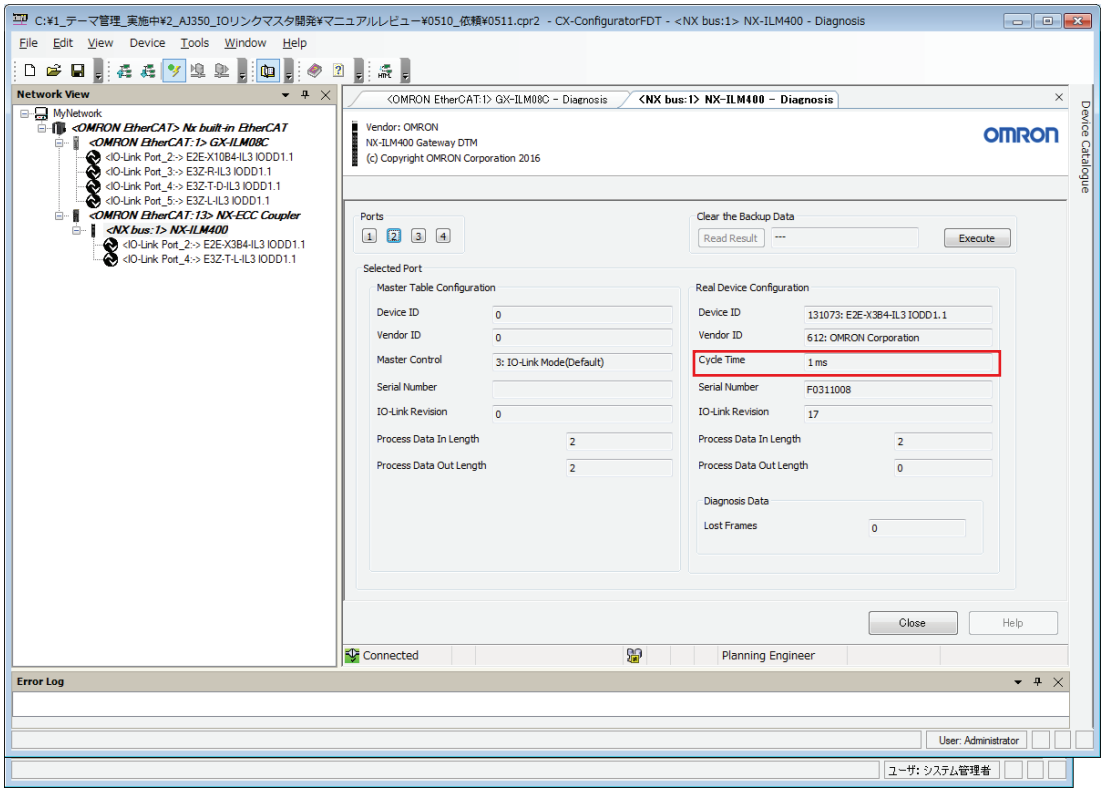
- When the minimum cycle time of the IO-Link devices is less than or equal to 1.1 ms
  IO-Link communications cycle is 2.1 [ms] and does not change.
- When the minimum cycle time of the IO-Link devices is greater than 1.1 ms
  The IO-Link communications cycle = (Minimum cycle time of the IO-Link devices*1) +1.0 [ms]

When the Baud Rate of the IO-Link Device Is COM2 (38.4 kbps) or COM1 (4.8 kbps)

The IO-Link communications cycle will be as described below.

The IO-Link communications cycle = (Minimum cycle time of the IO-Link devices*1) [ms]

*1. You can check the minimum cycle times for the IO-Link devices in the instruction manuals for the IO-Link devices.
Or, you can place the CX-ConfiguratorFDT online and check the cycle time in Read Device Configuration in the Diagnosis Tab Page for the IO-Link Master Unit, as shown in the following screen capture.



6

Types and Functions of IO-Link Master Units

This section describes the types and functions of IO-Link Master Units.

6-1 Types and Connection Configurations of IO-Link Master Units 6-2
6-1-1 Types of IO-Link Master Units 6-2
6-1-2 Connection Configuration with the Communications Coupler Unit and IO-Link Devices 6-2
6-2 Specifications of I/O Data 6-3
6-2-1 Allocatable I/O Data 6-3
6-3 List of Settings 6-4
6-4 Functions 6-6
6-4-1 Basic Functions of IO-Link Master Units 6-6
6-4-2 Application Functions of IO-Link Master Units 6-7

6-1 Types and Connection Configurations of IO-Link Master Units

This section describes the types of IO-Link Master Units.

6-1-1 Types of IO-Link Master Units

The NX-series IO-Link Master Unit is an NX Unit that has I/O processing functions for IO-Link communications with IO-Link devices and I/O processing functions for digital I/O data (ON/OFF signals) with non-IO_Link devices. For an IO-Link Master Unit, processing functions can be assigned for each port to combine different types of I/O processing functions.

Also, with IO-Link devices that support digital inputs for pin 2,*1 the IO-Link Master Unit can simultaneously perform both IO-Link communications and receive digital inputs.

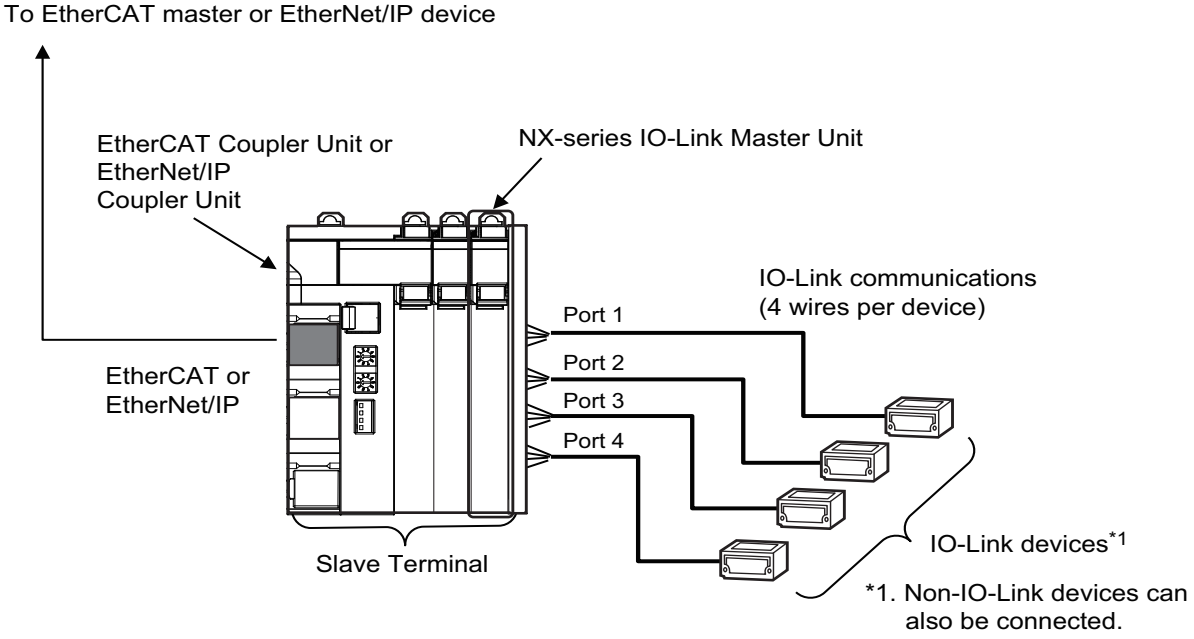
*1. Digital inputs that use pin 2 of IO-Link Master Unit ports.

The following types of I/O data are available.

Model	Number of inputs and outputs	Internal I/O common	I/O refreshing method	I/O connection terminals	Reference
NX-ILM400	4	PNP	Free-Run refreshing	Screwless Clamping Terminal Block	P.A-*

6-1-2 Connection Configuration with the Communications Coupler Unit and IO-Link Devices

An NX-series IO-Link Master Unit connects to IO-Link devices as shown below. It is also connected to an NX-series EtherCAT Coupler Unit or EtherNet/IP Coupler Unit and the Slave Terminal is connected to a host EtherCAT master or EtherNet/IP device.



6-2 Specifications of I/O Data

This section describes the I/O data for an IO-Link Master Unit.

6-2-1 Allocatable I/O Data

The data that can be assigned for I/O in the IO-Link Master Unit is given below.

Eight I/O entry mappings are assigned in the I/O allocation settings for the IO-Link Master Unit.

A specific I/O entry is assigned in the I/O entry mapping for each IO-Link Master Unit model.

You can change these assignments.

An I/O entry means the I/O data described in this section. An I/O entry mapping means a collection of I/O entries.

All of the data that can be assigned for an NX-series IO-Link Master Unit from the Sysmac Studio correspond to NX objects. The IO entry names and corresponding NX objects are listed in the following table. Refer to *A-3 List of NX Objects* on page A-10 for details on the NX objects. Refer to the user's manual for the connected Communications Coupler Unit for information the I/O allocations settings that are made from the Sysmac Studio.

I/O entry mapping name	Index (hex)	Subindex (hex)	I/O entry name	NX object name
Input Data Set 1	6000	01	I/O Port Status	I/O Port Status
	6001	01	Port1_2 I/O Port Error Status	Error Status for Ports 1 and 2
	6002	01	Port3_4 I/O Port Error Status	Port3_4 I/O Port Error Status
	6003	01	Digital Input Data	Digital Input Data
	6004	01-10	Port1 Input Data01 - 16	Port 1 Input Data 01 to 16
Input Data Set 2	6005	01-10	Port2 Input Data01 - 16	Port 2 Input Data 01 to 16
Input Data Set 3	6006	01-10	Port3 Input Data01 - 16	Port 3 Input Data 01 to 16
Input Data Set 4	6007	01-10	Port4 Input Data01 - 16	Port 4 Input Data 01 to 16
Output Data Set 1	7000	01	Digital Output Data	Digital Output Data
	7001	01-10	Port1 Output Data01 - 16	Port 1 Output Data 01 to 16
Output Data Set 2	7002	01-10	Port2 Output Data01 - 16	Port 2 Output Data 01 to 16
Output Data Set 3	7003	01-10	Port3 Output Data01 - 16	Port 3 Output Data 01 to 16
Output Data Set 4	7004	01-10	Port4 Output Data01 - 16	Port 4 Output Data 01 to 16

6-3 List of Settings

The followings are the setting descriptions, setting ranges, and default values of the functions that can be used in the IO-Link Master Unit.

The settings are reflected after the Unit is restarted.

Precautions for Safe Use

The Unit is restarted after the Unit operation settings are transferred from the Sysmac Studio. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

Setting		Description	Default value	Setting range	Index	Subindex
IO-Link Device Verification Setting		This setting specifies whether to verify that the IO-Link devices actually connected to the ports match the IO-Link devices in the IO-Link Device Configuration Settings when IO-Link communications start.	00 hex: Disabled	00 to 02 hex 00 hex: Do not check. 01 hex: Verify the vendor ID, device ID, and IO-Link revision. 02 hex: Verify the vendor ID, device ID, and IO-Link revision serial number.	5001 hex	01 to 04 hex
IO-Link Device Configuration Settings*1	Device ID	The type of IO-Link device.	00000000 hex	00000000 to 00FFFFFF hex	5006 to 5009 hex	01 hex
	Vendor ID	The vendor ID of the IO-Link device.	00000000 hex	00000000 to 0000FFFF hex		02 hex
	Serial Number	The serial number of the IO-Link device.	---	16 characters max.		05 hex
	IO-Link Revision*2	The IO-Link revision of the IO-Link device. • Set the major revision in the 4 upper bits, and the minor revision in the 4 lower bits.	00 hex	00 to FF hex		06 hex
	IO-Link Input Data Size*3	The size (in bytes) of the input data from the IO-Link device.	02 hex (2 bytes)	00 to 20 hex (0 to 32 bytes)		09 hex
	IO-Link Output Data Size*4	The size (in bytes) of the output data to the IO-Link device.	02 hex (2 bytes)	00 to 20 hex (0 to 32 bytes)		0A hex
	Master Control Communications Mode Setting	Set the communications mode for each port.	03 hex: IO-Link Mode	00 to 03 hex 00 hex: Disable Port 01 hex: SIO (DI) Mode 02 hex: SIO (DO) Mode 03 hex: IO-Link Mode		0B hex
Backup Setting		Make this setting to back up the parameter settings of the IO-Link devices in the IO-Link Master Unit. Specify whether to enable or disable backup for each port.	00 hex	00 to 01 hex 00 hex: Disables backup 01 hex: Enables backup	5002 hex	01 to 04 hex

Setting	Description	Default value	Setting range	Index	Subindex
Restoration Setting	Make this setting to restore the parameter settings of the IO-Link devices from the IO-Link Master Unit. Specify whether to enable or disable restoration for each port.	00 hex	00 to 01 hex 00 hex: Disables backup 01 hex: Enables backup	5003 hex	01 to 04 hex
Load Rejection Output Settings	Set whether to turn OFF outputs from the IO-Link Master Unit (i.e., whether to enable load rejection) when an error occurs in host communications. Make this setting for each port.	00 hex	00 to 01 hex 00 hex: Enables load rejection*5 01 hex: Disables load rejection*6	5004 hex	01 to 04 hex
Input Filter Settings	Filters digital input values. Make this setting for each port.*7	3 (1ms)	0: No filter 1: 0.25 ms 2: 0.5 ms 3: 1 ms 4: 2 ms 5: 4 ms 6: 8 ms 7: 16 ms 8: 32 ms 9: 64 ms 10: 128 ms 11: 256	5005 hex	01 to 04 hex

*1. You can check the codes for the IO-Link Device Configuration Settings in the manuals for the IO-Link devices. From Sysmac Studio, enter "#" to indicate hexadecimal followed by the hexadecimal number.

*2. Setting example: Set 11 hex for revision 1.1.

*3. Set the IO-Link input data size to a value greater than the IO-Link input data size of the device.

*4. Set the IO-Link output data size to a value greater than the IO-Link output data size of the device.

*5. Digital outputs are cleared and IO-Link communications are disabled.

*6. Digital outputs are held and IO-Link communications are maintained.

*7. Digital input values in SIO (DI) Mode and digital input values for pin 2 are specified separately for each port.

6-4 Functions

This section describes the functions of the IO-Link Master Unit.

6-4-1 Basic Functions of IO-Link Master Units

The following are the basic functions of OMRON's IO-Link Master Units.

For details, refer to the *IO-Link System User's Manual* (Cat. No. W570).

Function		Description
Communications	Cyclic communications	I/O data (process data) in the IO-Link devices is cyclically shared with the IO-Link Master Unit as the IO-Link communications master. At the same time, this data and the status of the IO-Link Master Unit is cyclically shared with the host communications master, with the IO-Link Master Unit operating as the host communications slave. Cyclic communications can be used to check the amount of detection performance deterioration in devices, and to check changes in usage conditions, such as the amount of incident light for photoelectric sensors, stability detection margins, and excessive proximity for proximity sensors.
	Message communications	The host communications master can send messages (commands) to the IO-Link Master Unit and receive the response from the IO-Link Master Unit. The IO-Link Master Unit can also function as a gateway to send messages (commands and responses) between the host communications master and the IO-Link devices. During operation, you can change and adjust device parameters, such as threshold settings, tuning execution, and ON-delay time changes, from a program. Or, during operation, you can check the internal status, such as the operating times of devices.
Communications mode settings		You can select any of the following modes for each port: IO-Link Mode, SIO (DI) Mode, SIO (DO) Mode, or Disable Port This allows you to combine IO-Link communications and digital I/O in a single Unit.
Digital inputs for pin 2		In IO-Link Mode, you can perform digital input with pin 2 while performing IO-Link communications.
Automatic baud rate setting for IO-Link communications		The IO-Link Master Unit automatically matches the specific baud rates (COM1, COM2, or COM3) of the IO-Link devices to communicate with the IO-Link devices. Therefore, it is not necessary to set the baud rate of the connected device for each port.
Connected device verification		This function is used to verify the configuration of IO-Link devices that are connected to the IO-Link Master Unit against the registered IO-Link device configuration settings when the power supply is turned ON. The user can enable or disable connected device verification.
IO-Link communications error detection		This function detects IO-Link cable breaks, disconnections from IO-Link device ports, error-level device events, device configuration verification errors, and IO-Link device malfunctions.
Detection of short-circuits in I/O cables		This function detects short-circuits in I/O cables
Notification of input data validity		The host controller can use the Input Data Enabled Flags to determine whether input data*1 is valid. This is not possible if EtherNet/IP is used for host communications.

*1. The input data includes IO-Link input data in IO-Link communications, the digital input data that is input with pin 2, and digital input data in SIO (DI) Mode.

6-4-2 Application Functions of IO-Link Master Units

The following table describes the application functions of OMRON's IO-Link Master Units.

Function	Description
Load rejection during host communications error	This function turns OFF outputs from the IO-Link Master Unit when an error occurs in host communications in IO-Link Mode or in an SIO mode. This prevents output operations with incorrect values from host communications.
IO-Link total communications retries	The IO-Link total communications retries can be read from the CX-ConfiguratorFDT. You can use this function to determine communications status as affected by I/O cable noise or other factors.
Digital input filter	You can set a filter processing time interval for digital inputs in SIO (DI) Mode or for digital inputs for pin 2 in IO-Link Mode. This lets you eliminate data corruption that can result from noise or switch chattering. This function can also be used to implement an ON delay and an OFF delay.
Backup or restoration of parameter settings in IO-Link devices	This function is used to back up parameter settings in IO-Link devices in the IO-Link Master Unit or restore them to IO-Link devices. This eliminates the need to set parameters again after replacing an IO-Link device.
Event log	The event log records events (including errors) that occur in the IO-Link Master Unit and the IO-Link devices. This enables partial troubleshooting for NJ/NX-series Controllers.

7

Troubleshooting

This section describes the error information and corrections for errors that can occur when the IO-Link Master Unit is used.

7-1 How to Check for Errors 7-2

7-2 Checking for Errors with the Indicators 7-3

7-3 Checking for Errors and Troubleshooting on the Sysmac Studio 7-4

7-3-1 Checking for Errors from the Sysmac Studio 7-4

7-3-2 Event Codes and Corrections for Errors 7-6

7-4 Resetting Errors 7-7

7-5 Troubles Specific To Each Type of NX Units 7-8

7-5-1 IO-Link Master Unit 7-8

7-6 Troubleshooting Flowchart 7-9

7-1 How to Check for Errors

Use one of the following error checking methods.

- Checking the indicators
- Troubleshooting with the Sysmac Studio

Refer to *7-3 Checking for Errors and Troubleshooting on the Sysmac Studio* on page 7-4 for details on confirming with the troubleshooting function of the Sysmac Studio.

7-2 Checking for Errors with the Indicators

Refer to the *IO-Link System User's Manual* (Cat. No. W570) for information on troubleshooting with the front-panel indicators.

7-3 Checking for Errors and Troubleshooting on the Sysmac Studio

Error management on the NX Series is based on the methods used for the NJ/NX-series Controllers.

This allows you to use the Sysmac Studio to check the meanings of errors and troubleshooting procedures.

7-3-1 Checking for Errors from the Sysmac Studio

When an error occurs, you can place the Sysmac Studio online to the Controller or the Communications Coupler Unit to check current Controller errors and the log of past Controller errors.

Refer to the user's manual for the connected Communications Coupler Unit for details on how to check errors.

Current Errors

Open the Sysmac Studio's Controller Error Tab Page to check the current error's level, source, source details, event name, event codes, details, attached information 1 to 4, and correction.

Errors in the observation level are not displayed.

Additional Information

Number of Current Errors

The following table gives the number of errors that are reported simultaneously as current errors in each Unit.

Unit	Number of simultaneous error notifications
NX-ILM400	15 errors

If the number of errors exceeds the maximum number of reportable current errors, errors are reported with a priority given to the oldest and highest-level errors. Errors that exceed the limit on simultaneous error notifications are not reported.

Errors that are not reported are still reflected in the error status.

Log of Past Errors

Open the Sysmac Studio's Controller Event Log Tab Page to check the times, levels, sources, source details, event names, event codes, details, attached information 1 to 4, and corrections for previous errors.

Additional Information

Number of Logs of Past Errors

Each event log can contain the following number of records.

The oldest events are overwritten if there are more than 15 events in the system event log or two events in the access event log.

Refer to the *NJ/NX-series Troubleshooting Manual* (Cat. No. W503) and the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for the items that you can check and the procedures to check for errors.
Refer to *7-3-2 Event Codes and Corrections for Errors* on page 7-6 for details on event codes.

7-3-2 Event Codes and Corrections for Errors

Refer to the *IO-Link System User's Manual* (Cat. No. W570) for a list of the errors (events) that can occur in an IO-Link Master Unit.

7-4 Resetting Errors

Refer to the user's manual for the connected Communications Coupler Unit for details on how to reset errors.

7-5 Troubles Specific To Each Type of NX Units

7-5-1 IO-Link Master Unit

Problem	Cause	Correction
Although a connected external device is ON, nothing is input and the input indicator is not lit either.	The I/O power is not supplied.	Check that the I/O power is supplied.
	The I/O power supply voltage is outside the rated range.	Set the I/O power supply voltage so that it is within the rated voltage range.
	The Unit is not wired correctly with the connected external device.	Check the wiring with the connected external device.
	The wiring to the connected external device is disconnected.	Check the wiring with the connected external device.
	A connected external device is defective.	Replace the connected external device.
A connected external device is ON and the input indicator is lit, but nothing is input.	A communications error occurred.	Check if a communications (NX bus) error occurred.
There is a delay in the ON and OFF timing for input values.	An input filter may be set.	Set the input filter value to 0. Alternatively, change the input filter to an appropriate value.

7-6 Troubleshooting Flowchart

Refer to the user's manual for the connected Communications Coupler Unit for details on the standard troubleshooting process when an error occurs.

8

Inspection and Maintenance

This section describes how to clean, inspect, and maintain the system.

8-1 Cleaning and Inspection 8-2
8-1-1 Cleaning 8-2
8-1-2 Periodic Inspection 8-2
8-2 Maintenance Procedures 8-5

8-1 Cleaning and Inspection

This section describes daily device maintenance such as cleaning and inspection.

Make sure to perform daily or periodic inspections in order to maintain the IO-Link Master Unit's functions in the best operating condition.

8-1-1 Cleaning

Clean the IO-Link Master Unit regularly as described below in order to keep it in optimal operating condition.

- Wipe the equipment over with a soft, dry cloth when performing daily cleaning.
- If dirt remains even after wiping with a soft, dry cloth, wipe with a cloth that has been wet with a sufficiently diluted detergent (2%) and wrung dry.
- Units will become stained if items such as rubber, vinyl products, or adhesive tape are left on the NX Unit for a long period. Remove such items during regular cleaning.

Precautions for Correct Use

- Never use benzene, thinners, other volatile solvents, or chemical cloths.
- Do not touch the NX bus connectors.

8-1-2 Periodic Inspection

Elements in the NX-series IO-Link Master Unit can deteriorate under improper environmental conditions. Periodic inspections are thus required to ensure that the required conditions are being kept.

Inspection is recommended at least once every six months to a year, but more frequent inspections may be necessary depending on the severe environments.

Take immediate steps to correct the situation if any of the conditions in the following table are not met.

Periodic Inspection Items

No.	Inspection item	Inspection details	Criteria	Correction
1	External power supply	Is the power supply voltage measured at the terminal block within standards?	Within the power supply voltage range	Use a voltage tester to check the power supply at the terminals. Take necessary steps to bring the power supply within the power supply voltage range.
2	I/O power supply	Is the power supply voltage measured at the I/O terminal block within standards?	Voltages must be within I/O specifications of each NX Unit.	Use a voltage tester to check the power voltage at the terminals. Take necessary steps to bring the I/O power supply within NX Unit standards.
3	Ambient environment	Is the ambient operating temperature within standards?	0 to 55°C	Use a thermometer to check the temperature and ensure that the ambient operating temperature remains within the allowed range of 0 to 55°C.
		Is the ambient operating humidity within standards?	Relative humidity must be 10% to 95% with no condensation.	Use a hygrometer to check the humidity and ensure that the ambient operating humidity remains between 10% and 95%. Make sure that condensation does not occur due to rapid changes in temperature.
		Is it subject to direct sunlight?	Not in direct sunlight	Protect the Controller if necessary.
		Is there an accumulation of dirt, dust, salt, metal powder, etc.?	No accumulation	Clean and protect the Controller if necessary.
		Is there water, oil, or chemical sprays hitting the Controller?	No spray	Clean and protect the Controller if necessary.
		Are there corrosive or flammable gases in the area of the Controller?	No spray	Check by smell or use a sensor.
		Is the Unit subject to shock or vibration?	Vibration resistance and shock resistance must be within specifications.	Install cushioning or other vibration and shock absorbing equipment if necessary.
		Are there noise sources near the Controller?	No significant noise sources	Either separate the Controller and noise source, or protect the Controller.
4	Installation and wiring	Are the DIN track mounting hooks for each NX Unit securely locked?	No looseness	Securely lock the DIN track mounting hooks.
		Are the cable connectors fully inserted and locked?	No looseness	Correct any improperly installed connectors.
		Are there any loose screws on the End Plates (PFP-M)?	No looseness	Tighten loose screws with a Phillips-head screwdriver.
		Are the NX Units connected to each other along the hookup guides and inserted until they touch the DIN track?	You must connect and fix the NX Units to the DIN track.	Connect the NX Units to each other along the hookup guides and insert them until they touch the DIN track.
		Are there any damaged external wiring cables?	No visible damage	Check visually and replace cables if necessary.

Tools Required for Inspections

Required Tools

- Phillips screwdriver
- Flat-blade screwdriver
- Voltage tester or digital voltmeter
- Industrial alcohol and pure cotton cloth

Tools Required Occasionally

- Oscilloscope
- Thermometer and hygrometer

8-2 Maintenance Procedures

When you replace an IO-Link Master Unit, follow the procedure in the user's manual for the connected Communications Coupler Unit and refer to the *IO-Link Systems User's Manual* (Cat. No. W570).

A

Appendices

The appendices provide the data sheets of the IO-Link Master Unit and the Unit dimensions.

A-1 Data Sheet A-2
A-1-1 Models A-2
A-1-2 IO-Link Master Unit A-3
A-2 Dimensions A-8
A-2-1 NX-series IO-Link Master Unit A-8
A-3 List of NX Objects A-10
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A-4 List of Screwless Clamping Terminal Block Models A-31
A-4-1 Model Notation A-31
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A-5 Version Information A-32
A-5-1 Relationship between Unit Versions of Units A-32

A-1 Data Sheet

This appendix gives the specifications of the IO-Link Master Unit.

A-1-1 Models

IO-Link Master Unit

Model	Number of ports	I/O refreshing method	Reference
NX-ILM400	4	Free-Run refreshing (Cannot be changed.)	*5-2 I/O Refreshing Methods* on page 5-4

A-1-2 IO-Link Master Unit

Description of Items on Datasheet of the IO-Link Master Unit

The meanings of the items on the datasheet of the IO-Link Master Unit are explained in the following table.

Item		Description
Unit name		The name of the Unit.
Model		The number of the Unit.
Number of ports		The number of ports for I/O connection on the Unit.
Communications specifications	**Baud rate**	The baud rate for IO-Link communications.
Power supply to devices in IO-Link Mode or SIO (DI) Mode	**Rated voltage**	The rated voltage that is supplied to devices connected to ports in IO-Link Mode and SIO (DI) Mone on the Unit.
	Supplied current	The maximum load current from the I/O power supply in IO-Link Mode or SIO (DI) Mode. A specification is given for each port.
	Short-circuit protection	Whether circuit protection is provided for load short-circuits.
Digital inputs (in SIO (DI) Mode)	**Internal I/O common**	The polarity that is used to connect to input devices in SIO (DI) Mode. Connections are PNP.
	Rated voltage	The rated input voltage and range in SIO (DI) Mode.
	Input current	The input current at the rated voltage in SIO (DI) Mode.
	ON voltage/ON current	The input voltage at which the input turns ON and the corresponding input current in SIO (DI) Mode.
	OFF voltage	The input voltage at which the input turns OFF in SIO (DI) Mode.
	Input filter time	The filter time when the status of the internal circuit is read as the data to the internal of the Unit in SIO (DI) Mode. It is same for both ON and OFF. The filter time to be set by the Sysmac Studio is given.
Digital outputs (in SIO (DO) Mode)	**Internal I/O common**	The polarity that is used to connect to output devices in SIO (DO) Mode. Connections are PNP.
	Output type	The transistor output type in SIO (DO) Mode.
	Rated voltage	The load voltage range in SIO (DO) Mode.
	Maximum load current	The maximum load current in SIO (DO) Mode. A specification is given for each port.
	Short-circuit protection	Whether circuit protection is provided for load short-circuits.
	Leakage current	The leakage current when the output is OFF in SIO (DO) Mode.
	Residual voltage	The residual voltage when the output is ON in SIO (DO) Mode.
Digital inputs for pin 2 (in IO-Link Mode)	**Internal I/O common**	The polarity of the connected input device for digital inputs for pin 2 in IO-Link Mode. Connections are PNP.
	Rated voltage	The range of the rated input voltage for digital inputs for pin 2 in IO-Link Mode.
	Input current	The input current at the rated voltage for digital inputs for pin 2 in IO-Link Mode.
	ON voltage/ON current	The input voltage at which the input turns ON and the corresponding input current for digital inputs for pin 2 in IO-Link Mode.
	OFF voltage	The input voltage at which the input turns ON for digital inputs for pin 2 in IO-Link Mode.
	Input filter time	The filter time when the status of the internal circuit is read as the data to the internal of the Unit for digital inputs for pin 2 in IO-Link Mode. It is same for both ON and OFF. The filter time to be set by the Sysmac Studio is given.
Cable specifications	**Cable type**	Whether the cable is shielded or unshielded.
	Length	The cable length.
	Electrostatic capacity between lines	The electrostatic capacity between lines.
	Loop resistance	The total resistance for two cables.
External connection terminals		The type of terminal block or connector that is used to wire the Unit. The number of terminals on the Screwless Clamping Terminal Block is also given.
I/O refreshing method		The I/O refreshing method that is used by the Unit.

Item	Description
Dimensions	The dimensions of the Unit. The dimensions are given in the form W × H × D. The dimensions are given in millimeters.
Isolation method	The isolation method between the input circuit and internal circuit of the Unit.
Insulation resistance	The insulation resistance between the input circuit and internal circuit of the Unit.
Dielectric strength	The dielectric strength between the input circuit and internal circuit of the Unit.
I/O power supply method	The method for supplying I/O power for the Unit. The supply method is determined for each Unit. The power is supplied from the NX bus or the external source.
Current capacity of I/O power supply terminals	The current capacity of the power supply terminals (IOV/IOG) of the Unit. When you supply I/O power to connected external devices, make sure that the total power does not exceed this value.
NX Unit power consumption	The power consumption of the NX Unit power supply of the Unit.
Current consumption from I/O power supply	The current consumption of the Unit from the I/O power supply. The above input current and current consumption of any connected external devices are excluded.
Weight	The weight of the Unit.
Circuit configuration	The input circuit layout of the Unit.
Terminal connection diagram	A diagram of the connection between the Unit and connected external devices. Any I/O Power Supply Connection Units or Shield Connection Units that are required to connect the connected external devices are also shown.
Installation orientation and restrictions	The installation orientation of the Slave Terminal that includes this Unit. Any restrictions to specifications that result from the installation orientation are also given.
Protective functions	The protective functions that the Unit has.

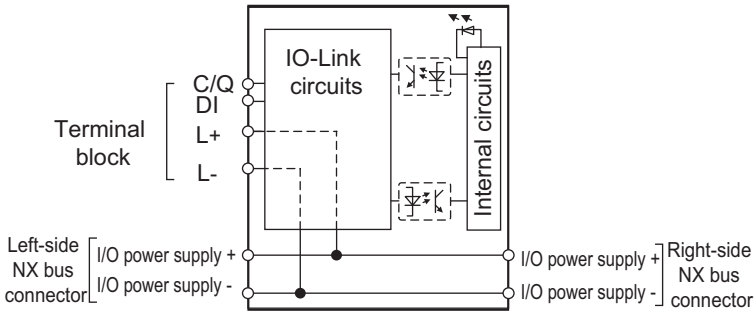
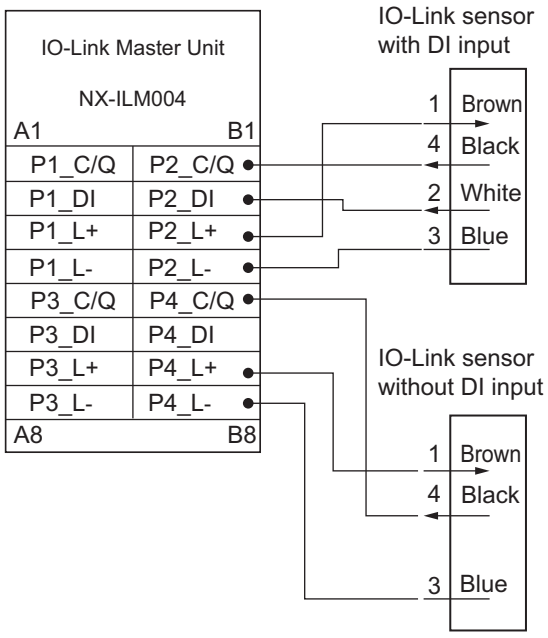
IO-Link Master Unit

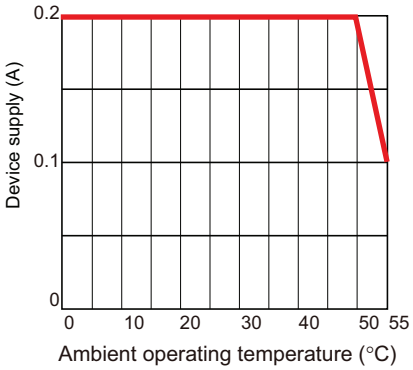
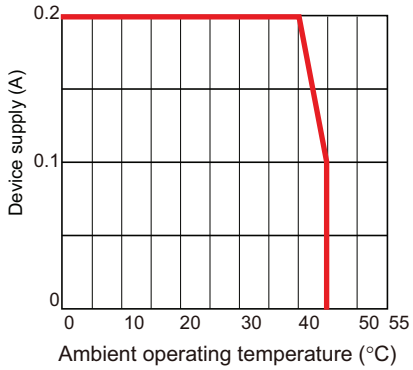
● General Specifications

Item		Specification
Enclosure		Must be built into a panel.
Grounding methods		Ground to 100 Ω or less.
Operating environment	**Ambient operating temperature**	0 to 55°C
	Ambient operating humidity	10% to 95% (with no condensation or icing)
	Atmosphere	Must be free from corrosive gases.
	Ambient storage temperature	−25 to 70°C (with no condensation or icing)
	Altitude	2,000 m max.
	Pollution degree	Pollution degree 2 or less: Conforms to JIS B3502 and IEC 61131-2.
	Noise immunity	Conforms to IEC 61000-4-4, 2 kV (power line).
	Overvoltage category	Category II: Conforms to JIS B3502 and IEC 61131-2.
	EMC immunity level	Zone B
	Vibration resistance	Conforms to IEC 60068-2-6. 5 to 8.4 Hz with amplitude of 3.5 mm, 8.4 to 150 Hz, acceleration of 9.8 m/s^2 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)
	Shock resistance	Conforms to IEC 60068-2-27. 147 m/s^2, 3 times each in X, Y, and Z directions
Applicable standards		UL 61010-2-201, ANSI/ISA 12.12.01, EU: EN 61131-2, RCM, KC, and IO-Link conformance

● Unit Specifications

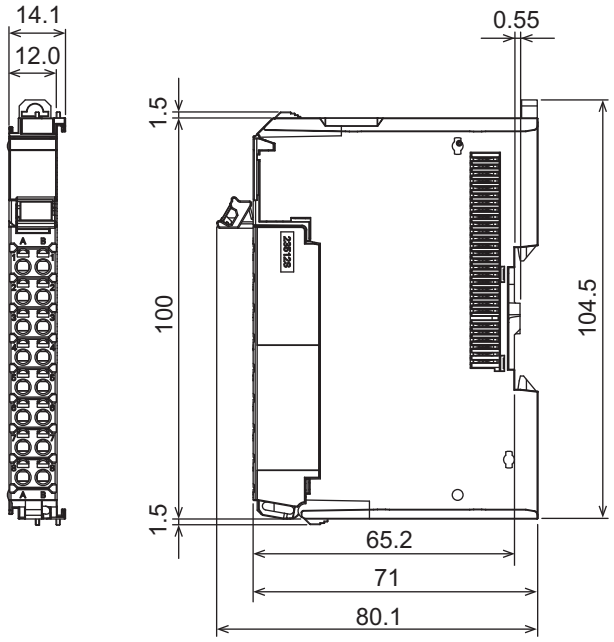
Item		Specification
Unit name		IO-Link Master Unit
Model		NX-ILM400
Number of ports		4
Communications specifications	**Baud rate**	COM1: 4.8kbps COM2: 38.4kbps COM3: 230.4kbps
Power supply to devices in IO-Link Mode or SIO (DI) Mode	**Rated voltage**	24 VDC (20.4 to 28.8 VDC)
	Supplied current	0.2 A/port
	Short-circuit protection	Provided.
Digital inputs (in SIO (DI) Mode)	**Internal I/O common**	PNP
	Rated voltage	24 VDC (20.4 to 28.8 VDC)
	Input current	5 mA typical (24 VDC)
	ON voltage/ON current	15 VDC min., 5 mA min.
	OFF voltage	5 VDC max.
	Input filter time	No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms
Digital outputs (in SIO (DO) Mode)	**Internal I/O common**	PNP
	Output type	Push-pull
	Rated voltage	24 VDC (20.4 to 28.8 VDC)
	Maximum load current	0.1 A/port
	Short-circuit protection	Provided.
	Leakage current	0.1 mA max.
	Residual voltage	1.5 V max.

Item		Specification
Digital inputs for pin 2 (in IO-Link Mode)	Internal I/O common	PNP
	Rated voltage	24 VDC (20.4 to 28.8 VDC)
	Input current	2 mA typical (24 VDC)
	ON voltage/ON current	15 VDC min., 2 mA min.
	OFF voltage	5 VDC max.
	Input filter time	No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms
Cable specifications	Cable type	Unshielded
	Length	20 m max.
	Electrostatic capacity between lines	3 nF max.
	Loop resistance	6 Ω max.
External connection terminals		Screwless Clamping Terminal Block (16 terminals)
I/O refreshing method		Free-Run refreshing
Dimensions		12 × 100 × 71 mm (W×H×D)
Isolation method		Photocoupler isolation
Insulation resistance		20 MΩ min. at 100 VDC (between isolated circuits)
Dielectric strength		510 VAC for 1 min, leakage current: 5 mA max. (between isolated circuits)
I/O power supply method		Supply from the NX bus
NX Unit power consumption		0.80 W
Current consumption from I/O power supply		50 mA
Weight		67 g
Circuit configuration		
Terminal connection diagram		

Item	Specification
Installation orientation and restrictions	Installation orientation: 6 possible orientations Restrictions: Upright Installation  Any Installation Other Than Upright 
Protective functions	Load short-circuit protection

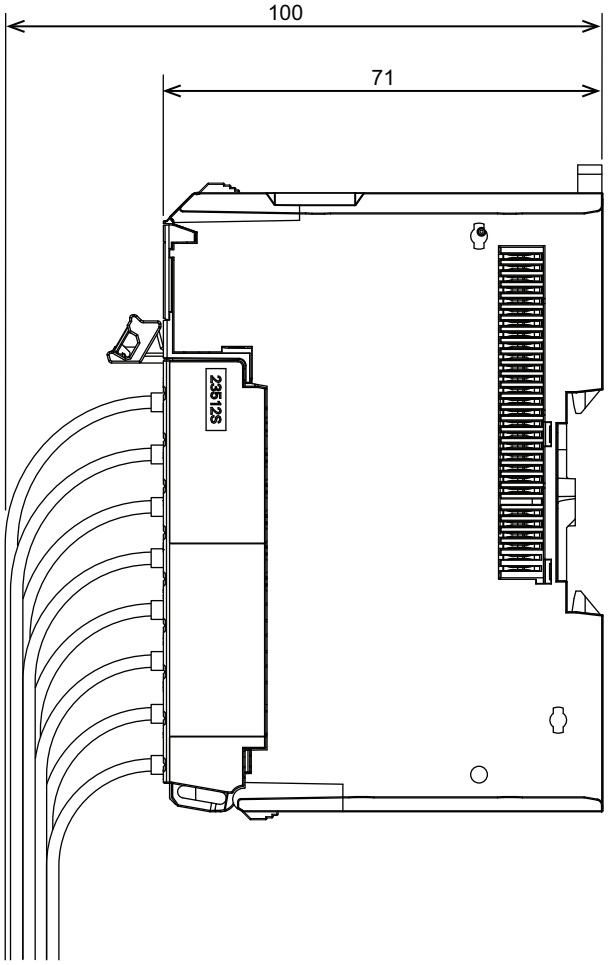
A-2 Dimensions

A-2-1 NX-series IO-Link Master Unit



(Unit: mm)

Installation Height



(Unit: mm)

A-3 List of NX Objects

This section explains the NX objects of the IO-Link Master Unit.

A-3-1 Format of Object Descriptions

In this manual, NX objects are described with the following format.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allo-cat-ion	Data attri-bute

Index (Hex)	:	This is the index of the NX object that is expressed as a four-digit hexadecimal number.
Subindex (Hex)	:	This is the subindex of the NX object that is expressed as a two-digit hexadecimal number.
Object name	:	This is the name of the object. For a subindex, this is the name of the subindex.
Default value	:	This is the value that is set by default.
Data range	:	For a read-only (RO) NX object, this is the range of the data you can read. For a read-write (RW) NX object, this is the setting range of the data.
Unit	:	The unit is the physical units.
Data type	:	This is the data type of the object.
Access	:	This data tells if the object is read-only or read/write. RO: Read only RW: Read/write
I/O allocation	:	This tells whether I/O allocation is allowed.
Data attribute	:	This is the timing when changes to writable NX objects are enabled. Y: Enabled by restarting N: Enabled at all times ---: Write-prohibited

A-3-2 IO-Link Master Unit

Unit Information Object

These objects are related to product information.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
1000	---	NX Bus Identity	---	---	---	---	---	---	---
	00	Number of Entries		---	---	USINT	RO	Not possible	
	02	Model	NX-ILM400 *1	---	---	ARRAY [0..11] OF BYTE	RO	Not possible	---
	04	Product Code	00770400Hex	---	---	UDINT	RO	Not possible	---
	05	Vendor Code	00000001Hex	---	---	UDINT	RO	Not possible	---
	06	Unit Version	01000000Hex	---	---	UDINT	RO	Not possible	---
	07	Serial Number	*2	00000000 to FFFFFFFF hex	---	UDINT	RO	Not possible	---
1001	---	Production Info	---	---	---	---	---	---	---
	00	Number of Entries	4	4	---	USINT	RO	Not possible	---
	01	Lot Number	*3	00000000 to FFFFFFFF hex	---	UDINT	RO	Not possible	---
	02	Hardware Version	V1.00 *4	---	---	ARRAY [0..19] OF BYTE	RO	Not possible	---
	03	Software Version	V1.00	---	---	ARRAY [0..19] OF BYTE	RO	Not possible	---

*1. The product models are assigned in ascending order from the lowest number of array elements. Unused elements are padded with spaces.

*2. A unique serial number is assigned to each product.

*3. The date of manufacture is given for the lot number.
Bits 24 to 31: Day of manufacture
Bits 16 to 23: Month of manufacture
Bits 8 to 15: Year of manufacture
Bits 0 to 7: Reserved
Bits 0 to 31: Serial number

*4. The hardware version is assigned in ascending order from the earliest number of array elements. Unused elements are padded with spaces.

Objects That Accept I/O Allocations

These objects accept I/O allocations.

You cannot access the objects that are described below with the Read NX Unit Object instruction or the Write NX Unit Object instruction.

Refer to the *NJ/NX-series Instructions Reference Manual* (Cat. No. W502) for details on the Read NX Unit Object instruction or the Write NX Unit Object instruction.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6000	---	I/O Port Status	---	---		---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible	---
	01	I/O Port Status (Details provided later.*1)	0000	0000 to FFFF hex	---	WORD	RO	Possible	—
6001	---	Error Status for Ports 1 and 2	---	---		---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible	---
	01	Error Status for Ports 1 and 2 (Details provided later.*2)	0000	0000 to FFFF hex	---	WORD	RO	Possible	—
6002	---	Error Status for Ports 3 and 4 (Details provided later.*3)	---	---		---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible	---
	01	Error Status for Ports 3 and 4	0000	0000 to FFFF hex	---	WORD	RO	Possible	---
6003	---	Digital Input Data	---	---		---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible	---
	01	Digital Input Data (Details provided later.*4)	0000	0000 to FFFF hex	---	WORD	RO	Possible	---
6004	—	Port 1 Input Data	---	---		---	---	---	---
	00	Number of Entries	10	00 to 10 hex	---	USINT	RO	Not possible	---
	01	Port 1 Input Data 01	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	02	Port 1 Input Data 02	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	03	Port 1 Input Data 03	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	04	Port 1 Input Data 04	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	05	Port 1 Input Data 05	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	06	Port 1 Input Data 06	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	07	Port 1 Input Data 07	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6004	08	Port 1 Input Data 08	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	09	Port 1 Input Data 09	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0A	Port 1 Input Data 10	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0B	Port 1 Input Data 11	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0C	Port 1 Input Data 12	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0D	Port 1 Input Data 13	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0E	Port 1 Input Data 14	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0F	Port 1 Input Data 15	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	10	Port 1 Input Data 16	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
6005	---	Port 2 Input Data	---	---		---	---	---	---
	00	Number of Entries	10	00 to 10 hex	---	USINT	RO	Not possible	---
	01	Port 2 Input Data 01	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	02	Port 2 Input Data 02	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	03	Port 2 Input Data 03	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	04	Port 2 Input Data 04	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	05	Port 2 Input Data 05	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	06	Port 2 Input Data 06	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6005	07	Port 2 Input Data 07	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	08	Port 2 Input Data 08	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	09	Port 2 Input Data 09	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0A	Port 2 Input Data 10	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0B	Port 2 Input Data 11	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0C	Port 2 Input Data 12	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0D	Port 2 Input Data 13	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0E	Port 2 Input Data 14	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0F	Port 2 Input Data 15	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	10	Port 2 Input Data 16	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
6006	---	Port 3 Input Data	---	---		---	---	---	
	00	Number of Entries	10	00 to 10 hex	---	USINT	RO	Not possible	---
	01	Port 3 Input Data 01	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	02	Port 3 Input Data 02	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	03	Port 3 Input Data 03	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	04	Port 3 Input Data 04	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	05	Port 3 Input Data 05	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6006	06	Port 3 Input Data 06	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	07	Port 3 Input Data 07	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	08	Port 3 Input Data 08	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	09	Port 3 Input Data 09	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0A	Port 3 Input Data 10	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0B	Port 3 Input Data 11	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0C	Port 3 Input Data 12	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0D	Port 3 Input Data 13	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0E	Port 3 Input Data 14	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0F	Port 3 Input Data 15	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	10	Port 3 Input Data 16	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
6007	---	Port 4 Input Data	---	---		---	---	---	
	00	Number of Entries	10	00 to 10 hex	---	USINT	RO	Not possible	---
	01	Port 4 Input Data 01	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	02	Port 4 Input Data 02	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	03	Port 4 Input Data 03	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	04	Port 4 Input Data 04	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6007	05	Port 4 Input Data 05	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	06	Port 4 Input Data 06	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	07	Port 4 Input Data 07	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	08	Port 4 Input Data 08	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	09	Port 4 Input Data 09	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0A	Port 4 Input Data 10	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0B	Port 4 Input Data 11	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0C	Port 4 Input Data 12	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0D	Port 4 Input Data 13	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0E	Port 4 Input Data 14	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	0F	Port 4 Input Data 15	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---
	10	Port 4 Input Data 16	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RO	Possible	---

*1. The following table shows the bit configuration of the I/O Port Status object. The status can be accessed either as WORD data or BOOL data.

Bit	Meaning	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
0	Port 1 Input Data Enabled Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
1	Port 2 Input Data Enabled Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
2	Port 3 Input Data Enabled Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
3	Port 4 Input Data Enabled Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
14	IO-Link Communications Module Processing Error	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
15	I/O Power ON Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---

*2. The contents of *Error Status for Ports 1 and 2* are given below. The status can be accessed either as WORD data or BOOL data.

Bit	Meaning	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
0	Port 1 IO-Link Communications Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
1	Port 1 I/O Short Detected Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
2	Port 1 Verification Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
3	Port 1 Device I/O Size Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
4	Port 1 Device Error-level Event Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
5	Port 1 Device Warning-level Event Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
6	Port 1 PDO Mapping Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
8	Port 2 IO-Link Communications Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
9	Port 2 IO Short Detected Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
10	Port 2 Verification Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
11	Port 2 Device I/O Size Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
12	Port 2 Device Error-level Event Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
13	Port 2 Device Warning-level Event Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
14	Port 2 PDO Mapping Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---

*3. The contents of *Error Status for Ports 3 and 4* are given below. The status can be accessed either as WORD data or BOOL data.

Bit	Meaning	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
0	Port 3 IO-Link Communications Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
1	Port 3 IO Short Detected Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
2	Port 3 Verification Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
3	Port 3 Device I/O Size Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
4	Port 3 Device Error-level Event Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
5	Port 3 Device Warning-level Event Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
6	Port 3 PDO Mapping Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
8	Port 4 IO-Link Communications Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
9	Port 4 IO Short Detected Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
10	Port 4 Verification Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
11	Port 4 Device I/O Size Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
12	Port 4 Device Error-level Event Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	—
13	Port 4 Device Warning-level Event Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	—
14	Port 4 PDO Mapping Error Flag	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	—

*4. The following table shows the bit configuration of the Digital Input Data object. The status can be accessed either as WORD data or BOOL data.

Bit	Meaning	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
1	Port 1 Digital Input Bit	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	—
2	Port 2 Digital Input Bit	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	—
3	Port 3 Digital Input Bit	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	—
4	Port 4 Digital Input Bit	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	—

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7000	---	Digital Output Data	---	---		---	---	---	
	00	Number of Entries	1	1	---	USINT	RO	Not possible	—
	01	Digital Output Data (Details provided later.*1)	0000	0000 to FFFF hex	---	WORD	RW	Possible	N
7001	---	Port 1 Output Data	---	---		---	---	---	
	00	Number of Entries	10 hex	10 hex	---	USINT	RO	Not possible	---
	01	Port 1 Output Data 01	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	02	Port 1 Output Data 02	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	03	Port 1 Output Data 03	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	04	Port 1 Output Data 04	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	05	Port 1 Output Data 05	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	06	Port 1 Output Data 06	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	07	Port 1 Output Data 07	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	08	Port 1 Output Data 08	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	09	Port 1 Output Data 09	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0A	Port 1 Output Data 10	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0B	Port 1 Output Data 11	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0C	Port 1 Output Data 12	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0D	Port 1 Output Data 13	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0E	Port 1 Output Data 14	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7001	0F	Port 1 Output Data 15	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	10	Port 1 Output Data 16	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
7002	---	Port 2 Output Data	---	---		---	---	---	
	00	Number of Entries	10 hex	10 hex	---	USINT	RO	Not possible	---
	01	Port 2 Output Data 01	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	02	Port 2 Output Data 02	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	03	Port 2 Output Data 03	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	04	Port 2 Output Data 04	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	05	Port 2 Output Data 05	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	06	Port 2 Output Data 06	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	07	Port 2 Output Data 07	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	08	Port 2 Output Data 08	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	09	Port 2 Output Data 09	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0A	Port 2 Output Data 10	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0B	Port 2 Output Data 11	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0C	Port 2 Output Data 12	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0D	Port 2 Output Data 13	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7002	0E	Port 2 Output Data 14	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0F	Port 2 Output Data 15	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	10	Port 2 Output Data 16	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
7003	---	Port 3 Output Data	---	---		---	---	---	
	00	Number of Entries	10 hex	10 hex	---	USINT	RO	Not possible	---
	01	Port 3 Output Data 01	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	02	Port 3 Output Data 02	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	03	Port 3 Output Data 03	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	04	Port 3 Output Data 04	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	05	Port 3 Output Data 05	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	06	Port 3 Output Data 06	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	07	Port 3 Output Data 07	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	08	Port 3 Output Data 08	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	09	Port 3 Output Data 09	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0A	Port 3 Output Data 10	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0B	Port 3 Output Data 11	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0C	Port 3 Output Data 12	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7003	0D	Port 3 Output Data 13	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0E	Port 3 Output Data 14	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0F	Port 3 Output Data 15	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	10	Port 3 Output Data 16	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
7004	---	Port 4 Output Data	---	---		---	---	---	
	00	Number of Entries	10 hex	10 hex	---	USINT	RO	Not possible	---
	01	Port 4 Output Data 01	FALSE	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	02	Port 4 Output Data 02	FALSE	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	03	Port 4 Output Data 03	FALSE	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	04	Port 4 Output Data 04	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	05	Port 4 Output Data 05	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	06	Port 4 Output Data 06	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	07	Port 4 Output Data 07	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	08	Port 4 Output Data 08	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	09	Port 4 Output Data 09	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0A	Port 4 Output Data 10	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0B	Port 4 Output Data 11	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7004	0C	Port 4 Output Data 12	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0D	Port 4 Output Data 13	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0E	Port 4 Output Data 14	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	0F	Port 4 Output Data 15	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N
	10	Port 4 Output Data 16	0000	0000 to FFFF hex	---	ARRAY [0..1] OF BYTE	RW	Possible	N

*1. The following table shows the bit configuration of the Digital Output Data object. The status can be accessed either as WORD data or BOOL data.

Bit	Meaning	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
1	Port 1 Digital Output Bit	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
2	Port 2 Digital Output Bit	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
3	Port 3 Digital Output Bit	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---
4	Port 4 Digital Output Bit	FALSE	FALSE/TRUE	---	BOOL	RO	Possible	---

Other Objects

This section lists other objects.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5001	---	IO-Link Device Verification Settings	---	---		---	---	---	
	00	Number of Entries	04 hex	04 hex	---	USINT	RO	Not possible	---
	01	Port 1 Device Verification Setting	00 hex	00 to 02 hex *1	---	USINT	RW	Not possible	Y
	02	Port 2 Device Verification Setting	00 hex	00 to 02 hex *1	---	USINT	RW	Not possible	Y
	03	Port 3 Device Verification Setting	00H hex	00 to 02 hex *1	---	USINT	RW	Not possible	Y
	04	Port 4 Device Verification Setting	00 hex	00 to 02 hex *1	---	USINT	RW	Not possible	Y

*1. The meanings of the set values for the Device Verification Settings are as follows:

Set value	Meaning
00 hex	Do not check.
01 hex	Devices are verified for the vendor ID, device ID, and IO-Link revision.
02 hex	Devices are verified for the vendor ID, device ID, IO-Link revision, and serial number.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5002	---	Backup Settings	---	---		---	---	---	
	00	Number of Entries	04 hex	04 hex	---	USINT	RO	Not possible	---
	01	Port 1 Backup Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y
	02	Port 2 Backup Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y
	03	Port 3 Backup Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y
	04	Port 4 Backup Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y

*1. The meanings of the set values for the Backup Settings are as follows:

Set value	Meaning
00 hex	The backup functions are disabled.
01 hex	The backup functions are enabled.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5003	---	Restoration Settings	---	---		---	---	---	
	00	Number of Entries	04 hex	04 hex	---	USINT	RO	Not possible	---
	01	Port 1 Restoration Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y
	02	Port 2 Restoration Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y
	03	Port 3 Restoration Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y
	04	Port 4 Restoration Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y

*1. The meanings of the set values for the Restoration Settings are as follows:

Set value	Meaning
00 hex	Restoration is disabled.
01 hex	Restoration is enabled.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5004	---	Load Rejection Output Settings	---	---		---	---	---	
	00	Number of Entries	04 hex	04 hex	---	USINT	RO	Not possible	---
	01	Port 1 Load Rejection Output Setting	00 hex	00 or 01 hex*1	---	USINT	RW	Not possible	Y
	02	Port 2 Load Rejection Output Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y
	03	Port 3 Load Rejection Output Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y
	04	Port 4 Load Rejection Output Setting	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	Y

*1. The Load Rejection Output Settings are used to set the load rejection outputs to use when host communications error occur. The meanings of the set values are as follows:

Set value	Meaning
00 hex	IO-Link Mode Enabled: Output rejection notification is sent to the IO-Link device. SO Mode Enabled: The output value is cleared to OFF.
01 hex	IO-Link Mode Disabled: IO-Link communications continue with the last output data that was received. SO Mode Disabled: The output that was last received is retained.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allo-cation	Data attribute
5005	---	Input Filter Settings	---	---		---	---	---	
	00	Number of Entries	04 hex	04 hex	---	USINT	RO	Not possible	---
	01	Port 1 Input Filter Value Setting	03 hex	00 to 0B hex *1	---	USINT	RW	Not possible	Y
	02	Port 2 Input Filter Value Setting	03 hex	00 to 0B hex *1	---	USINT	RW	Not possible	Y
	03	Port 3 Input Filter Value Setting	03 hex	00 to 0B hex *1	---	USINT	RW	Not possible	Y
	04	Port 4 Input Filter Value Setting	03 hex	00 to 0B hex *1	---	USINT	RW	Not possible	Y

*1. Set the filter times for the digital input signals in the Input Filter Settings object.
The meanings of the set values are as follows:

Set value	Meaning
00 hex	No filter
01 hex	0.25 ms
02 hex	0.5 ms
03 hex	1 ms (default)
04 hex	2 ms
05 hex	4 ms
06 hex	8 ms
07 hex	16 ms
08 hex	32 ms
09 hex	64 ms
0A hex	128 ms
0B hex	256 ms

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5006	---	Port 1 IO-Link Device Configuration Settings	---	---		---	---	---	
	00	Number of Entries	0B hex	0B hex	---	USINT	RO	Not possible	---
	01	Device ID	0 hex	00000000 to 00FFFFFF hex	---	UDINT	RW	Not possible	Y
	02	Vendor ID	0 hex	00000000 to 0000FFFF hex	---	UINT	RW	Not possible	Y
	05	Serial Number	---	16 characters max.	---	STRING (16)	RW	Not possible	Y
	06	IO-Link Revision	00 hex	00 to FF hex	---	USINT	RW	Not possible	Y
	09	IO-Link Input Data Size	02 hex	00 to 20 hex	Byte	USINT	RW	Not possible	
	0A	IO-Link Output Data Size	02 hex	00 to 20 hex	Byte	USINT	RW	Not possible	Y
	0B	Master Control Communications Mode Setting	03 hex	00 to 03 hex *1	---	USINT	RW	Not possible	Y
5007	---	Port 2 IO-Link Device Configuration Settings	---	---		---	---	---	
	00	Number of Entries	0B hex	0B hex	---	USINT	RO	Not possible	---
	01	Device ID	0 hex	00000000 to 00FFFFFF hex	---	UDINT	RW	Not possible	Y
	02	Vendor ID	0 hex	00000000 to 0000FFFF hex	---	UDINT	RW	Not possible	Y
	05	Serial Number	---	16 characters max.	---	STRING (16)	RW	Not possible	Y
	06	IO-Link Revision	00 hex	00 to FF hex	---	USINT	RW	Not possible	Y
	09	IO-Link Input Data Size	02 hex	00 to 20 hex	Byte	USINT	RW	Not possible	Y
	0A	IO-Link Output Data Size	02 hex	00 to 20 hex	Byte	USINT	RW	Not possible	Y
	0B	Master Control Communications Mode Setting	03 hex	00 to 03 hex *1	---	USINT	RW	Not possible	Y
5008	---	Port 3 IO-Link Device Configuration Settings	---	---		---	---	---	
	00	Number of Entries	0B hex	0B hex	---	USINT	RO	Not possible	---
	01	Device ID	0 hex	00000000 to 00FFFFFF hex	---	UDINT	RW	Not possible	Y
	02	Vendor ID	0 hex	00000000 to 0000FFFF hex	---	UINT	RW	Not possible	Y
	05	Serial Number	---	16 characters max.	---	STRING (16)	RW	Not possible	Y
	06	IO-Link Revision	00 hex	00 to FF hex	---	USINT	RW	Not possible	Y
	09	IO-Link Input Data Size	02 hex	00 to 20 hex	Byte	USINT	RW	Not possible	Y
	0A	IO-Link Output Data Size	02 hex	00 to 20 hex	Byte	USINT	RW	Not possible	Y
	0B	Master Control Communications Mode Setting	03 hex	00 to 03 hex*1	---	USINT	RW	Not possible	Y

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5009	---	Port 4 IO-Link Device Configuration Settings	---	---		---	---	---	
	00	Number of Entries	0B hex	0B hex	---	USINT	RO	Not possible	---
	01	Device ID	0 hex	00000000 to 00FFFFFF hex	---	UDINT	RW	Not possible	Y
	02	Vendor ID	0 hex	00000000 to 0000FFFF hex	---	UINT	RW	Not possible	Y
	05	Serial Number	---	16 characters max.	---	STRING (16)	RW	Not possible	Y
	06	IO-Link Revision	00 hex	00 to FF hex	---	USINT	RW	Not possible	Y
	09	IO-Link Input Data Size	02 hex	00 to 20 hex	Byte	USINT	RW	Not possible	Y
	0A	IO-Link Output Data Size	02 hex	00 to 20 hex	Byte	USINT	RW	Not possible	Y
	0B	Master Control Communications Mode Setting	03 hex	00 to 03 hex *1	---	USINT	RW	Not possible	Y

*1. The communications mode for each port is set in Master Control Communications Mode Settings.
The meanings of the set values are as follows:

Set value	Meaning
00 hex	Disable Port
01 hex	SIO (DI) Mode
02 hex	SIO (DO) Mode
03 hex	IO-Link Mode (default)

Index (hex)	Subindex (hex)	Object name		Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
500A	00	Port 1 IO-Link Device Information Area	Number of Entries	0A hex	0A hex	---	USINT	RO	Not possible	---
	01		Device ID	0 hex	00000000 to FFFFFFFF hex	---	UDINT	RO	Not possible	---
	02		Vendor ID	0 hex	0000 to FFFF hex	---	UINT	RO	Not possible	---
	05		Serial Number	---	16 characters max.	---	STRING (16)	RO	Not possible	---
	06		IO-Link Revision	00 hex	00 to FF hex	---	USINT	RO	Not possible	---
	08		Cycle Time	00 hex	00 to FF hex	---	USINT	RO	Not possible	---
	09		IO-Link Input Data Size	00 hex	00 to 20 hex	Byte	USINT	RO	Not possible	---
	0A		IO-Link Output Data Size	00 hex	00 to 20 hex	Byte	USINT	RO	Not possible	---
500B	00	Port 2 IO-Link Device Information Area	Number of Entries	0A hex	0A hex	---	USINT	RO	Not possible	---
	01		Device ID	0 hex	00000000 to FFFFFFFF hex	---	UDINT	RO	Not possible	---
	02		Vendor ID	0 hex	0000 to FFFF hex	---	UINT	RO	Not possible	---
	05		Serial Number	---	16 characters max.	---	STRING (16)	RO	Not possible	---
	06		IO-Link Revision	00 hex	00 to FF hex	---	USINT	RO	Not possible	---
	08		Cycle Time	00 hex	00 to FF hex	---	USINT	RO	Not possible	---
	09		IO-Link Input Data Size	00 hex	00 to 20 hex	Byte	USINT	RO	Not possible	---
	0A		IO-Link Output Data Size	00 hex	00 to 20 hex	Byte	USINT	RO	Not possible	---
500C	00	Port 3 IO-Link Device Information Area	Number of Entries	0A hex	0A hex	---	USINT	RO	Not possible	---
	01		Device ID	0 hex	00000000 to FFFFFFFF hex	---	UDINT	RO	Not possible	---
	02		Vendor ID	0 hex	0000 to FFFF hex	---	UINT	RO	Not possible	---
	05		Serial Number	---	16 characters max.	---	STRING (16)	RO	Not possible	---
	06		IO-Link Revision	00 hex	00 to FF hex	---	USINT	RO	Not possible	---
	08		Cycle Time	00 hex	00 to FF hex	---	USINT	RO	Not possible	---
500C	09	Port 3 IO-Link Device Information Area	IO-Link Input Data Size	00 hex	00 to 20 hex	Byte	USINT	RO	Not possible	---
	0A		IO-Link Output Data Size	00 hex	00 to 20 hex	Byte	USINT	RO	Not possible	---

Index (hex)	Subindex (hex)	Object name		Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
500D	00	Port 4 IO-Link Device Information Area	Number of Entries	0A hex	0A hex	---	USINT	RO	Not possible	---
	01		Device ID	0 hex	00000000 to FFFFFFFF hex	---	UDINT	RO	Not possible	---
	02		Vendor ID	0 hex	0000 to FFFF hex	---	UINT	RO	Not possible	---
	05		Serial Number	---	16 characters max.	---	STRING (16)	RO	Not possible	---
	06		IO-Link Revision	00 hex	00 to FF hex	---	USINT	RO	Not possible	---
	08		Cycle Time	00 hex	00 to FF hex	---	USINT	RO	Not possible	---
	09		IO-Link Input Data Size	00 hex	00 to 20 hex	Byte	USINT	RO	Not possible	---
	0A		IO-Link Output Data Size	00 hex	00 to 20 hex	Byte	USINT	RO	Not possible	---
500E	00	Lost Frames (IO-Link Total Communications Retries)	Number of Entries	04 hex	04 hex	---	USINT	RO	Not possible	---
	01		Port 1 Lost Frames (IO-Link Total Communications Retries)	00 hex	00 to FF hex	Frames	USINT	RW	Not possible	N
	02		Port 2 Lost Frames (IO-Link Total Communications Retries)	00 hex	00 to FF hex	Frames	USINT	RW	Not possible	N
	03		Port 3 Lost Frames (IO-Link Total Communications Retries)	00 hex	00 to FF hex	Frames	USINT	RW	Not possible	N
	04		Port 4 Lost Frames (IO-Link Total Communications Retries)	00 hex	00 to FF hex	Frames	USINT	RW	Not possible	N

Index (hex)	Subindex (hex)	Object name		Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5018	00	Clear Backup Data Command	Number of Entries	01 hex	01 hex	---	USINT	RO	Not possible	---
	01		Command	00 hex	00 or 01 hex *1	---	USINT	RW	Not possible	N
	02		Result	*2	0000, 0001, and FFFF hex *2		UINT	RO	Not possible	N

*1. *Command* is used to clear the IO-Link device backup data that is stored in the IO-Link Master Unit.
The meanings of the set values are as follows:

Set value	Meaning
01 hex	Clears the IO-Link backup data.
00 hex	Does not clear the IO-Link backup data.

*2. *Result* is used to display the cleared status of the IO-Link device backup data that is stored in the IO-Link Master Unit. The meanings of the values are as follows:

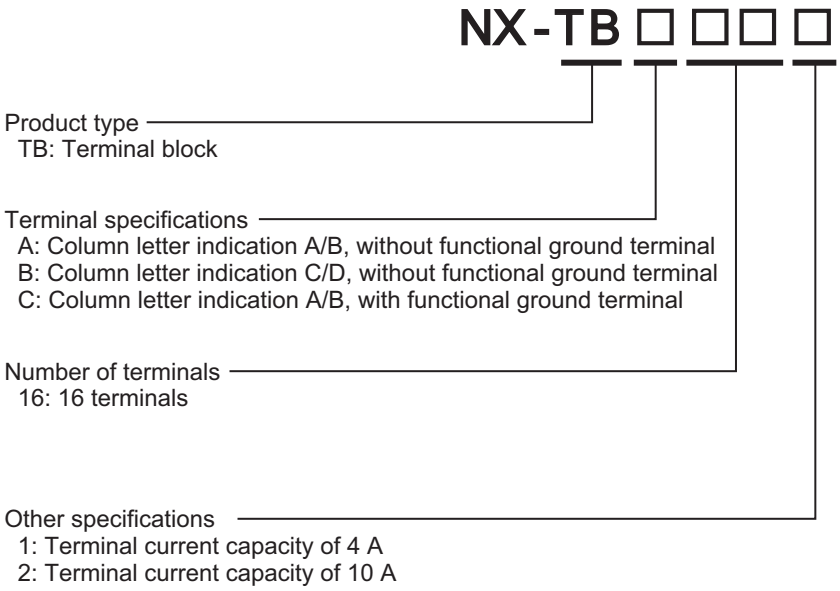
Set value	Meaning
0000 hex	Backup completed or not executed.
0001 hex	Backup failed.
FFFF hex	Execution is in progress.

A-4 List of Screwless Clamping Terminal Block Models

This section explains how to read the Screwless Clamping Terminal Block model numbers and shows the model number table.

A-4-1 Model Notation

The Screwless Clamping Terminal Block models are assigned based on the following rules.



A-4-2 List of Terminal Block Models

The following table shows a list of Screwless Clamping Terminal Blocks.

Terminal Block model	Number of terminals	Ground terminal mark	Terminal current capacity
NX-TBA161	16	Not provided	4 A
NX-TBB161			
NX-TBA162			10 A
NX-TBB162			
NX-TBC162		Provided	

Note When you purchase a Terminal Block, purchase an NX-TB□□□2.

A-5 Version Information

This section describes the relationship between the unit versions of the NX Units, Communications Coupler Units and CPU Units, and the versions of the Sysmac Studio, and the specification changes for each unit version of each Unit.

A-5-1 Relationship between Unit Versions of Units

The relationship between the unit versions of the NX Units and the Communications Coupler Units, CPU Units, and Sysmac Studio versions are shown below.

How to Read the Version Combination Table

The items that are used in the version combination table are given below.

NX Units		Corresponding Unit Versions/Versions						
		EtherCAT				EtherNet/IP		
Model	Unit version	Communications Coupler Units	CPU Units	Sysmac Studio	CX-ConfiguratiorFDT	Communications Coupler Units	Sysmac Studio	CX-ConfiguratiorFDT
Model numbers of NX Units.	Unit versions of NX Units.	Unit versions of EtherCAT Coupler Units that are compatible with the NX Units.	Unit versions of NX-series CPU Units or NJ-series CPU Units that are compatible with the EtherCAT Coupler Unit.	Sysmac Studio versions that are compatible with the NX Units, EtherCAT Coupler Units and CPU Units.	The version of the CX-ConfiguratiorFDT that supports the IO-Link Master Unit.	Unit versions of EtherNet/IP Coupler Units that are compatible with the NX Units.	Sysmac Studio versions that are compatible with the NX Units and EtherNet/IP Coupler Units.	The version of the CX-ConfiguratiorFDT that supports the IO-Link Master Unit.

Version Combination Table

- With the combinations of the unit versions/versions shown below, you can use all the functions that are supported by the unit version of the Unit model. Use the unit versions/versions (or the later/higher unit versions/versions) that correspond to the NX Unit models and the unit versions. You cannot use the specifications that were added or changed for the relevant NX Unit models and the unit versions unless you use the corresponding unit versions/versions.
- If you use a unit version/version later/higher than the corresponding unit versions/versions below, refer to the version information for the Communications Coupler Unit and CPU Unit.

NX Unit		Corresponding unit version/version						
		EtherCAT				EtherNet/IP		
Model	Unit version	Communications Coupler Unit	Unit	Sysmac Studio	CX-Configuratior FDT	Communications Coupler Unit	Sysmac Studio	CX-Configuratior FDT
NX-ILM400	Ver.1.0	Ver.1.0	Ver.1.12	Ver.1.16	Ver.2.2	Ver.1.0	Ver.1.16	Ver.2.2

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OMRON Corporation **Industrial Automation Company**
Kyoto, JAPAN
Contact: www.ia.omron.com

Regional Headquarters
OMRON EUROPE B.V.
Wegalaan 67-69, 2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON ELECTRONICS LLC
2895 Greenspoint Parkway, Suite 200
Hoffman Estates, IL 60169 U.S.A.
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.
No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark,
Singapore 119967
Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.
Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

Authorized Distributor:

Cat. No. W567-E1-01 0716