

## Machine Automation Controller

### NX-series

# Digital I/O Units

## User's Manual

NX-ID□□□□

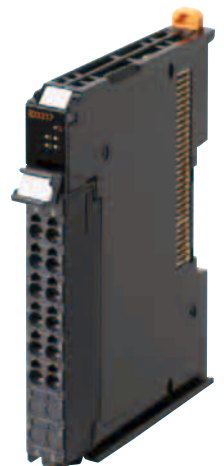
NX-IA□□□□

NX-OC□□□□

NX-OD□□□□

NX-MD□□□□

Digital I/O Units




W521-E1-04

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# Introduction

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Thank you for purchasing an NX-series Digital I/O Unit.

This manual contains information that is necessary to use the NX-series Digital I/O Unit. Please read this manual and make sure you understand the functionality and performance of the NX-series Digital I/O 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 Digital I/O Unit  
NX-ID□□□□ /IA□□□□ /OD□□□□/OC□□□□/MD□□□□

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# Relevant Manuals

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The table below provides the relevant manuals for the NX-series Digital I/O Units.

Read all of the manuals that are relevant to your system configuration and application to make the most of the NX-series Digital I/O Units.

Other manuals, such as related product manuals, are necessary for specific system configurations and applications. Refer to *Related Manuals* on page 25 for the related manuals.

Manual name	Application
NX-series Digital I/O Units User's Manual	Learning how to use NX-series Digital I/O Units
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.

The diagram illustrates the structure of a manual page, showing various levels of headings and their corresponding icons. The page is divided into sections, with a page tab indicating the current section. The annotations on the left and right describe the following elements:

- Level 1 heading:** 4 Installation and Wiring
- Level 2 heading:** 4-3 Mounting Units
- Level 3 heading:** 4-3-1 Connecting Controller Components
- Step in a procedure:** 1 Join the Units so that the connectors fit exactly. Indicates a procedure.
- Special information:** Precautions for Correct Use. Icons indicate precautions, additional information, or reference information.
- Manual name:** NJ-series CPU Unit Hardware User's Manual (W500)
- Page tab:** 4. Gives the number of the main section.

The diagram also shows a vertical page tab on the right side of the page, labeled "4-3 Mounting Units" and "4-3-1 Connecting Controller Components".

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.



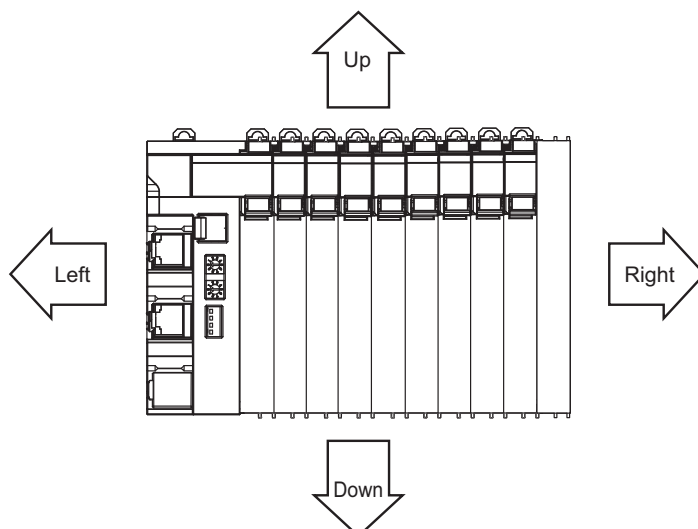
### Version Information

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.



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# 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 Digital I/O 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.

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

## 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

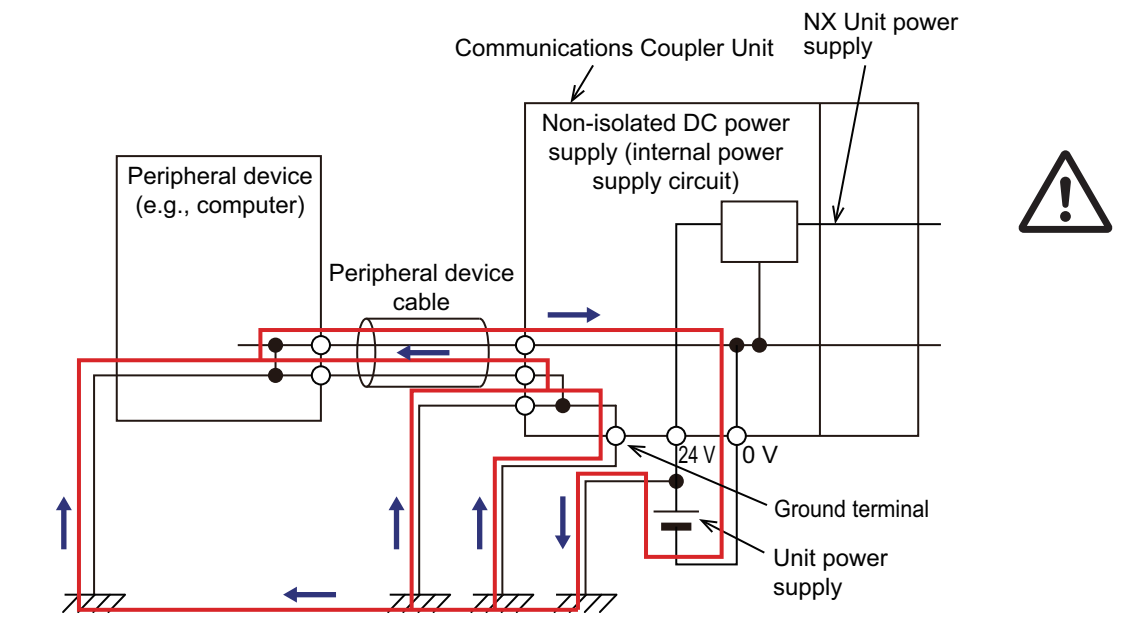
### Caution

## 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.



## 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

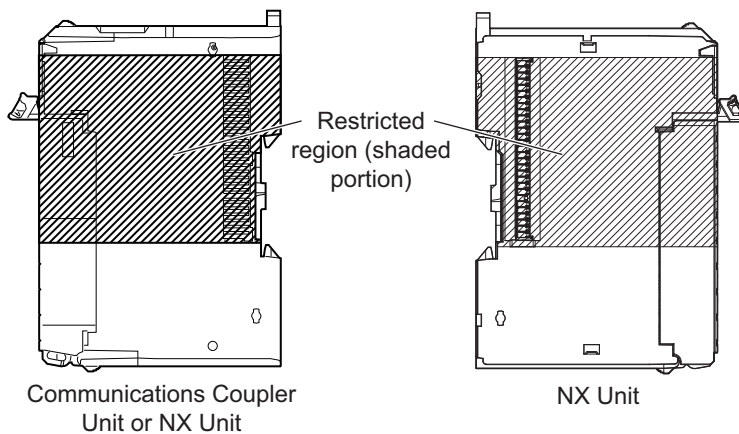
- When transporting any Unit, use the special packing box for it. Also, do not subject the Unit to excessive vibration or shock during transportation.
- Do not drop any Unit or subject it to abnormal vibration or shock. Doing so may result in Unit malfunction or burning.

## Mounting

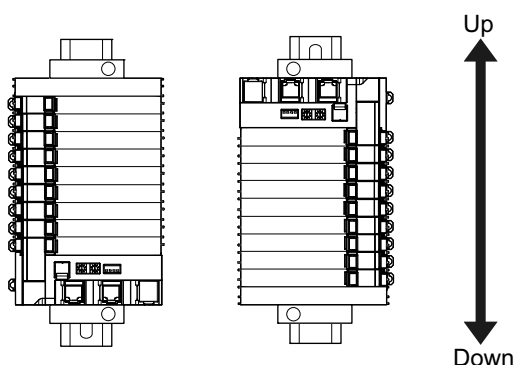
- Mount terminal blocks and connectors only after checking the mounting location carefully.
- Be sure that the terminal blocks, expansion cables, and other items with locking devices are properly locked into place.

## 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 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.



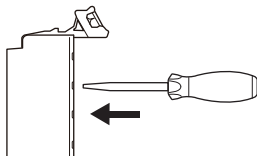
- For the installation orientations in the following figure, support the cables, e.g., with a duct, so that the End Plate on the bottom is not subjected to the weight of the cables. The weight of the cables may cause the bottom End Plate to slide downward so that the Slave Terminal is no longer secured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



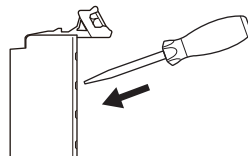
## Wiring

- 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**

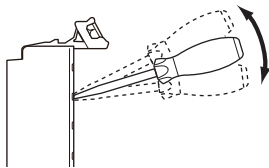


**OK**

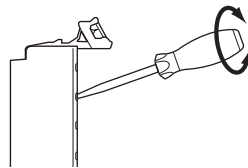


- When you insert a flat-blade screwdriver into a release hole on a screwless clamping terminal block, press it down with a force of 30N or less. Applying excessive force may damage the terminal block.
- Do not incline or twist the flat-blade screwdriver while it is in a release hole on a screwless clamping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

## 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

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- 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 an EtherCAT slave or Special Unit.

## General Communications

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- Do not exceed the ranges that are given in the specifications for the communications distance and number of connected Units.

## EtherCAT Communications

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- Make sure that the communications distance, number of nodes connected, and method of connection for EtherCAT are within specifications. Do not connect EtherCAT Coupler Units to EtherNet/IP, a standard in-house LAN, or other networks. An overload may cause the network to fail or malfunction.
- Malfunctions or unexpected operation may occur for some combinations of EtherCAT revisions of the master and slaves. If you disable the revision check in the network settings, check the slave revision settings in the master and the actual slave revisions, and then make sure that functionality is compatible in the manuals or other references. You can check the slave versions in the settings from the

Sysmac Studio and you can check the actual slave revisions from the Sysmac Studio or on slave nameplates.

- After you transfer the user program, the CPU Unit is restarted and communications with the EtherCAT slaves are cut off. During that period, the slave outputs behave according to the slave settings. The time that communications are cut off depends on the EtherCAT network configuration. Before you transfer the user program, confirm that the system will not be adversely affected.
- EtherCAT communications are not always established immediately after the power supply is turned ON. Use the system-defined variables in the user program to confirm that communications are established before attempting control operations.
- If frames sent to EtherCAT slaves are lost due to noise or other causes, slave I/O data is not communicated, and the intended operation is sometimes not achieved. Perform the following processing if noise countermeasures are necessary.

Program the *\_EC\_InDataInvalid* (Input Data Disable) system-defined variable as an interlock condition in the user program.

Set the *PDO communications consecutive timeout detection count* setting in the EtherCAT master to at least 2.

Refer to the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) for details.

- When an EtherCAT slave is disconnected, communications will stop and control of the outputs will be lost not only for the disconnected slave, but for all slaves connected after it. Confirm that the system will not be adversely affected before you disconnect a slave.
- If you disconnect the cable from an EtherCAT slave to disconnect it from the network, any current communications frames may be lost. If frames are lost, slave I/O data is not communicated, and the intended operation is sometimes not achieved. Perform the following processing for a slave that needs to be replaced.

Program the *\_EC\_InDataInvalid* (Input Data Disable) system-defined variable as an interlock condition in the user program.

Set the *PDO communications consecutive timeout detection count* setting in the EtherCAT master to at least 2.

Refer to the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) for details.

## Unit Replacement

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- 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

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

# Precautions for Correct Use

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## Storage, Mounting, and Wiring

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- Follow the instructions in this manual to correctly perform installation.
- 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.
- Use the EtherCAT connection methods and applicable cables that are specified in this manual and in the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505). Otherwise, communications may be faulty.

## Actual Operation

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- If you change the event level of an error, the output status when the error occurs may also change. Confirm safety before you change an event level.

## Turning OFF the Power Supply

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- 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.

## EtherCAT Communications

---

- Do not disconnect the EtherCAT communications cables during operation. The outputs will become unstable. However, for the built-in EtherCAT port on the NJ-series CPU Unit, it is OK to disconnect the communications cable from an EtherCAT Slave Terminal that has been disconnected from communications in the software.

# Regulations and Standards

## Conformance to EC 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 EC Directives

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

- The NX-series Units must be installed within a control panel.
- You must use reinforced insulation or double insulation 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 EC 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 EC 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

- **Usage Conditions for Locations Other Than the Bridge or Decks**
  - The EtherCAT Coupler Unit 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.
- **Usage Conditions for the Bridge (Certified only by Nippon Kaiji Kyokai (Class NK))**
  - The EtherCAT Coupler Unit 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/](http://www.fa.omron.co.jp/nj_info_e/).

# Unit Versions

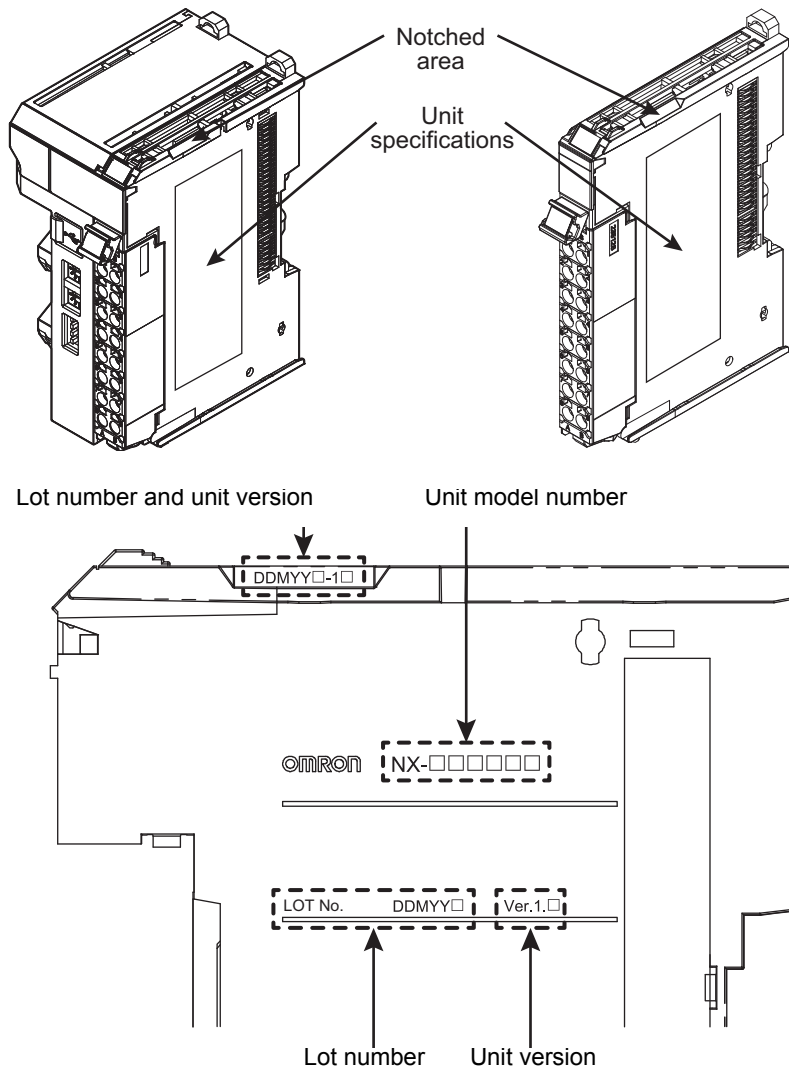
This section describes the notation that is used for unit versions, the confirmation method for unit versions, and the relationship between unit versions and Sysmac Studio versions.

## 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. DDMY□: 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	<p>Gives the lot number and unit version of the Unit.</p> <ul style="list-style-type: none"> <li>DDMY□□: Lot number, □□: Used by OMRON. “M” gives the month (1 to 9: January to September, X: October, Y: November, Z: December)</li> <li>1□□: Unit version The decimal portion of the unit version is omitted. (It is provided in the Unit specifications.)</li> </ul>

## Confirming Unit Versions with the Sysmac Studio

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

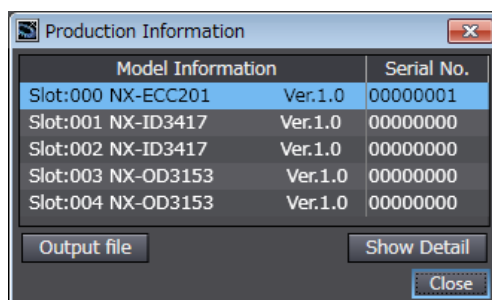
You can also display the Edit Slave Terminal Configuration Tab Page with any of the following operations.

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**.

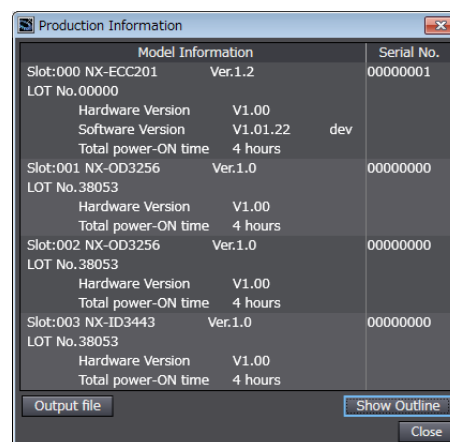
Or, select the EtherCAT Coupler Unit on the EtherCAT Configuration Edit Tab Page click the **Edit Slave Terminal Configuration** Button.

- 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

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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 of the Communications Coupler Unit for the versions that support monitoring the total power-ON time.

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## 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-7 Version Information* on page A-105 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 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.
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 <i>NX-series Safety Control Unit User's Manual</i> (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-series Troubleshooting Manual	W503	NJ501-□□□□ NJ301-□□□□	Learning about the errors that may be detected in an NJ-series Controller.	Concepts on managing errors that may be detected in an NJ-series Controller and information on individual errors are described. Use this manual together with the <i>NJ-series CPU Unit Hardware User's Manual</i> (Cat. No. W500) and <i>NJ-series CPU Unit Software User's Manual</i> (Cat. No. W501).

Manual name	Cat. No.	Model numbers	Application	Description
NX-series EtherCAT® Coupler Unit User's Manual	W519	NX-ECC201 NX-ECC202	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.
NJ-series CPU Unit Hardware User's Manual	W500	NJ501-□□□□ NJ301-□□□□	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. <ul style="list-style-type: none"> <li>• Features and system configuration</li> <li>• Overview</li> <li>• Part names and functions</li> <li>• General specifications</li> <li>• Installation and wiring</li> <li>• Maintenance and Inspection</li> </ul> Use this manual together with the <i>NJ-series CPU Unit Software User's Manual</i> (Cat. No. W501).
NJ-series CPU Unit Software User's Manual	W501	NJ501-□□□□ NJ301-□□□□	Learning how to program and set up an NJ-series CPU Unit.  Mainly software information is provided.	The following information is provided on an NJ-series CPU Unit. <ul style="list-style-type: none"> <li>• CPU Unit operation</li> <li>• CPU Unit features</li> <li>• Initial settings</li> <li>• Programming based on IEC 61131-3 language specifications</li> </ul> Use this manual together with the <i>NJ-series CPU Unit Hardware User's Manual</i> (Cat. No. W500).
NJ-series CPU Unit Built-in EtherCAT® Port User's Manual	W505	NJ501-□□□□ NJ301-□□□□	Using the built-in EtherCAT port on an NJ-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 <i>NJ-series CPU Unit Hardware User's Manual</i> (Cat. No. W500) and <i>NJ-series CPU Unit Software User's Manual</i> (Cat. No. W501).
NJ-series CPU Unit Motion Control User's Manual	W507	NJ501-□□□□ NJ301-□□□□	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 <i>NJ-series CPU Unit Hardware User's Manual</i> (Cat. No. W500) and <i>NJ-series CPU Unit Software User's Manual</i> (Cat. No. W501).

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

# Terminology

Term	Abbreviation	Description
application layer status, AL status	---	Status for indicating information on errors that occur in an application on a slave.
CAN application protocol over EtherCAT	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-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-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 technology 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 predetermined 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, communication 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.
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.

Term	Abbreviation	Description
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

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

<b>Cat. No.</b>	<b>W521-E1-04</b>
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↑  
Revision code

Revision code	Date	Revised content
01	April 2013	Original production
02	June 2013	Added time stamp refreshing, models on time stamp refreshing and corrected mistakes.
03	September 2013	Added information on the NX-IA3117/OC2733 and corrected mistakes.
04	July 2014	Added information on NX-ID5142-5/ID6142-5/OD5121-5/OD5256-5/OD6121-5/OD6256-5/MD6121-5/MD6256-5 and corrected mistakes.



# Sections in this Manual

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<b>2</b>	Specifications	<b>A</b>	Appendices	<b>2</b>	<b>A</b>
<b>3</b>	Part Names and Functions	<b>I</b>	Index	<b>3</b>	<b>I</b>
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# 1

# Features and System Configuration

This section describes NX system configuration and the types of Digital I/O Units.

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# 1-1 Features and Types of Digital I/O Units

This section describes features and types of Digital I/O Units.

## 1-1-1 Digital I/O Unit Features

The Digital I/O Units are NX Units to process inputs and outputs of digital signals (ON/OFF signals). The NX-series Digital I/O Units have the following features.

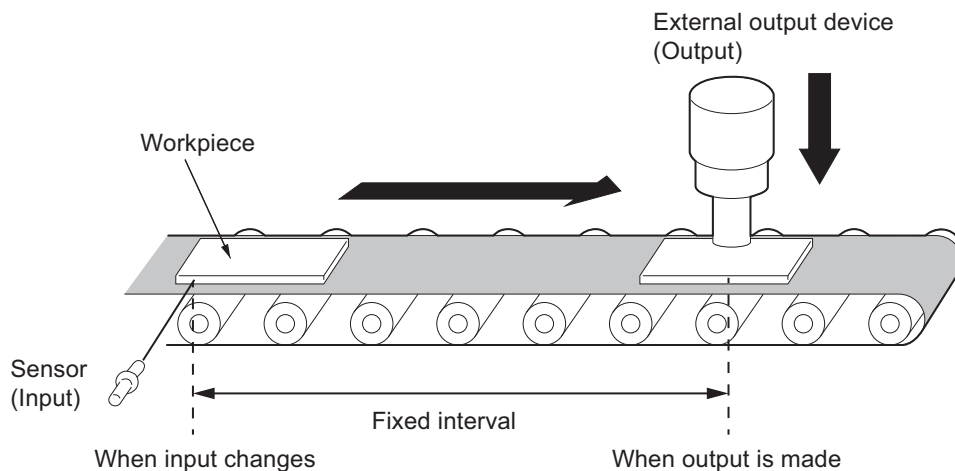
### Synchronous I/O with Refresh Cycle of the NX Bus

When the EtherCAT Coupler Unit is used together with NX Units that support synchronous I/O refreshing, the I/O control of multiple NX Units can be synchronized at the time to synchronize with the refresh cycle of the NX bus.

This provides an accurate I/O control because it suppresses jitter in the I/O timing of multiple NX Units.

### Controlling Outputs at Fixed Intervals After Inputs Change

You can use EtherCAT Coupler Units with NX Units that support input refreshing with input changed time and with other NX Units that support output refreshing with specified time stamp to control the outputs at fixed intervals after the sensor inputs change.



### Simple I/O Wiring with a Screwless Clamping Terminal Block

The terminal block is a screwless clamping terminal block.

You can connect the wires simply by pushing the ferrules into the terminals. The amount of wiring work is reduced without requiring the use of screws.

## 1-1-2 Digital I/O Unit Types

The types of Digital I/O Units are as follows.

Type	Purpose
Digital Input Units	These are Units with functionality to process input of digital signals from sensors and other connected external devices.
Digital Output Units	These are Units with functionality to process output of digital signals to relays and other connected external devices.
Digital Mixed I/O Units	These are Units with functionality to process input of digital signals from connected external devices as well as functionality to process output of digital signals to connected external devices.

Refer to *1-3 Model List* on page 1-6 for details on Digital I/O Unit models and *1-4 List of Functions* on page 1-14 for details on their functions.

# 1-2 System Configuration of Slave Terminals

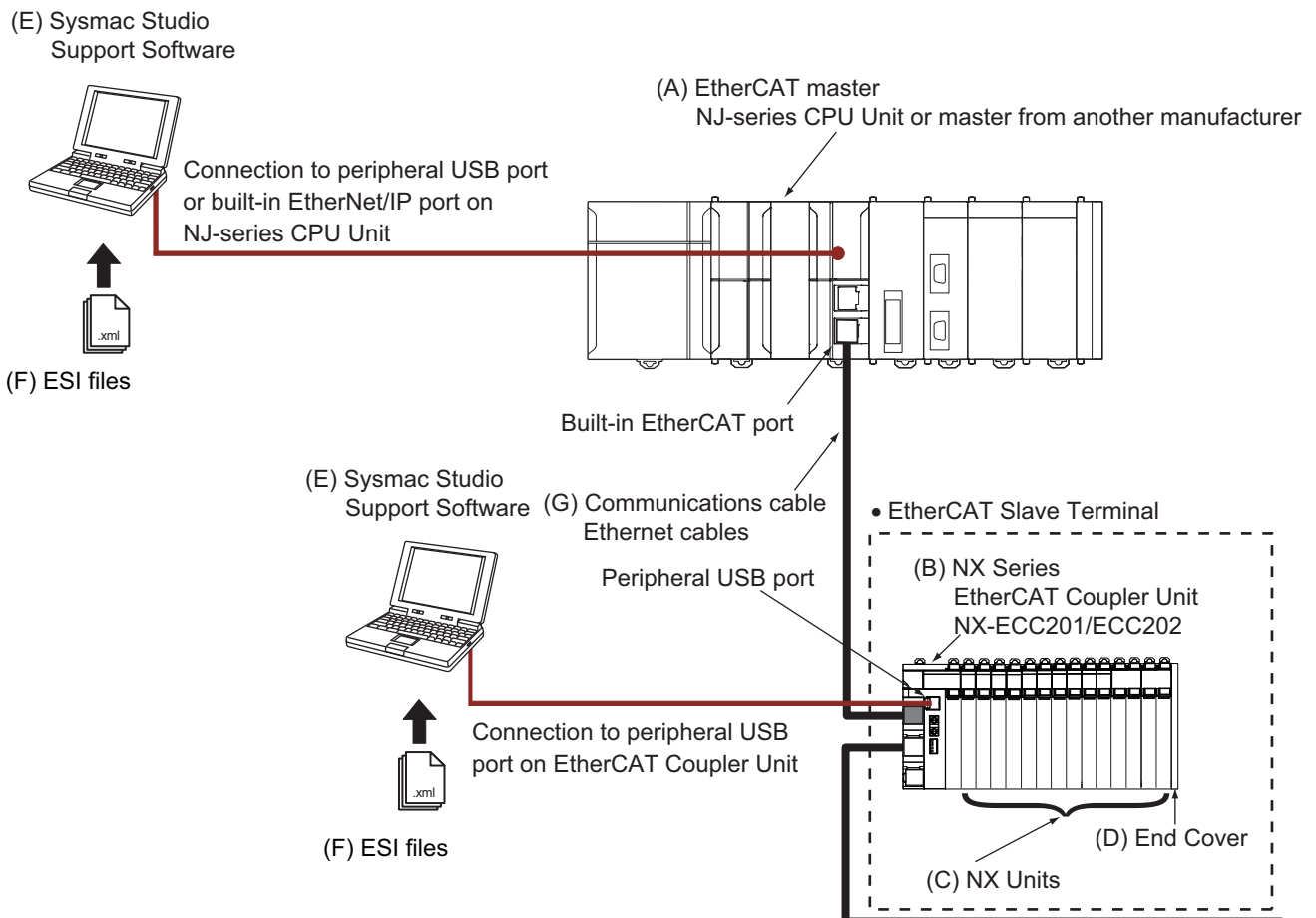
## 1-2-1 Overview

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.



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	<p>The EtherCAT Coupler Unit serves as an interface for process data communications on the EtherCAT network between the NX Units and the EtherCAT master.</p> <p>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.</p> <p>The EtherCAT Coupler Unit can also perform message communications (SDO communications) with the EtherCAT master.</p>
(C)	NX Units	<p>The NX Units perform I/O processing with connected external devices.</p> <p>The NX Units perform process data communications with the EtherCAT master through the EtherCAT Coupler Unit.</p>
(D)	End Cover	The End Cover is attached to the end of the Slave Terminal.
(E)	Sysmac Studio Support Software	<p>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.</p> <p>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-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.</p>
(F)	ESI (EtherCAT Slave Information) file	<p>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.</p> <p>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.</p>
(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 Digital I/O Unit models are assigned based on the following rules.



Unit type \_\_\_\_\_  
 ID : DC input  
 IA : AC input  
 OD : Transistor output  
 OC : Relay output  
 MD : DC input/Transistor output

Number of points \_\_\_\_\_  
 2 : 2 points  
 3 : 4 points  
 4 : 8 points  
 5 : 16 points  
 6 : 32 points, or 16 points each for inputs and outputs

I/O type \_\_\_\_\_

Number	Inputs	Outputs	Mixed I/O (Input, Output)
1	For both NPN/PNP	NPN	For both NPN/PNP, NPN
2	–	PNP	For both NPN/PNP, PNP
3	NPN	–	–
4	PNP	–	–
6	–	N.O.	–
7	–	N.O. + N.C.	–

Other specifications \_\_\_\_\_  
 Refer to *Other specifications* on the next page.

External connection terminals \_\_\_\_\_

Number	External connection terminals
None	Screwless clamping terminal block
-5	MIL connector



## Other Specifications

### ● Digital Input Units

Number	Input voltage	ON/OFF response time		I/O refreshing method	
		Exceeds 1 $\mu$ s	1 $\mu$ s max.	Free-Run refreshing <sup>*1</sup> only or Switching Synchronous I/O refreshing <sup>*2</sup> and Free-Run refreshing	Input refreshing with input changed time only
17	12 to 24 VDC or 240 VAC	Yes	–	Yes	–
42	24 VDC	Yes	–	Yes	–
43		–	Yes	Yes	–
44		–	Yes	–	Yes

\*1. Free-Run refreshing

\*2. Synchronous I/O refreshing

### ● Digital Output Units

Number	Rated voltage	Load current	ON/OFF response time		I/O refreshing method		Other functions
			Exceeds 1 $\mu$ s	1 $\mu$ s max.	Free-Run refreshing <sup>*1</sup> only or Switching Synchronous I/O refreshing <sup>*2</sup> and Free-Run refreshing	Output refreshing with specified time stamp only	Load short-circuit protection
21	12 to 24 VDC or 240 VAC	0.5 A	Yes	–	Yes	–	–
33		2 A	Yes	–	Yes	–	–
53	24 VDC	0.5 A	–	Yes	Yes	–	–
54			–	Yes	–	Yes	–
56			Yes	–	Yes	–	Yes
57			–	Yes	Yes	–	Yes
58			–	Yes	–	Yes	Yes

\*1. Free-Run refreshing

\*2. Synchronous I/O refreshing

### ● Digital Mixed I/O Units

Number	Input section		Output section				
	Rated input voltage	Rated voltage	Load current	ON/OFF response time		I/O refreshing method	Other functions
				Exceeds 1 $\mu$ s	1 $\mu$ s max.		Load short-circuit protection
21	24 VDC	12 to 24 VDC	0.5 A	Yes	–	Switching Synchronous I/O refreshing and Free-Run refreshing	Yes
56		24 VDC		Yes	–		–

Refer to *Section 5 I/O Refreshing* for details on the I/O refreshing method.

## 1-3-2 Digital Input Units

This section shows the specifications for Digital Input Units.

Refer to *A-1-2 Digital Input Units* on page A-5 for details on the specifications of individual Digital Input Units.

### DC Input Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-ID3317	4 points	NPN	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 $\mu$ s max./400 $\mu$ s max.	P. A-7
NX-ID3343			24 VDC		Input refreshing with input changed time only	100 ns max./100 ns max.
NX-ID3344				P. A-9		
NX-ID3417		PNP	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 $\mu$ s max./400 $\mu$ s max.	P. A-10
NX-ID3443			24 VDC		Input refreshing with input changed time only	100 ns max./100 ns max.
NX-ID3444				P. A-12		
NX-ID4342	8 points	NPN	24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 $\mu$ s max./400 $\mu$ s max.	P. A-13
NX-ID4442		PNP				P. A-14
NX-ID5342	16 points	NPN	24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 $\mu$ s max./400 $\mu$ s max.	P. A-15
NX-ID5442		PNP				P. A-16

### DC Input Units (MIL Connector, 30 mm Width)

Model	Number of points	Internal I/O common	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-ID5142-5	16 points	For both NPN/PNP	24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 $\mu$ s max./400 $\mu$ s max.	P. A-17
NX-ID6142-5	32 points	For both NPN/PNP	24 VDC			P. A-19

**AC Input Units (Screwless Clamping Terminal Block, 12 mm Width)**

Model	Number of points	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-IA3117	4 points	200 to 240 VAC, 50/60 Hz (170 to 264 VAC, $\pm 3$ Hz)	Free-Run refreshing	10 ms max./40 ms max.	P. A-22

### 1-3-3 Digital Output Units

This section shows the specifications for Digital Output Units.

Refer to *A-1-3 Digital Output Units* on page A-24 for details on the specifications of individual Digital Output Units.

#### Transistor Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-OD2154	2 points	NPN	0.5 A/point, 1 A/Unit	24 VDC	Output refreshing with specified time stamp only	300 ns max./300 ns max.	P. A-26
NX-OD2258		PNP					P. A-28
NX-OD3121	4 points	NPN	0.5 A/point, 2 A/Unit	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	0.1 ms max./0.8 ms max.	P. A-29
NX-OD3153						300 ns max./300 ns max.	P. A-30
NX-OD3256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-31
NX-OD3257						300 ns max./300 ns max.	P. A-32
NX-OD4121	8 points	NPN	0.5 A/point, 4 A/Unit	12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-34
NX-OD4256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-35
NX-OD5121	16 points	NPN		12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-36
NX-OD5256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-37

## Transistor Output Units (MIL Connector, 30 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-OD5121-5	16 points	NPN	0.5 A/point, 2 A/Unit	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	0.1 ms max./0.8 ms max.	P. A-38
NX-OD5256-5		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-40
NX-OD6121-5	32 points	NPN	0.5 A/point, 2 A/common, 4 A/Unit	12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-41
NX-OD6256-5		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-43

## Relay Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Relay type	Maximum switching capacity	I/O refreshing method	ON/OFF response time	Reference
NX-OC2633	2 points	N.O.	250 VAC/2 A ( $\cos\Phi = 1$ ), 250 VAC/2 A ( $\cos\Phi = 0.4$ ), 24 VDC/2 A, 4 A/Unit	Free-Run refreshing	15 ms max./15 ms max.	P. A-45
NX-OC2733		N.O. + N.C.				P. A-47

### 1-3-4 Digital Mixed I/O Units

This section shows the specifications for Digital Mixed I/O Units.

Refer to *A-1-4 Digital Mixed I/O Units* on page A-49 for details on the specifications of individual Mixed I/O Units.

#### DC Input/Transistor Output Units (MIL Connector, 30 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-MD6121-5	Outputs: 16 points	Outputs: NPN Inputs: For both NPN/PNP	0.5 A/point, 2 A/Unit	Outputs: 12 to 24 VDC Inputs: 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	Outputs: 0.1 ms max./0.8 ms max. Inputs: 20 $\mu$ s max./400 $\mu$ s max.	P. A-51
NX-MD6256-5	Inputs: 16 points	Outputs: PNP Inputs: For both NPN/PNP		Outputs: 24 VDC Inputs: 24 VDC		Outputs: 0.5 ms max./1.0 ms max. Inputs: 20 $\mu$ s max./400 $\mu$ s max.	P. A-55

## 1-4 List of Functions

This section provides an overview of functions that the Digital I/O Units have.

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

### 1-4-1 Digital Input Units

Function name	Description	Reference
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.	<i>5-2-4 Free-Run Refreshing</i> on page 5-5
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	<i>5-2-5 Synchronous Input Refreshing</i> on page 5-9
Time Stamp Refreshing	With this I/O refreshing method, the NX Units record the DC times when inputs change or perform outputs at specified DC times. These times are asynchronous to the NX bus refresh cycles.  Data exchange between the NX Units and EtherCAT Coupler Unit are performed cyclically on the NX bus refresh cycles.	<i>5-2-7 Time Stamp Refreshing</i> on page 5-18
Input refreshing with input changed time	With this I/O refreshing method, the Input Units record the DC times when inputs changed.	<i>5-2-8 Input Refreshing with Input Changed Time</i> on page 5-19
Input Filter	This function eliminates the chattering or the noises from input signals.  It is used to prevent the error reading due to the noises. You can set the filter time constant.	<i>6-4-2 Input Filter</i> on page 6-14



## 1-4-2 Digital Output Units

Function name	Description	Reference
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.	5-2-4 <i>Free-Run Refreshing</i> on page 5-5
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	5-2-6 <i>Synchronous Output Refreshing</i> on page 5-13
Time Stamp Refreshing	With this I/O refreshing method, the NX Units record the DC times when inputs change or perform outputs at specified DC times. These times are asynchronous to the NX bus refresh cycles. Data exchange between the NX Units and EtherCAT Coupler Unit are performed cyclically on the NX bus refresh cycles.	5-2-7 <i>Time Stamp Refreshing</i> on page 5-18
Output refreshing with specified time stamp	With this I/O refreshing method, the Output Units refresh outputs at specified DC times.	5-2-9 <i>Output Refreshing with Specified Time Stamp</i> on page 5-24
Load Rejection Output Setting	A function that performs the preset output operation when the Digital Output Unit cannot receive output data due to a host error on the Communications Coupler Unit or an error on the NX bus.	7-4-2 <i>Load Rejection Output Setting</i> on page 7-12
Load Short-circuit Protection	A function in which the output will turn OFF to protect the output circuit when an overload or load short-circuit occurs due to a failure of the connected external devices.	7-4-3 <i>Load Short-circuit Protection</i> on page 7-18

### 1-4-3 Digital Mixed I/O Units

Function name	Description	Reference
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.	<i>5-2-4 Free-Run Refreshing</i> on page 5-5
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	<i>5-2-5 Synchronous Input Refreshing</i> on page 5-9
Input Filter	This function eliminates the chattering or the noises from input signals. It is used to prevent the error reading due to the noises. You can set the filter time constant.	<i>6-4-2 Input Filter</i> on page 6-14
Load Rejection Output Setting	A function that performs the preset output operation when the Digital Output Unit cannot receive output data due to a host error on the Communications Coupler Unit or an error on the NX bus.	<i>7-4-2 Load Rejection Output Setting</i> on page 7-12
Load Short-circuit Protection	A function in which the output will turn OFF to protect the output circuit when an overload or load short-circuit occurs due to a failure of the connected external devices.	<i>7-4-3 Load Short-circuit Protection</i> on page 7-18

## 1-5 Support Software

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Refer to *A-7 Version Information* on page A-105 for information on the Support Software that can perform the settings of the Slave Terminal.



# 2

## Specifications

This section describes the general specifications and individual specifications of Digital I/O Units.

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<b>2-1</b>	<b>General Specifications</b>	<b>2-2</b>
<b>2-2</b>	<b>Individual Specifications</b>	<b>2-3</b>

## 2-1 General Specifications

General specifications of Digital I/O Units 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 <sup>*1</sup>	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 <sup>2</sup> 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)
	Shock resistance <sup>*1</sup>	Conforms to IEC 60068-2-27, 147 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
	Insulation resistance	*2
Dielectric strength	*2	
Applicable standards <sup>*3</sup>		cULus: Listed (UL508), ANSI/ISA 12.12.01, EC: EN 61131-2, C-Tick, KC: KC Registration, NK, LR

\*1. Relay Output Unit specifications depend on the model. Refer to *A-1 Data Sheet* on page A-2 for details.

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

\*3. Refer to the OMRON website ([www.ia.omron.com](http://www.ia.omron.com)) or ask your OMRON representative for the most recent applicable standards for each model.

## 2-2 Individual Specifications

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Refer to *A-1 Data Sheet* on page A-2 for the specifications of individual Digital I/O Units.





# 3

## Part Names and Functions

This section describes the names and functions of the Digital I/O Unit parts.

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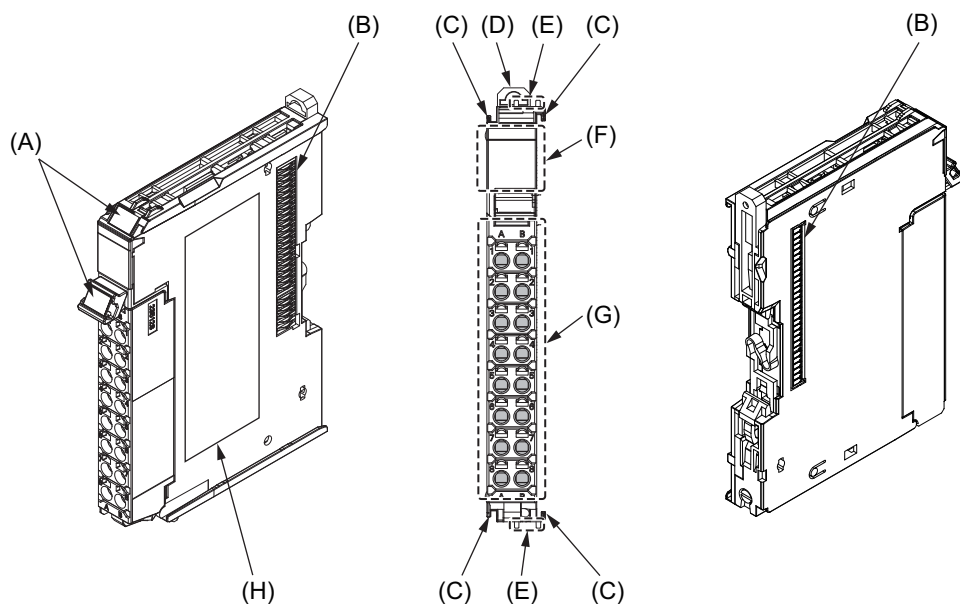
<b>3-1 Part Names</b> .....	<b>3-2</b>
3-1-1 Screwless Clamping Terminal Block Type .....	3-2
3-1-2 Connector Types .....	3-6
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3-2-2 IN/OUT Indicator .....	3-12

## 3-1 Part Names

This section describes the names and functions of the Digital I/O Unit parts.

### 3-1-1 Screwless Clamping Terminal Block Type

#### NX Units (12 mm Width)

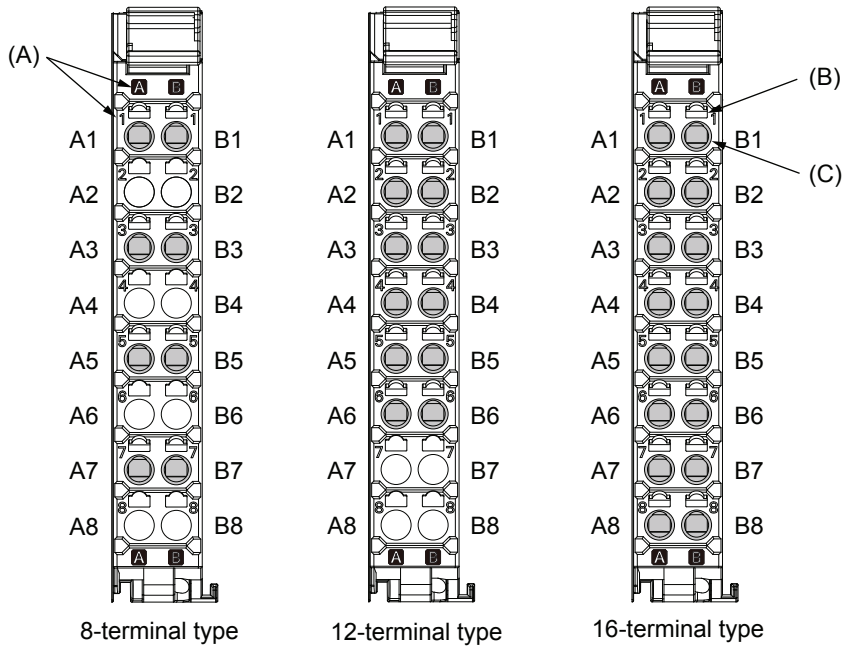


Letter	Name	Function
(A)	Marker attachment locations	The locations where markers are attached. The markers made by OMRON are installed for the factory setting. Commercially available markers can also be installed. Refer to 4-1-2 <i>Attaching Markers</i> on page 4-4
(B)	NX bus connector	This connector 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 <i>Indicators</i> on page 3-9
(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.

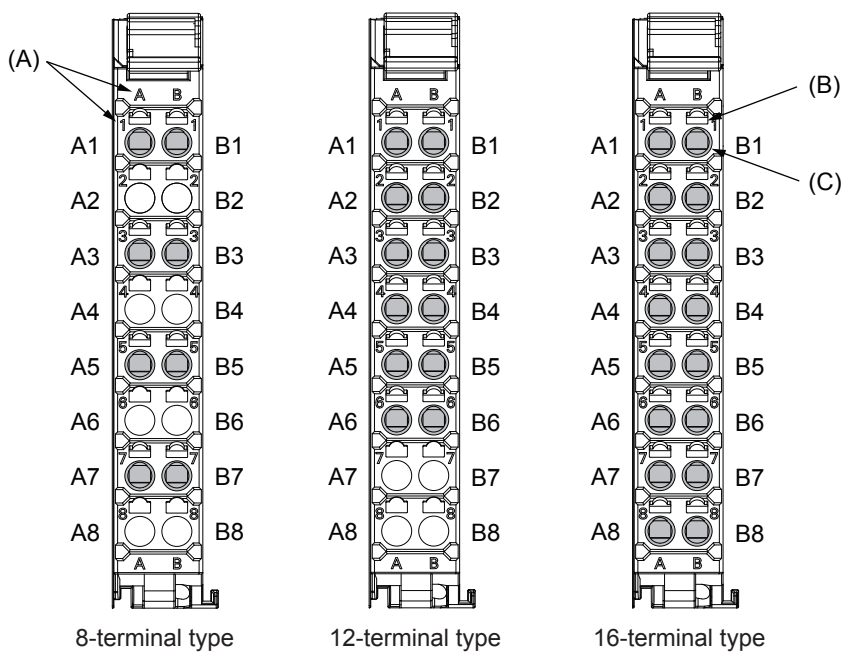
## Terminal Blocks

There are two models of Screwless Clamping Terminal Blocks: NX-TB□□□2 and NX-TB□□□1. Each model has three types of terminal blocks: 8-terminal type, 12-terminal type, and 16-terminal type.

● NX-TB□□□2



● NX-TB□□□1



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.

The NX-TB□□□2 and NX-TB□□□1 Terminal Blocks have different terminal current capacities. The NX-TB□□□2 has 10 A and NX-TB□□□1 has 4 A.

To differentiate between the two models of Terminal Blocks, use the terminal number column indications. The Terminal Block with white letters on a dark background is the NX-TB□□□2.

You can mount either NX-TB□□□1 or NX-TB□□□2 Terminal Blocks to the Units that the current capacity specification of the terminals is 4 A or less.

You can only mount the NX-TB□□□2 Terminal Block to the Units that the current capacity specification of the terminals is greater than 4 A.



#### Additional Information

- Each Digital I/O Unit is compatible with only one of three types of terminal blocks. You cannot use a terminal block with a number of terminals that differs from the specifications for a particular Unit.
- The 8-terminal type and 12-terminal type do not have terminal holes and release holes for following terminal numbers.

8-terminal type: A2, A4, A6, A8, B2, B4, B6, and B8

12-terminal type: A7, A8, B7, and B8

### ● Applicable Terminal Blocks for Each Unit Model

The following indicates the Terminal Blocks that are applicable to each Unit.

Unit model number	Terminal Block			
	Model	Number of terminals	Ground terminal	Current capacity
NX-ID3□□□	NX-TBA121	12	Not provided	4 A
	NX-TBA122			10 A
NX-ID4□□□	NX-TBA161	16		4 A
NX-ID5□□□	NX-TBA162			10 A
NX-IA3117	NX-TBA081	8		4 A
NX-OD2□□□	NX-TBA082			10 A
NX-OD3□□□	NX-TBA121	12		4 A
	NX-TBA122			10 A
NX-OD4□□□	NX-TBA161	16		4 A
NX-OD5□□□	NX-TBA162			10 A
NX-OC2□□□	NX-TBA081	8		4 A
	NX-TBA082			10 A



#### Precautions for Correct Use

You can mount either NX-TB□□□1 or NX-TB□□□2 Terminal Blocks to the Units that the current capacity specification of the terminals is 4 A or less.

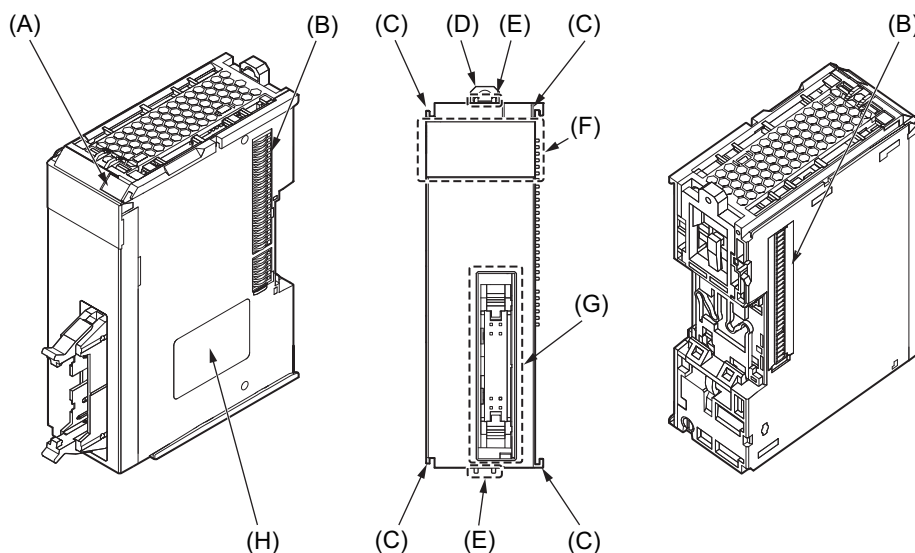
However, even if you mount the NX-TB□□□2 Terminal Block, the current specification does not change because the current capacity specification of the terminals on the Units is 4 A or less.

Refer to *A-6 List of Screwless Clamping Terminal Block Models* on page A-104 for information on the models of Terminal Blocks.

## 3-1-2 Connector Types

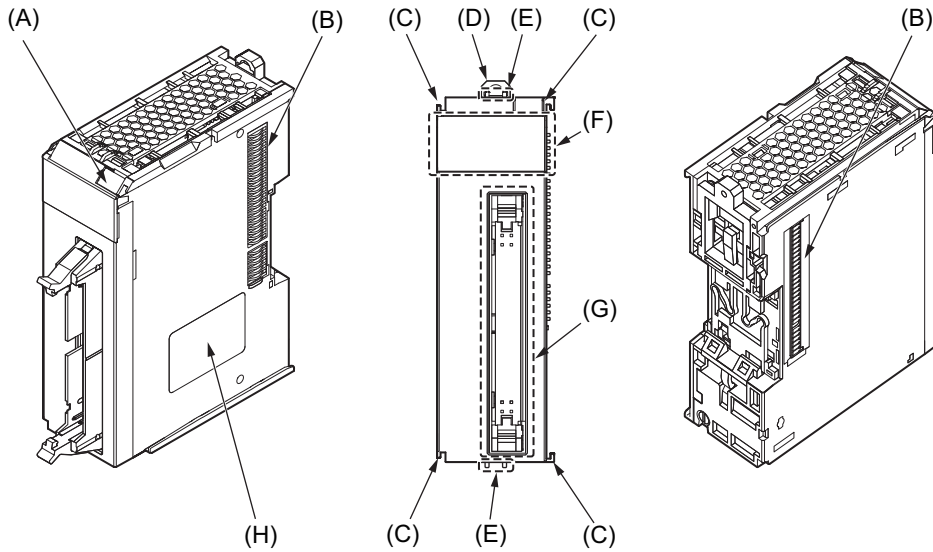
## NX Units (30 mm Width)

## ● Units with MIL Connectors (1 Connector with 20 Terminals)



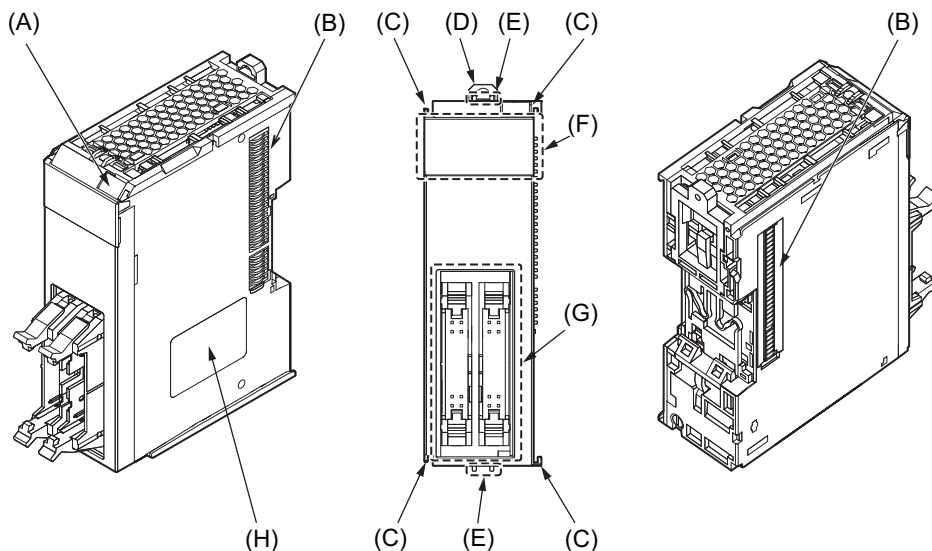
Letter	Name	Function
(A)	Marker attachment location	The locations where markers are attached. The markers made by OMRON are installed for the factory setting. Commercially available markers can also be installed. Refer to 4-1-2 <i>Attaching Markers</i> on page 4-4.
(B)	NX bus connector	This connector 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 <i>Indicators</i> on page 3-9.
(G)	Connectors	The connectors are used to connect to external devices.
(H)	Unit specifications	The specifications of the Unit are given.

● Units with MIL Connectors (1 Connector with 40 Terminals)



Letter	Name	Function
(A)	Marker attachment location	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 <i>Attaching Markers</i> 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 <i>Indicators</i> on page 3-9.
(G)	Connectors	The connectors are used to connect to external devices.
(H)	Unit specifications	The specifications of the Unit are given.

● Units with MIL Connectors (2 Connectors with 20 Terminals)



Letter	Name	Function
(A)	Marker attachment location	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 <i>Attaching Markers</i> 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 <i>Indicators</i> on page 3-9.
(G)	Connectors	The connectors are used to connect to external devices.
(H)	Unit specifications	The specifications of the Unit are given.

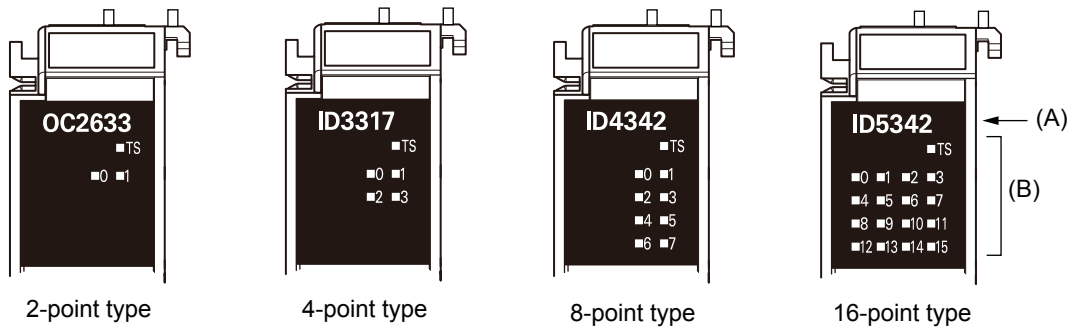


## 3-2 Indicators

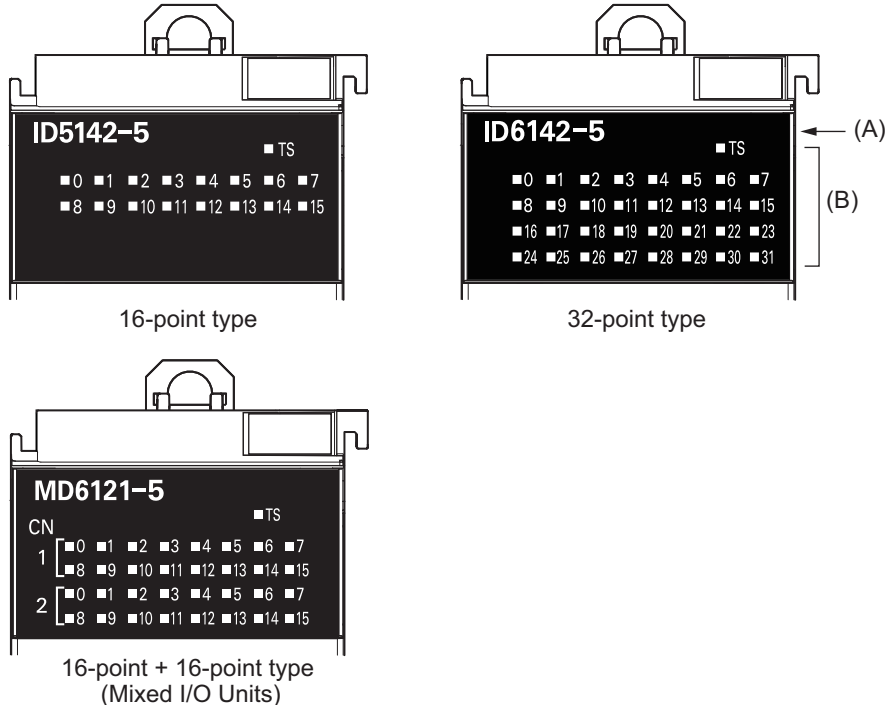
There are the indicators to show the current operating status of the Unit or the signal I/O status on the Digital I/O Units.

The following indicator patterns are available depending on width of the Unit and the number of I/O points.

### ● NX Units (12 mm Width)



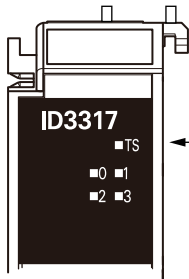
### ● NX Units (30 mm Width)



Let- ter	Name	Function
(A)	Model number indications	<p>The model numbers of the NX Unit are displayed. (Example) "ID3317" in the case of NX-ID3317</p> <p>The NX Units are separated in the following color depending on the type of inputs and outputs.</p> <ul style="list-style-type: none"> <li>• Digital Input Unit: Orange</li> <li>• Digital Output Unit: Yellow</li> <li>• Digital Mixed I/O Unit: White</li> </ul>
(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

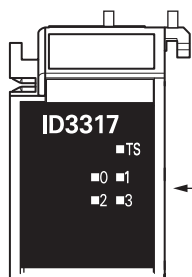


This indicator shows the current status of the Digital I/O Unit and its communications status with the Communications Coupler Unit.

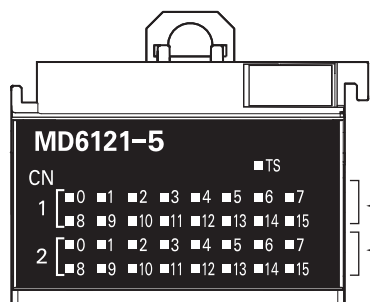
The meanings of light statuses are described as follows:

Color	Status	Description
Green		Lit The Unit is operating normally. The Unit is ready for I/O refreshing.
		Flashing at 2-s intervals. <ul style="list-style-type: none"> <li>Initializing</li> <li>Restarting is in progress for the Unit.</li> <li>Downloading</li> </ul>
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 <ul style="list-style-type: none"> <li>No Unit power supply</li> <li>Restarting is in progress for the Slave Terminal.</li> <li>Waiting for initialization to start</li> </ul>

### 3-2-2 IN/OUT Indicator



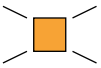

← This indicator shows the signal I/O status of each terminal of the Digital I/O Units.



For Digital Mixed I/O Units, the indicator shows as follows.

← OUT indicator

← IN indicator

Color	Status	Description
Yellow	 Lit	Digital I/O is ON
-	 Not lit	Digital I/O is OFF

# 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

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## 4-1 Installing NX Units

This section describes how to install NX Units.

Refer to the user's manual of 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.

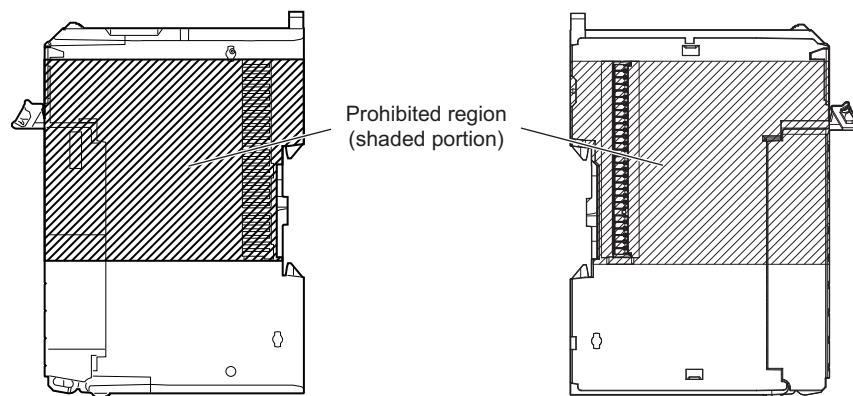
Always turn OFF the power supply before you mount NX Units.

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 Correct Use

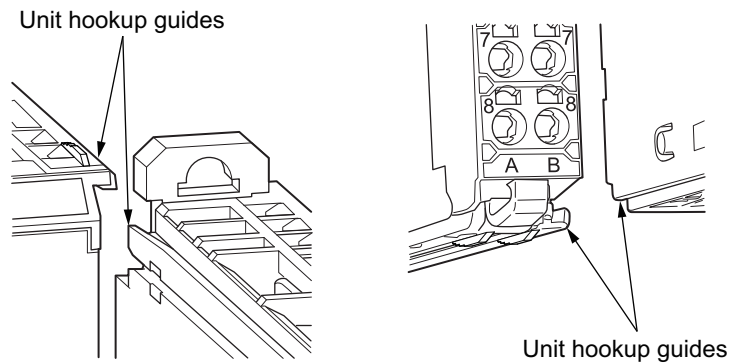
- Do not apply labels or tape on the NX Units. When the Unit is installed or removed, adhesive or scrap may adhere to the pins of the NX bus connector, which may cause malfunctions.
- Do not write with ink or soil within the prohibited region that is shown in the following figure. When the Unit is installed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



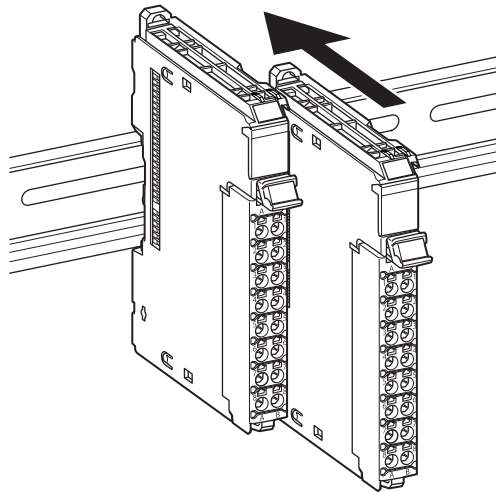
#### Precautions for Correct Use

- 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 of 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.

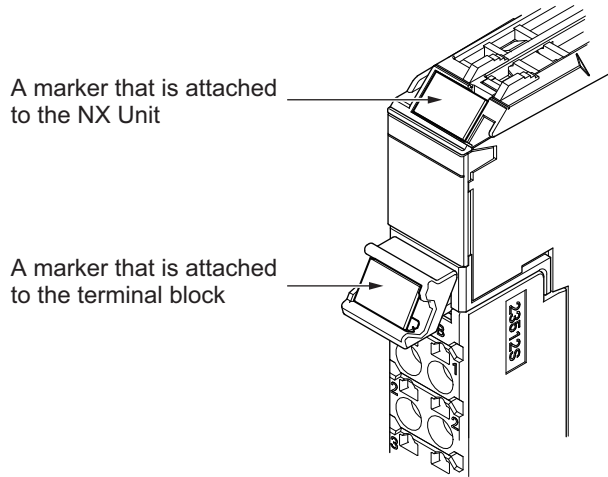
## 4-1-2 Attaching Markers

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.

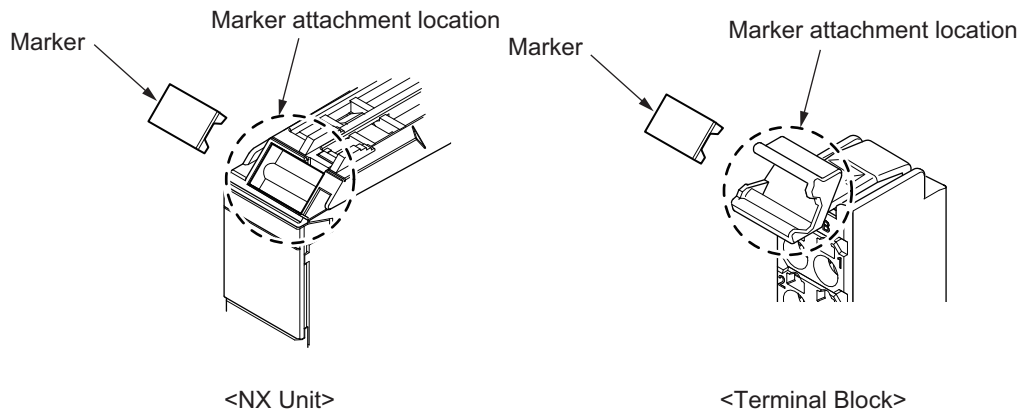


The marker attachment locations vary depending on the type of the external connection terminals on the NX Units.

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

### ● 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.

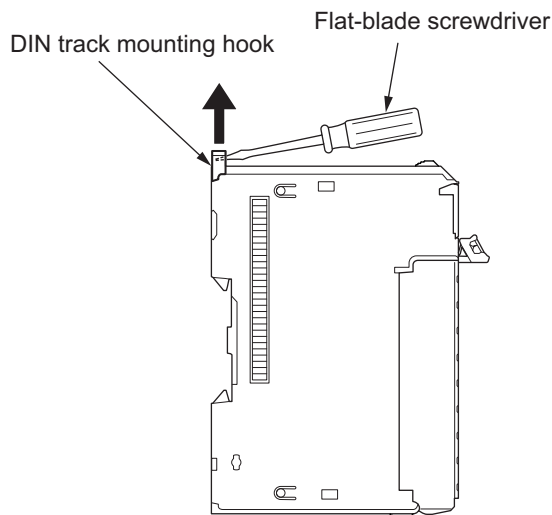
## 4-1-3 Removing NX Units



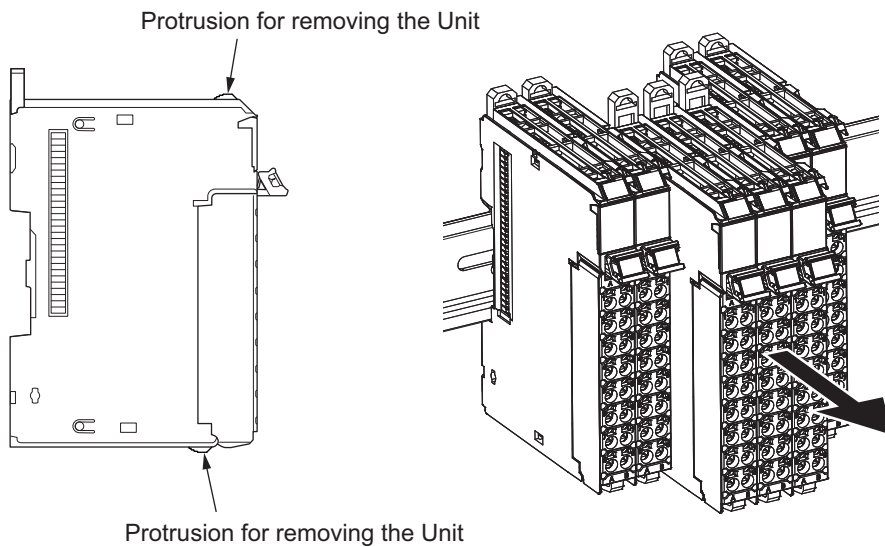
### Precautions for Safe Use

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.



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



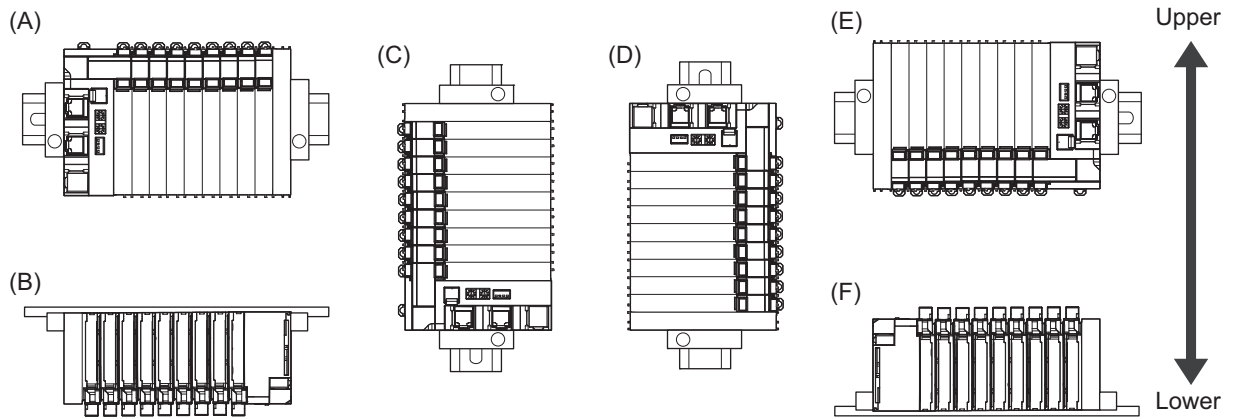
### Precautions for Correct Use

- 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.

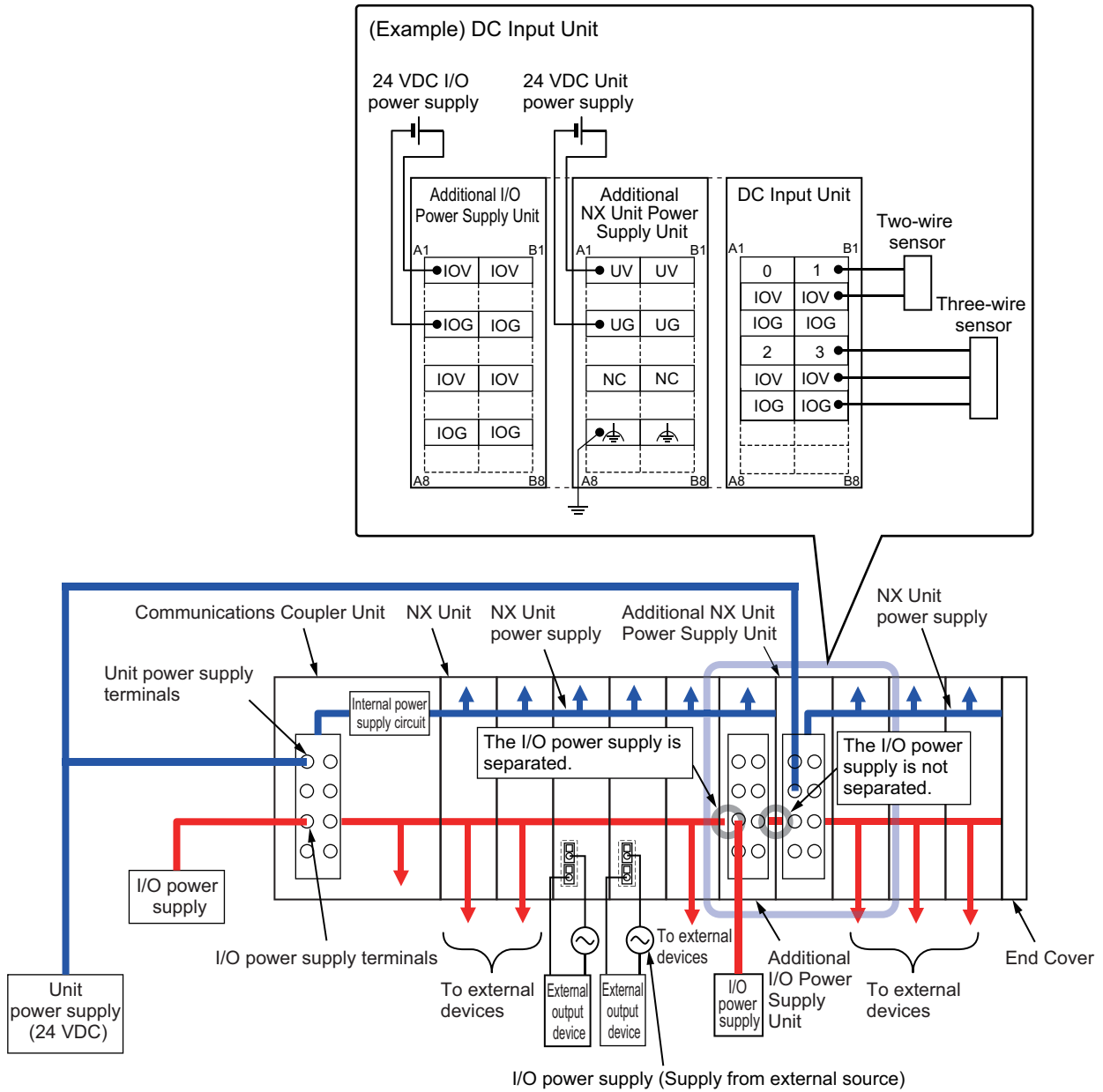
Power supply name	Description
Unit power supply	<p>This is the power supply for generating the NX Unit power supply required for the Slave Terminal to operate.</p> <p>This is connected to the Unit power supply terminal on the Communications Coupler Unit or on the Additional NX Unit Power Supply Unit.</p> <p>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.</p> <p>The internal circuits of the Communications Coupler Unit and NX Units operate by the NX Unit power supply.</p> <p>The NX Unit power supply is supplied to the NX Units in the Slave Terminal through the NX bus connectors.</p>
I/O power supply	<p>This power supply is used for driving the I/O circuits of the NX Units and for the connected external devices.</p> <p>This is connected to the I/O power supply terminal on the Communications Coupler Unit or the Additional I/O Power Supply Unit.</p> <p>The I/O power supply is used for the following applications.</p> <ul style="list-style-type: none"> <li>• I/O circuits operations in the Digital I/O Units</li> <li>• Input current in a Digital Input Unit</li> <li>• Load current of the external load of a Digital Output Unit</li> <li>• Power supply for the connected external devices</li> </ul> <p>The I/O power supply is supplied to the NX Units from the I/O power supply terminals and through the NX bus connectors.</p>

## 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	<p>This power is supplied by one of the following two methods.</p> <p>Refer to <i>A-1 Data Sheet</i> on page A-2 for the supply method of each NX Unit.</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul>

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 total current consumption from I/O power supply of the Digital I/O Units is calculated as follows.

- **Total Current Consumption from I/O Power Supply of the Digital Input Units**

= (Current consumption from I/O power supply of the Digital Input Units) + (Input current of the Digital Input Units × Number of input points used) + (Total current consumption of connected external devices)

- **Total Current Consumption from I/O Power Supply of the Digital Output Units**

= (Current consumption from I/O power supply of the Digital Output Units) + (Total load current of connection load) + (Total current consumption of connected external devices)

Refer to *A-1 Data Sheet* on page A-2 for the current consumption from I/O power supply for each Digital I/O Unit model and input current for each Digital Input Unit model.

There are no above confirmations if you use the NX Unit that supplies the I/O power from external source.

Use the total current consumption from I/O power supply from external source and the total current consumption from the I/O power supply from the above NX bus together to calculate the I/O power supply capacity.

### 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.

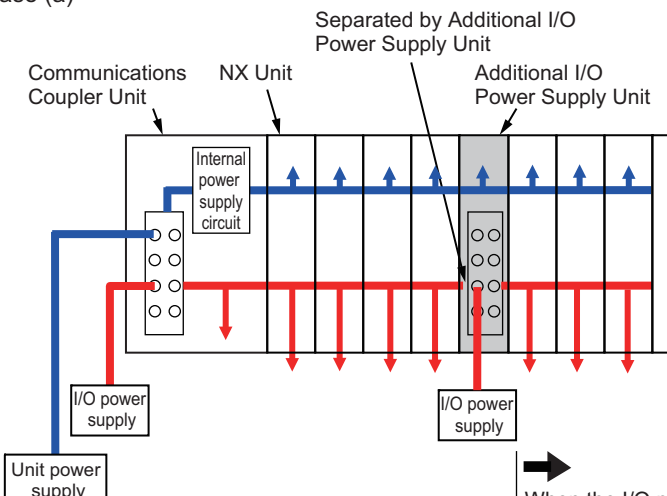
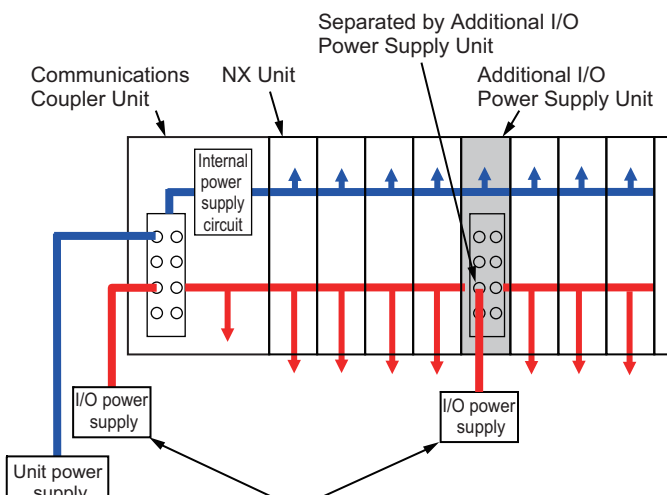
There are the following types of NX-series power supply-related Units other than Communications Coupler Units.

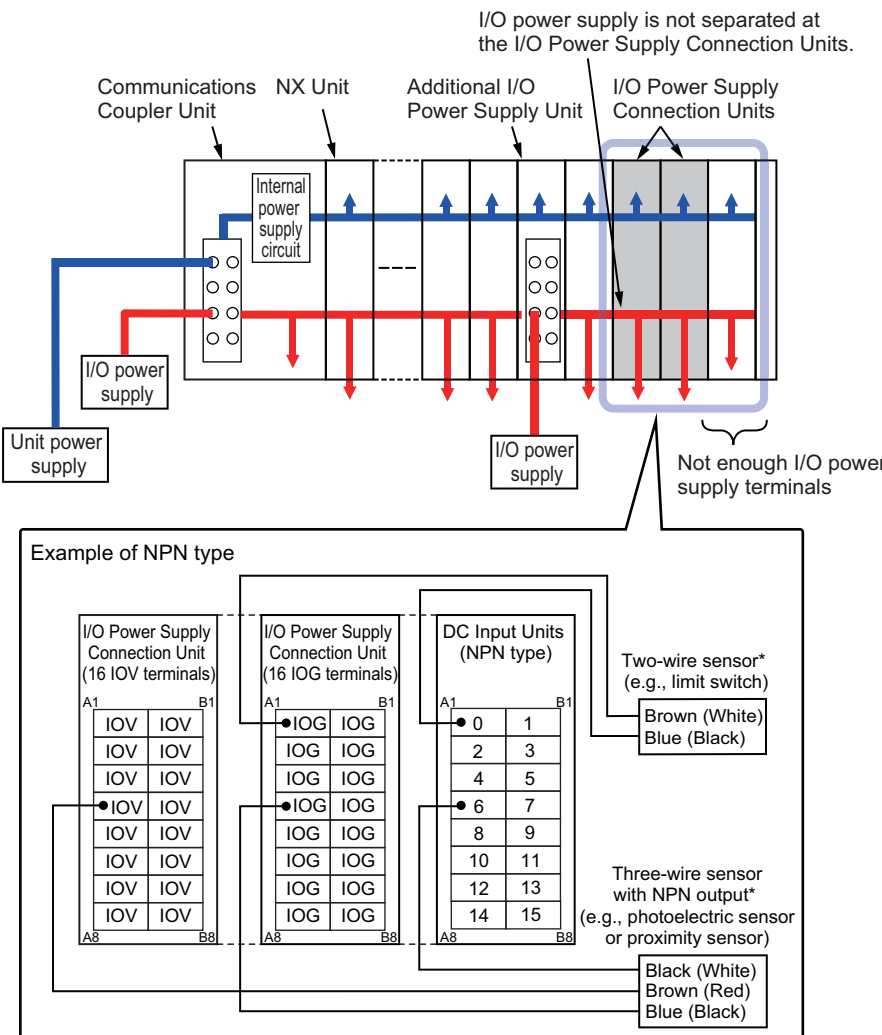
Refer to the *NX-series System Unit User's Manual* (Cat. No. W523) for details on NX-series power supply-related Units.

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

Unit name	Function
<p>Additional NX Unit Power Supply Unit</p>	<p>This NX Unit provides NX Unit power supply.</p> <p>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.</p> <div style="text-align: center;"> <p>The diagram illustrates the power supply configuration. On the left, a Communications Coupler Unit provides power to the first NX Unit. An Additional NX Unit Power Supply Unit is connected to the bus between the coupler and the second NX Unit. This additional unit provides power to the second and third NX Units. The I/O power supply for the additional unit is connected to the first NX Unit. The unit power supply for the additional unit is connected to the second NX Unit. The diagram shows that the total power consumption of the NX Units in the Slave Terminal is within the capacity of the NX Unit power supply.</p> </div> <p>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.</p>





Unit name	Function
<p>Additional I/O Power Supply Unit</p>	<p>This NX Unit provides additional I/O power supply.                      Use this NX Unit in the following cases.</p> <p>(a) When the I/O power supply capacity is insufficient</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• 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</li> </ul> <p>(b) Separating the I/O power supply</p> <ul style="list-style-type: none"> <li>• When connected external devices have different I/O power supply voltages</li> <li>• When separating the power supply systems</li> </ul> <p>Case (a)</p>  <p>Separated by Additional I/O Power Supply Unit</p> <p>When the I/O power supply becomes the following states for the subsequent NX Units.</p> <ul style="list-style-type: none"> <li>- When it exceeds the maximum current of I/O power supply</li> <li>- When it goes below the voltage specifications of the connected external devices</li> </ul> <p>Case (b)</p>  <p>Separated by Additional I/O Power Supply Unit</p> <ul style="list-style-type: none"> <li>- When different I/O power supply voltage are used.</li> <li>- When separating the power supply systems.</li> </ul> <p>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.</p>

Unit name	Function																																																												
<p>I/O Power Supply Connection Unit</p>	<p>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.</p>  <p>I/O power supply is not separated at the I/O Power Supply Connection Units.</p> <p>Communications Coupler Unit, NX Unit, Additional I/O Power Supply Unit, I/O Power Supply Connection Units</p> <p>Internal power supply circuit, I/O power supply, Unit power supply, I/O power supply, Not enough I/O power supply terminals</p> <p><b>Example of NPN type</b></p> <table border="1"> <caption>I/O Power Supply Connection Unit (16 IOV terminals)</caption> <tr><td>A1</td><td>B1</td></tr> <tr><td>IOV</td><td>IOV</td></tr> <tr><td>IOV</td><td>IOV</td></tr> <tr><td>IOV</td><td>IOV</td></tr> <tr><td>• IOV</td><td>IOV</td></tr> <tr><td>IOV</td><td>IOV</td></tr> <tr><td>IOV</td><td>IOV</td></tr> <tr><td>IOV</td><td>IOV</td></tr> <tr><td>IOV</td><td>IOV</td></tr> <tr><td>A8</td><td>B8</td></tr> </table> <table border="1"> <caption>I/O Power Supply Connection Unit (16 IOG terminals)</caption> <tr><td>A1</td><td>B1</td></tr> <tr><td>• IOG</td><td>IOG</td></tr> <tr><td>IOG</td><td>IOG</td></tr> <tr><td>IOG</td><td>IOG</td></tr> <tr><td>• IOG</td><td>IOG</td></tr> <tr><td>IOG</td><td>IOG</td></tr> <tr><td>IOG</td><td>IOG</td></tr> <tr><td>IOG</td><td>IOG</td></tr> <tr><td>IOG</td><td>IOG</td></tr> <tr><td>A8</td><td>B8</td></tr> </table> <table border="1"> <caption>DC Input Units (NPN type)</caption> <tr><td>A1</td><td>B1</td></tr> <tr><td>• 0</td><td>1</td></tr> <tr><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td></tr> <tr><td>• 6</td><td>7</td></tr> <tr><td>8</td><td>9</td></tr> <tr><td>10</td><td>11</td></tr> <tr><td>12</td><td>13</td></tr> <tr><td>14</td><td>15</td></tr> <tr><td>A8</td><td>B8</td></tr> </table> <p>Two-wire sensor* (e.g., limit switch) Brown (White) Blue (Black)</p> <p>Three-wire sensor with NPN output* (e.g., photoelectric sensor or proximity sensor) Black (White) Brown (Red) Blue (Black)</p> <p>* 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.</p>	A1	B1	IOV	IOV	IOV	IOV	IOV	IOV	• IOV	IOV	IOV	IOV	IOV	IOV	IOV	IOV	IOV	IOV	A8	B8	A1	B1	• IOG	IOG	IOG	IOG	IOG	IOG	• IOG	IOG	IOG	IOG	IOG	IOG	IOG	IOG	IOG	IOG	A8	B8	A1	B1	• 0	1	2	3	4	5	• 6	7	8	9	10	11	12	13	14	15	A8	B8
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12	13																																																												
14	15																																																												
A8	B8																																																												

## 4-3 Wiring the Terminals

This section describes how to wire the terminals on the Digital I/O Units.

 <b>WARNING</b>	
	<p>Make sure that the voltages and currents that are input to the Units and slaves are within the specified ranges.</p> <p>Inputting voltages or currents that are outside of the specified ranges may cause accidents or fire.</p>

### 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

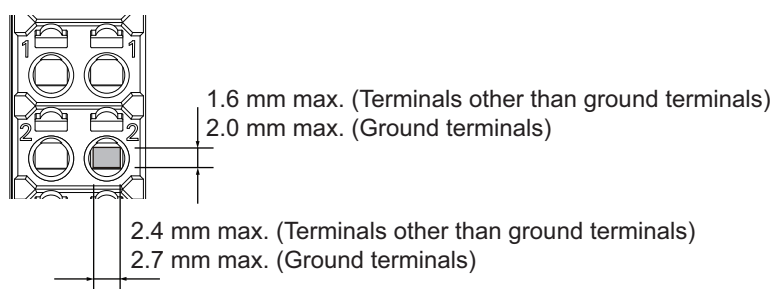
## Applicable Wires

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.

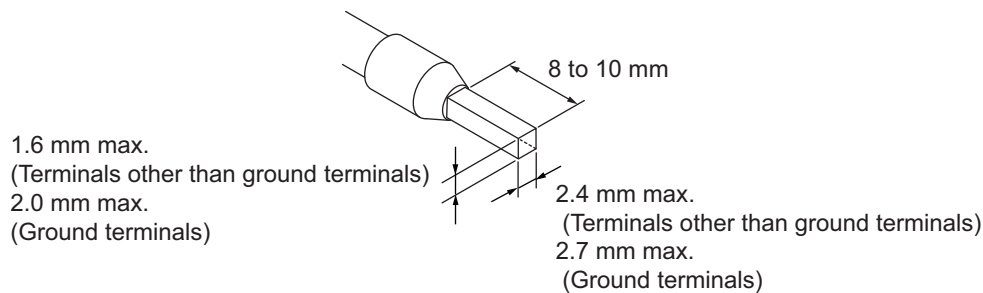
Always use one-pin ferrules. Do not use two-pin ferrules.

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

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

\*1. Some AWG14 wires exceed 2.0 mm<sup>2</sup> 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.

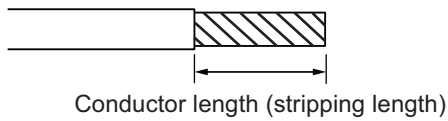


● **Using Twisted Wires/Solid Wires**

If you use the twisted wires or the solid wires, the applicable wire range and conductor length (stripping length) are as follows.

Terminal types	Applicable wire range	Conductor length (stripping length)
Ground terminals* <sup>1</sup>	2.0 mm <sup>2</sup>	9 to 10 mm
Terminals other than ground terminals	0.08 to 1.5 mm <sup>2</sup> AWG28 to 16	8 to 10 mm

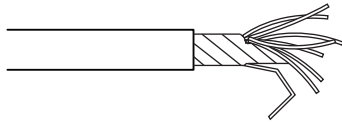
\*1. When you use the NX-TB□□□1 Terminal Block, use twisted wires to connect the ground terminal. Do not use solid wires.



**Precautions for Correct Use**

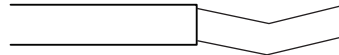
- Use cables with suitable wire sizes for the carrying current. There are also restrictions on the current due to the ambient temperature. Refer to the manuals for the cables and use the cables correctly for the operating environment.
- For twisted wires, strip the sheath and twist the conductor portion.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

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Unravel wires

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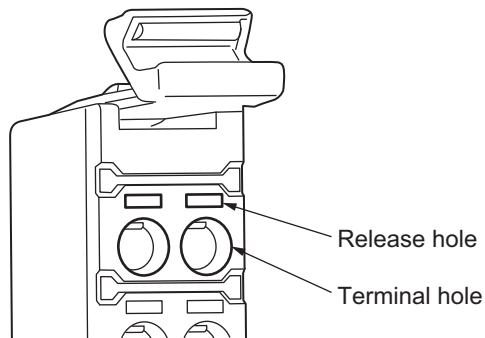


Bend wires

## Connecting/Removing Wires

This section describes how to connect and remove wires.

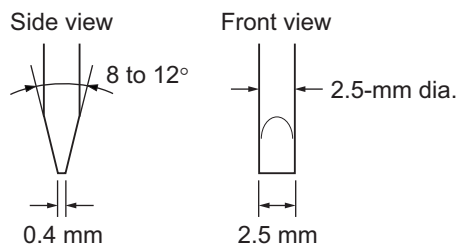
### ● Terminal Block Parts and Names



### ● Required Tools

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

Use the following flat-blade screwdriver.



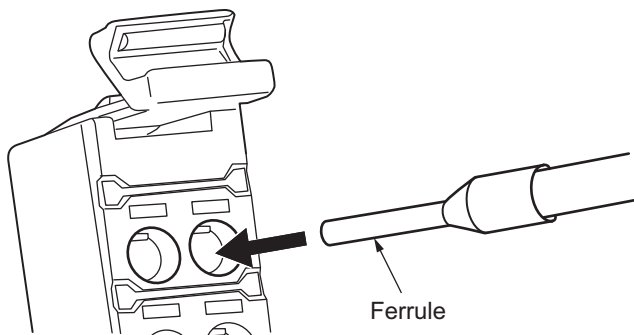
Recommended screwdriver

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.



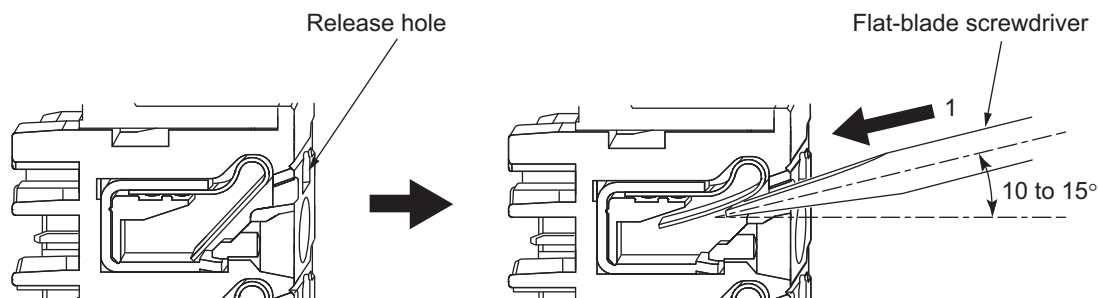
After you make a connection, make sure that the ferrule is securely connected to the terminal block.

### ● 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°.

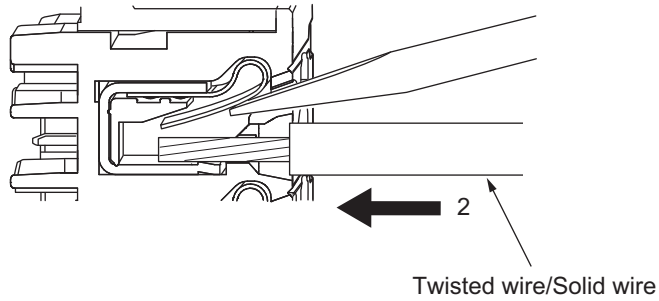
If you press in the screwdriver correctly, you will feel the spring in the release hole.



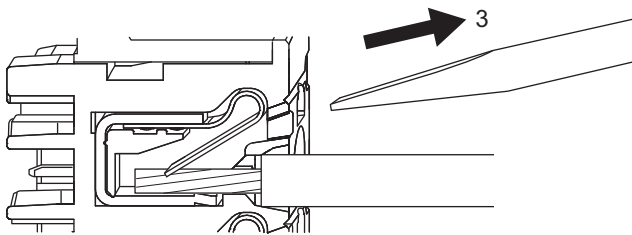


- 2** Leave the flat-blade screwdriver pressed into the release hole and insert the twisted wire or the solid wire into the terminal hole.

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.

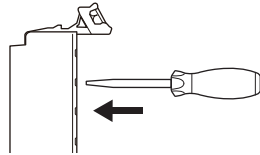


### Precautions for Safe Use

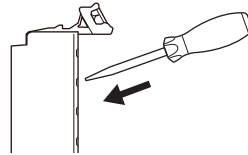
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- Do not press the flat-blade screwdriver straight into the release hole. Doing so may break the terminal block.

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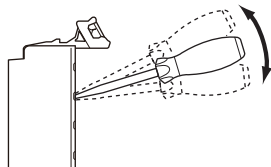


OK

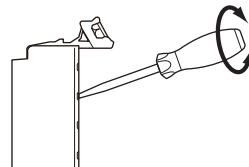


- When you insert a flat-blade screwdriver into a release hole, press it down with a force of 30 N max. Applying excessive force may damage the terminal block.
- Do not tilt or twist the flat-blade screwdriver while it is pressed into the release hole. Doing so may break the terminal block.

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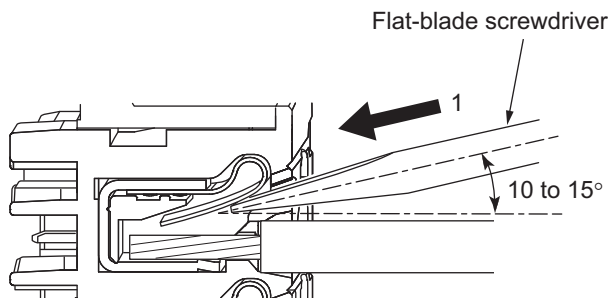
- Make sure that all wiring is correct.
  - Do not bend the cable forcibly. Doing so may sever the cable.
-

## ● Removing Wires

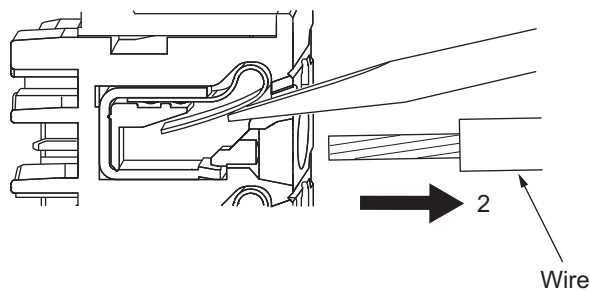
Use the following procedure to remove the wires from the terminal block.

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

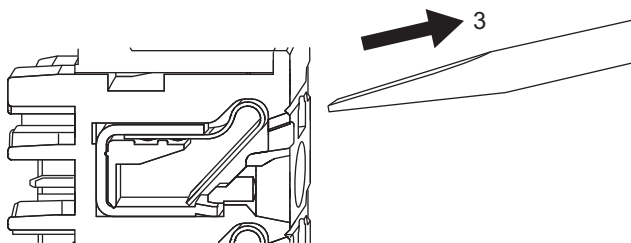
- 1** Press the flat-blade screwdriver diagonally into the release hole.  
Press at an angle of 10° to 15°.  
If you press in the screwdriver correctly, you will feel the spring in the release hole.



- 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.



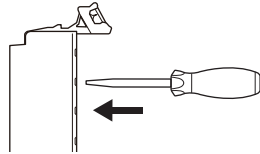


### Precautions for Safe Use

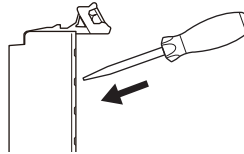
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- Do not press the flat-blade screwdriver straight into the release hole. Doing so may break the terminal block.

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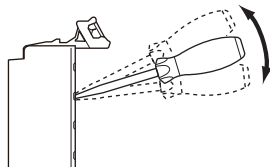


OK

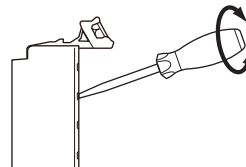


- When you insert a flat-blade screwdriver into a release hole, press it down with a force of 30 N max. Applying excessive force may damage the terminal block.
- Do not tilt or twist the flat-blade screwdriver while it is pressed into the release hole. Doing so may break the terminal block.

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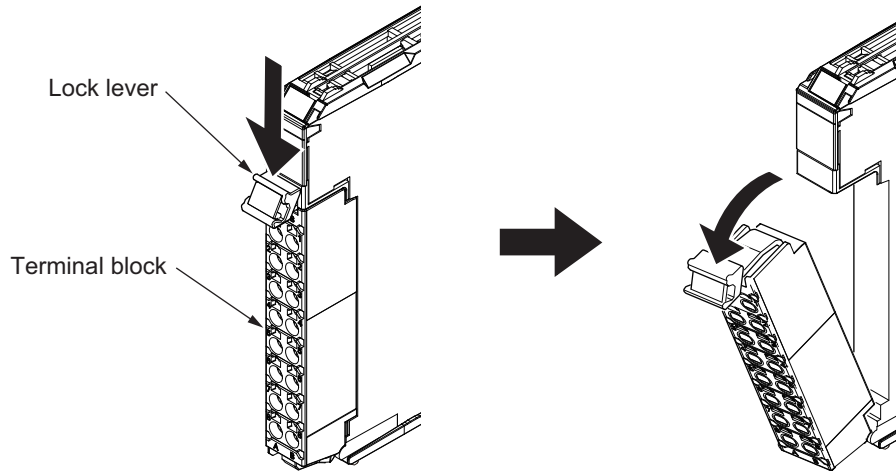
NG



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

## Removing a Terminal Block

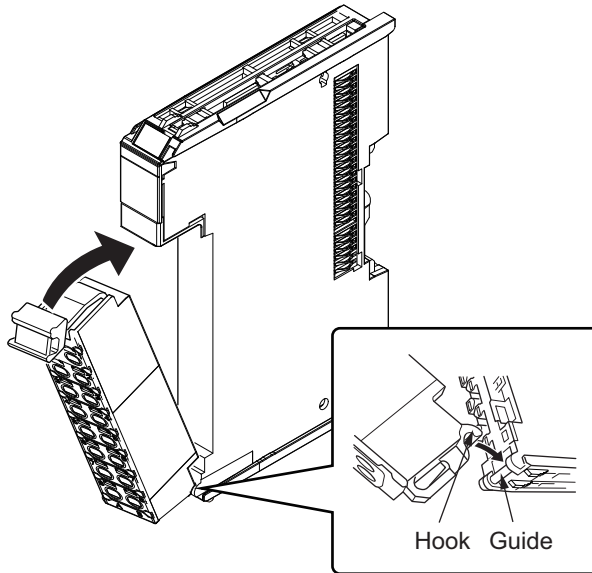
- 1 Press the lock lever on the terminal block and pull out the top of the terminal block to remove it.



## Attaching a Terminal Block

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- 1 Place the terminal block hook on the guide at the bottom of the NX Unit and press in on the top of the terminal block to attach it.



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

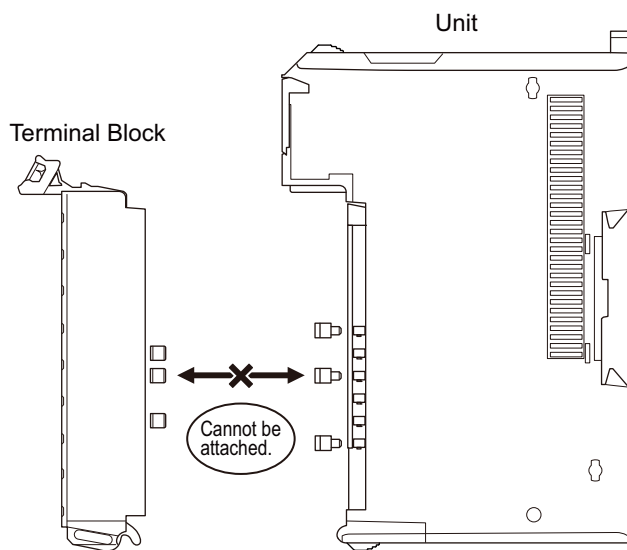
Refer to *Applicable Terminal Blocks for Each Unit Model* on page 3-5 for the applicable Terminal Blocks.

## 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.

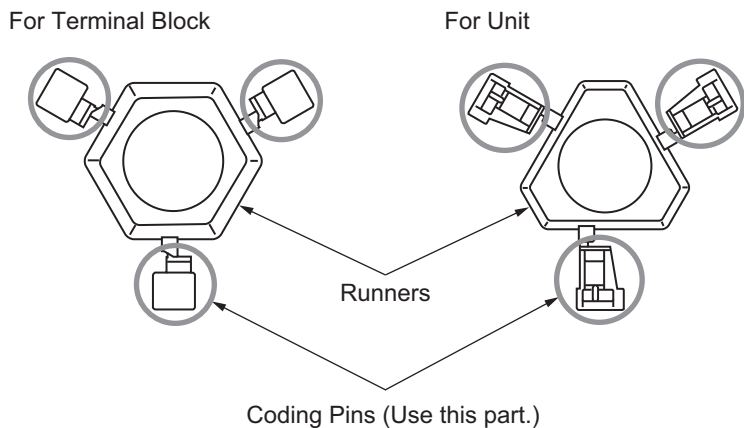
You can use these pins to create a combination in which the wrong terminal block cannot be attached because the pin patterns do not match.



● **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.

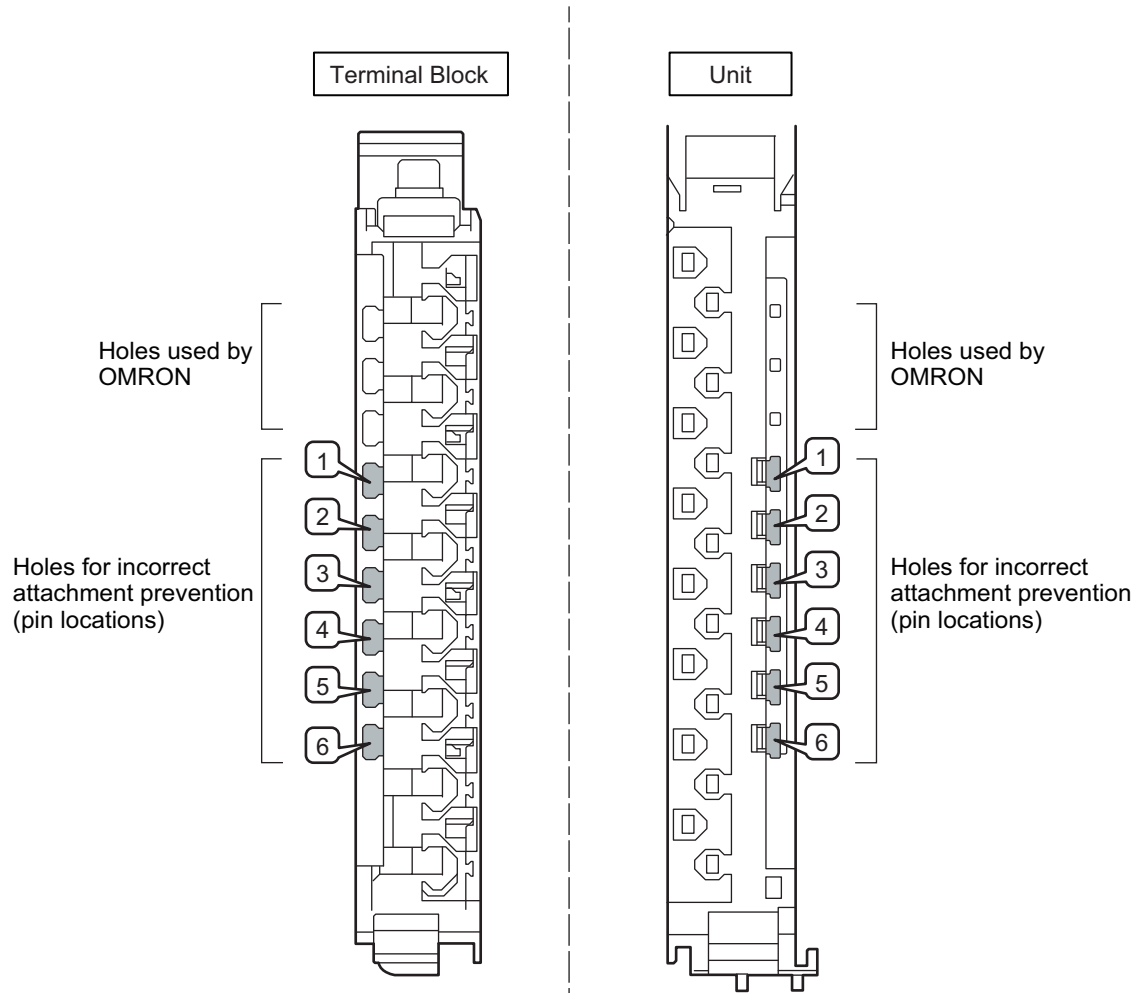
Name	Model	Specification
Coding Pin	NX-AUX02	For 10 Units (Terminal Block: 30 pins, Unit: 30 pins)



● 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.)



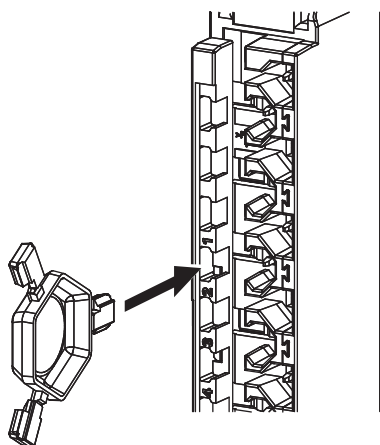
**Precautions for Correct Use**

- 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.

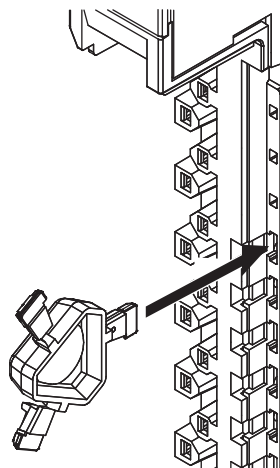
● **Inserting the Coding Pins**

- 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

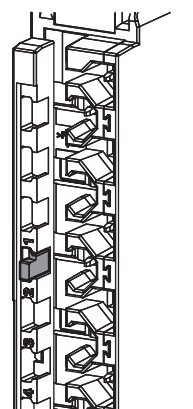
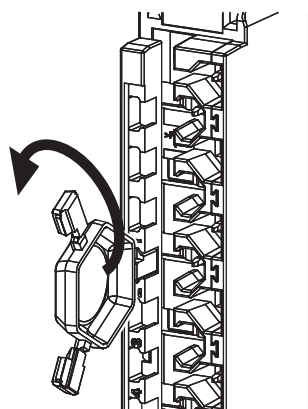


Unit

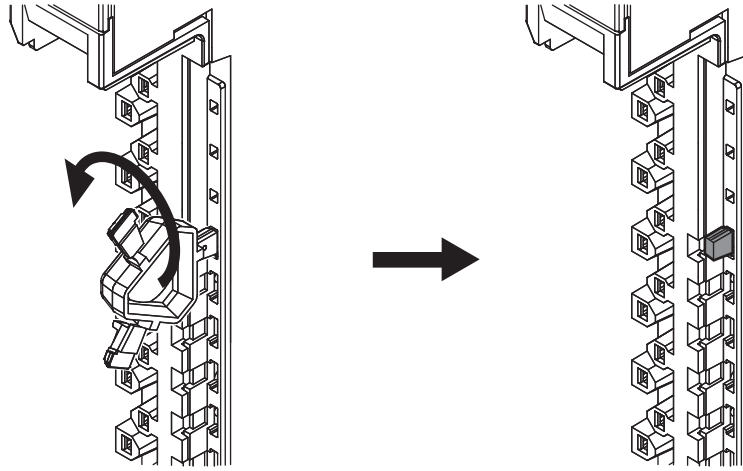


- 2** Rotate the runner to break off the Coding Pin.

Terminal Block



Unit



## 4-3-2 Wiring to Connectors

This section describes wiring for the Digital I/O Units with connectors.

Depending on the connector, the following methods are used to connect the Digital I/O Units with connectors to external I/O devices.

- Use an OMRON Connecting Cable (equipped with a special connector) to connect to a Terminal Block or Relay Terminal.
- Use a special connector and make your own cable.



### Precautions for Safe Use

- 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.
- Turn ON the power after checking the connector's wiring.
- Do not pull the cable. Doing so will damage the cable.
- Bending the cable too sharply can damage or break wiring in the cable.

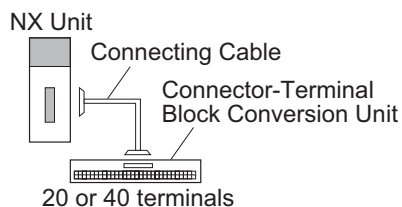
## Connecting to Connector-Terminal Block Conversion Units or I/O Relay Terminals

OMRON Connecting Cable can be used to connect Digital I/O Units with connectors to OMRON Connector-Terminal Block Conversion Units or to OMRON I/O Relay Terminals.

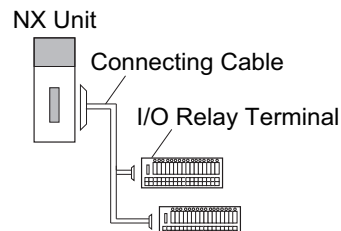
For details, refer to *A-3 Connecting Connector-Terminal Block Conversion Units and I/O Relay Terminals* on page A-63.

### ● Connection Examples

Connector-Terminal Block Conversion Unit



I/O Relay Terminals



### Precautions for Safe Use

If the external power supply has polarity, connect it with the correct polarity. If the polarity is reversed, current may flow in the reverse direction and damage the connected devices regardless of the operation of the Controller.

## Using User-made Cables with Connector

### ● Available Connectors

Use the following connectors when assembling a connector and cable.

NX Units with MIL Connectors

Model	Specifications	Pins
NX-ID5142-5	DC Input Unit, 16 points	20
NX-ID6142-5	DC Input Unit, 32 points	40
NX-OD5121-5	Transistor Output Unit, 16 points	20
NX-OD5256-5		
NX-OD6121-5	Transistor Output Unit, 32 points	40
NX-OD6256-5		
NX-MD6121-5	DC Input/Transistor Output Units, 16 inputs, 16 outputs	20 (x 2)
NX-MD6256-5		

Applicable Cable-side Connectors

Connection	Pins	OMRON set	DDK parts
Pressure-welded	40	XG4M-4030-T	FRC5-A040-3TOS
	20	XG4M-2030-T	FRC5-A020-3TOS

### ● Wire Size

We recommend using cable with wire gauges of AWG 24 or AWG 28 (0.2 mm<sup>2</sup> to 0.08 mm<sup>2</sup>). Use cable with external wire diameters of 1.61 mm max.

### ● Wiring

- Make sure that all Units are connected properly.
- After the cable side connector is connected, close the lock lever on the NX Unit side connector section to lock it. After you complete the wiring, make sure that the connector is locked.



### Precautions for Safe Use

If the external power supply has polarity, connect it with the correct polarity. If the polarity is reversed, current may flow in the reverse direction and damage the connected devices regardless of the operation of the Controller.

### 4-3-3 Checking the Wiring

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

For Input Units, you can turn ON/OFF the inputs from external devices that are connected to the target Units and monitor the results.

For Output Units, you can refresh the I/O outputs of the target Units with the specified values by forced refreshing, and check the operation of the connected external devices.



#### Additional Information

---

If you check the wiring for the Output Units that support output refreshing with specified time stamp, set the value of the Output Bit  Time Stamp parameter to 0. At this time, the Output Units refresh outputs immediately and outputs are refreshed according to the output set values.

---

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 easily check the wiring.

Also, if you use I/O checking, you can check the wiring by connecting the computer in which the Sysmac Studio is installed to the peripheral USB port on the EtherCAT Coupler Unit. Therefore, you can check the wiring in conditions such as the following.

- When you want to check the wiring in advance even though the CPU Unit is temporarily unavailable, such as when commissioning the equipment
- When you want to check the wiring in advance even though the wiring of the EtherCAT network is not completed, such as when commissioning the equipment
- When you want to check the wiring when the CPU Unit and an EtherCAT Slave Terminal have some distance from each other
- When more than one EtherCAT Slave Terminal is used and more than one person wants to check the wiring at the same time

Refer to the *EtherCAT Coupler Unit User's Manual* (Cat. No. W519-E1-03 or later) for details on I/O checking.

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

## 4-4 Wiring Examples

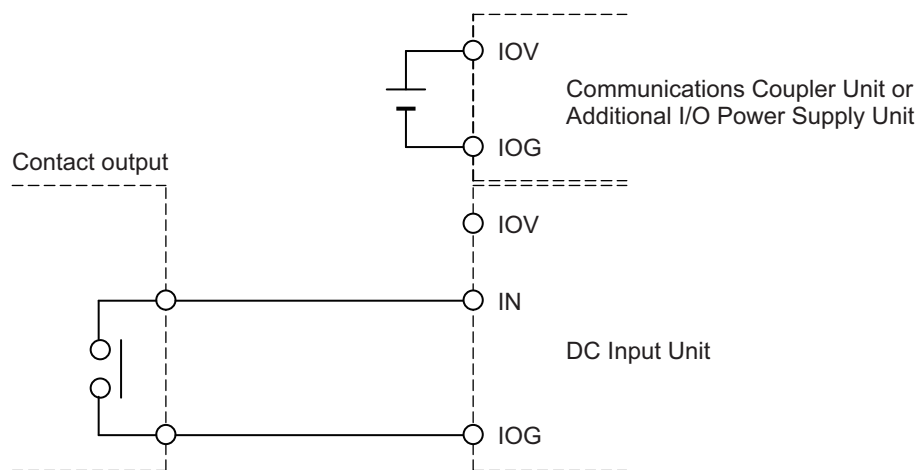
This section gives some wiring examples for the Digital I/O Units and precautions for wiring.

### 4-4-1 Wiring the Input Units

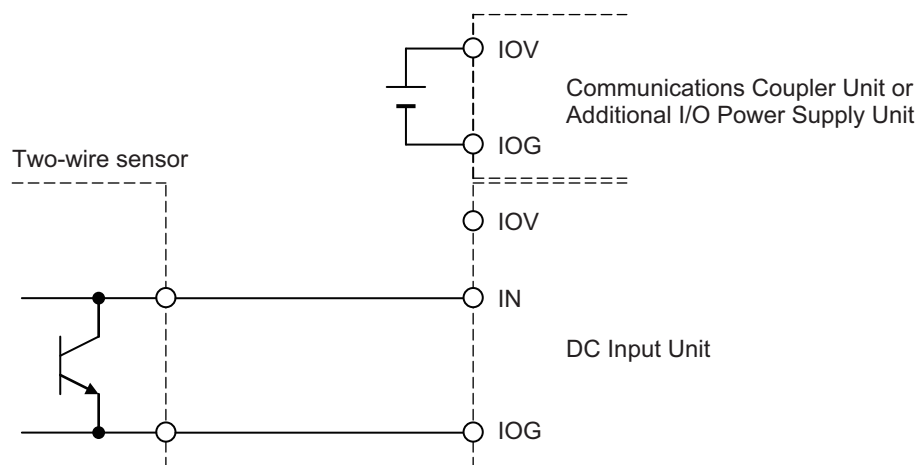
#### Wiring to the DC Input Units (When I/O Power Is Supplied from the NX Bus)

##### ● NPN Type Input Units

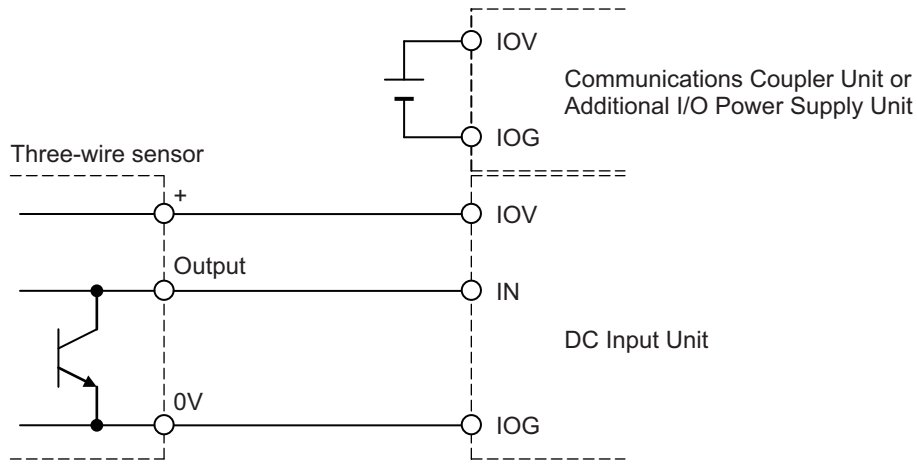
This is the wiring for contact output type external devices.



This is the wiring for two-wire sensors.

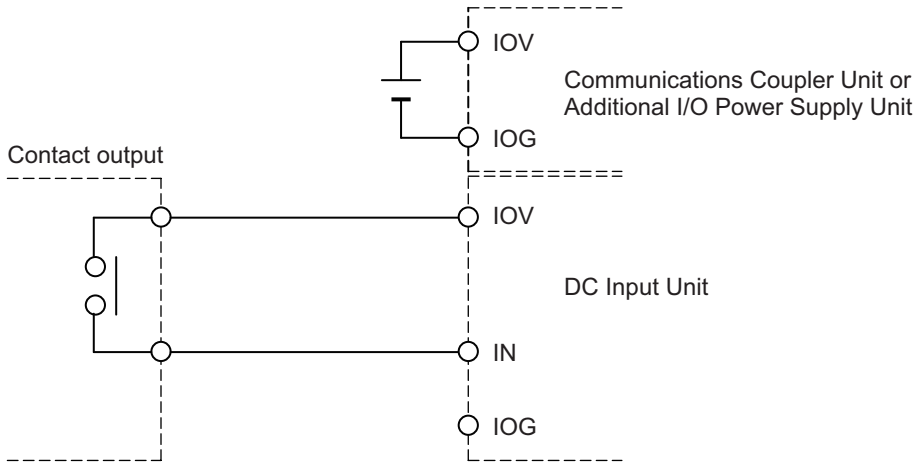


This is the wiring for three-wire sensors.



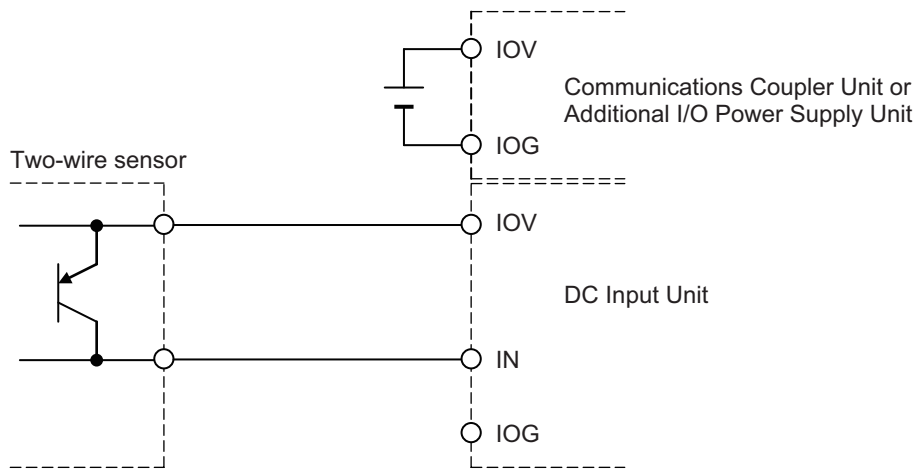
● PNP Type Input Units

This is the wiring for contact output type external devices.

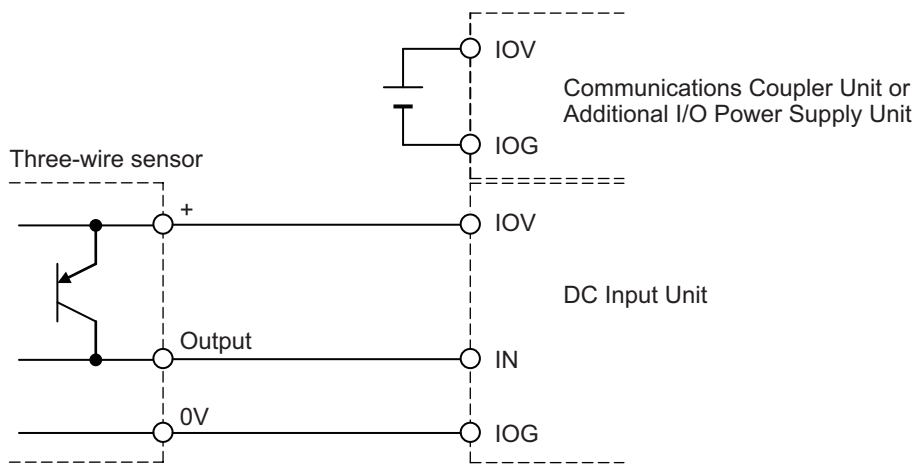




This is the wiring for two-wire sensors.



This is the wiring for three-wire sensors.



● **Precautions when Connecting a Two-wire DC Sensor**

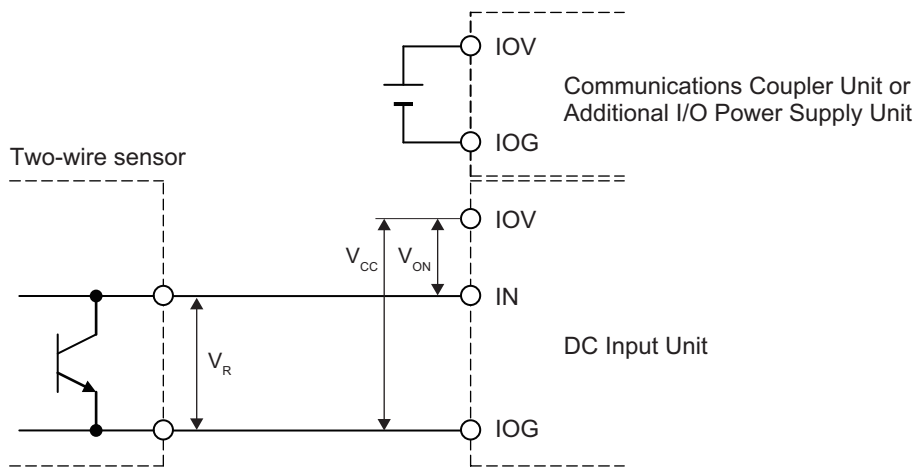
When a two-wire sensor is used with a DC Input Unit, check that the following conditions are met. Failure to meet these conditions may result in operating errors.

(a) Relation between ON voltage of the DC Input Unit and sensor residual voltage

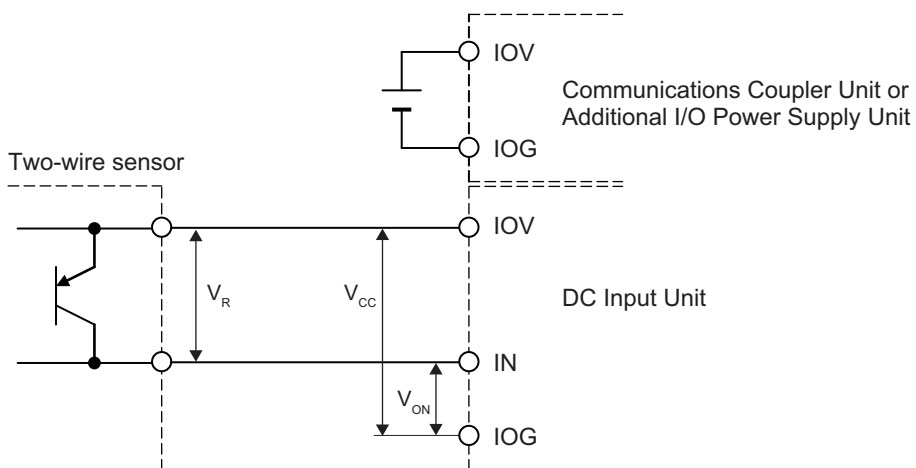
The DC Input Unit cannot detect sensor output ON unless the following conditions are satisfied:

$$V_{ON} \leq V_{CC} - V_R$$

The voltages related to the conditions for NPN type sensors are shown in the figure below.



The voltages related to the conditions for PNP type sensors are shown in the figure below.



$V_{CC}$ : Power supply voltage

$V_R$ : Sensor's output residual voltage

$V_{ON}$ : ON voltage of DC Input Unit

(b) Relation between input current to the DC Input Unit and sensor control output (load current)

The DC Input Unit cannot detect sensor output ON unless the following conditions are satisfied:

$$I_{OUT}(\min) \leq I_{in} \leq I_{OUT}(\max)$$

$I_{OUT}(\min)$ : Minimum value of load current

$I_{OUT}(\max)$ : Maximum value of load current

Use the following equation to calculate the input current of the resistance input.

$$I_{in} = (V_{CC} - V_R - 1.5 \text{ [internal residual voltage of DC Input Unit]}) / R_{IN}$$

Use the following equation to calculate the input current of the constant current input.

$$I_{in} = I_{ON}$$

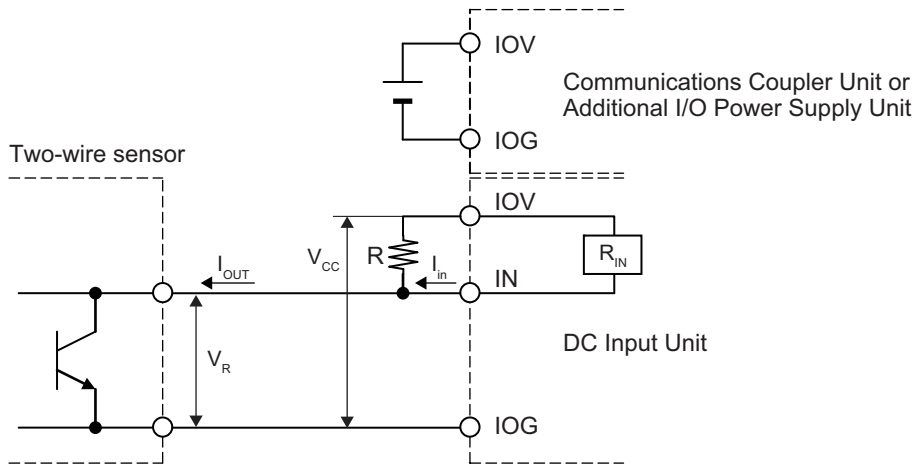
**Note** For constant current input type Input Units, the input current does not increase linearly for the input voltage. If you gradually raise the input voltage and once the input current reaches  $I_{ON}$ , the input current does not increase and remains roughly constant even when the input voltage is raised.

When  $I_{in}$  is smaller than  $I_{OUT}(\min)$ , connect a bleeder resistor R. The bleeder resistor constant can be calculated as follows: Select an appropriate bleeder resistor R so that both equations can be satisfied.

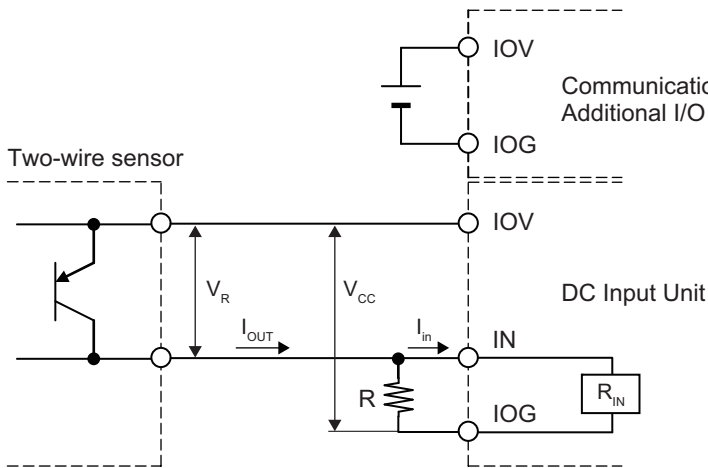
$$R \leq (V_{CC} - V_R) / (I_{OUT}(\min) - I_{ON})$$

Rated power W of bleeder resistor  $\geq (V_{CC} - V_R)^2 / R \times 4$  [allowable margin]

The voltages and currents related to the conditions for NPN type sensors are shown in the figure below.



The voltages and currents related to the conditions for PNP type sensors are shown in the figure below.



$V_{CC}$ : Power supply voltage

$V_R$ : Sensor's output residual voltage

$I_{OUT}$ : Sensor control output (load current)

$I_{ON}$ : Input current of DC Input Unit (Input current when the rated voltage is applied)

R: Bleeder resistor

$R_{IN}$ : Input resistor of DC Input Unit

(c) Relation between OFF current of the DC Input Unit and sensor leakage current

The DC Input Unit cannot detect sensor output OFF unless the following conditions are satisfied:

$$I_{\text{OFF}} \geq I_{\text{leak}}$$

When  $I_{\text{leak}}$  is greater than  $I_{\text{OFF}}$  connect a bleeder resistor R.

Use the following equation to calculate the bleeder resistance constant of the resistance input.

$$R \leq R_{\text{IN}} \times V_{\text{OFF}} / (I_{\text{leak}} \times R_{\text{IN}} - V_{\text{OFF}})$$

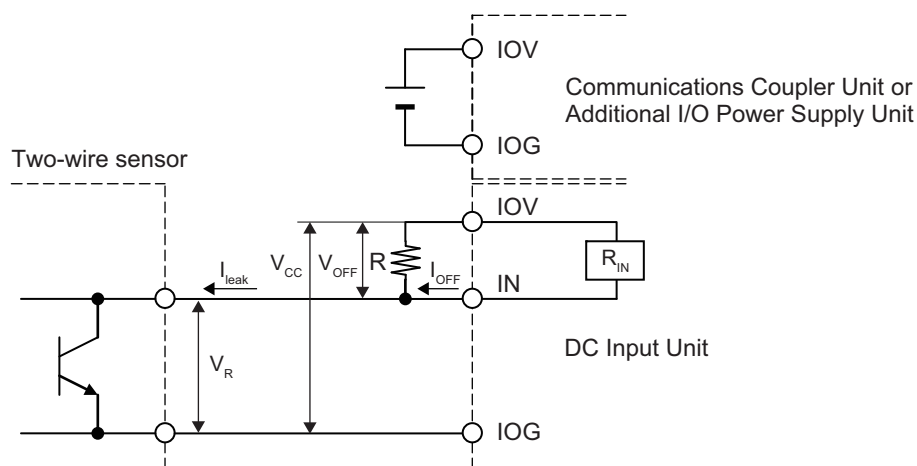
Use the following equation to calculate the bleeder resistance constant of the constant current input.

$$R \leq (V_{\text{OFF}} / I_{\text{OFF}}) \times V_{\text{OFF}} / (I_{\text{leak}} \times (V_{\text{OFF}} / I_{\text{OFF}}) - V_{\text{OFF}})$$

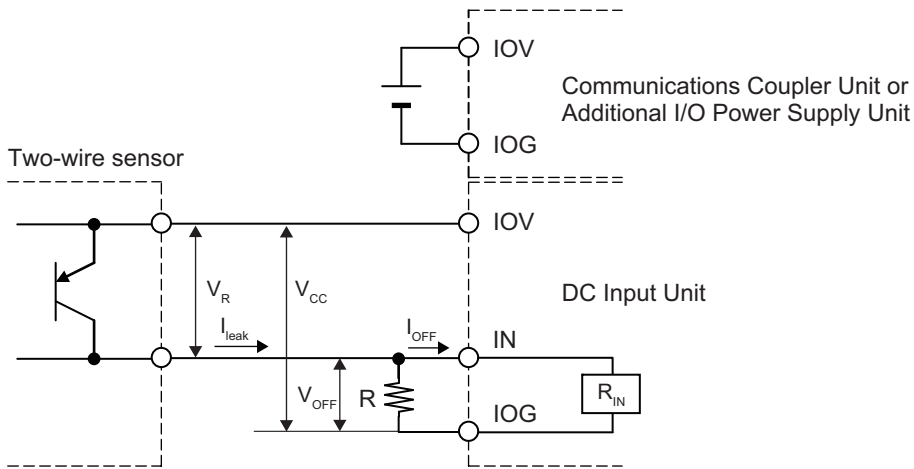
For both the resistance input and constant current input, use the following equation to calculate the rated power of bleeder resistor.

$$\text{Rated power } W \text{ of bleeder resistor} \geq (V_{\text{CC}} - V_{\text{R}})^2 / R \times 4 \text{ [allowable margin]}$$

The voltages and currents related to the conditions for NPN type sensors are shown in the figure below.



The voltages and currents related to the conditions for PNP type sensors are shown in the figure below.



- $V_{CC}$ : Power supply voltage
- $V_R$ : Sensor's output residual voltage
- $V_{OFF}$ : OFF voltage of DC Input Unit
- $I_{leak}$ : Sensor leakage current
- R: Bleeder resistor
- $I_{OFF}$ : OFF current of DC Input Unit
- $R_{IN}$ : Input resistor of DC Input Unit

(d) Precautions on sensor inrush 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.

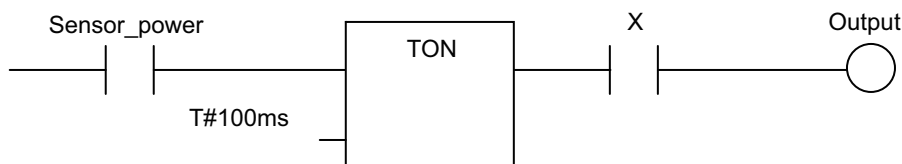
Determine the time required for sensor operation to stabilize after the sensor is turned ON and take appropriate measures, such as inserting an ON delay into the user program after turning ON the sensor.

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.

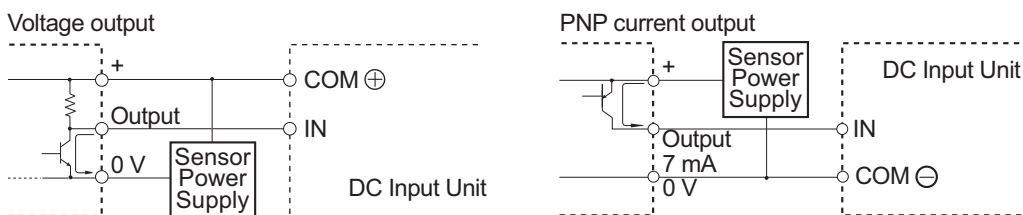
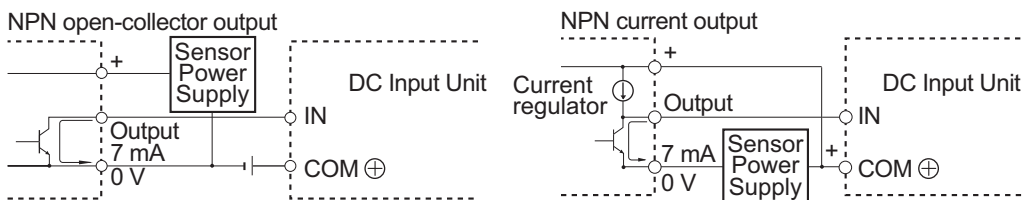
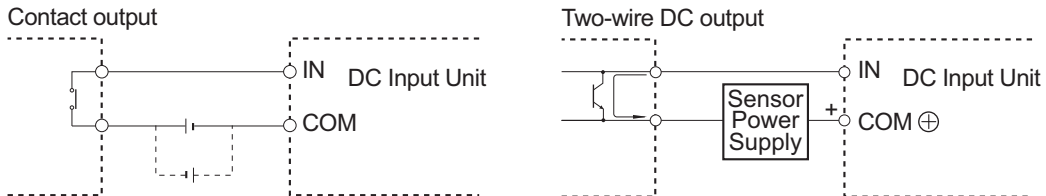


## Wiring to the DC Input Units (When I/O Power Is Supplied from an External Source)

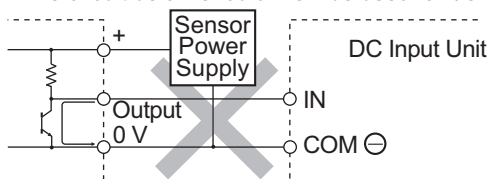
Use the following information for reference when selecting or connecting input devices.

### ● DC Input Units

The following types of DC input devices can be connected.



• The circuit below should NOT be used for I/O devices having a voltage output.



### ● Precautions when Connecting a Two-wire DC Sensor

When a two-wire sensor is used with a DC Input Unit, check that the following conditions are met. Failure to meet these conditions may result in operating errors.

(a) Relation between ON voltage of the DC Input Unit and sensor residual voltage

$$V_{ON} \leq V_{CC} - V_R$$

(b) Relation between input current to the DC Input Unit and sensor control output (load current)

$$I_{OUT} (\text{min}) \leq I_{ON} \leq I_{OUT} (\text{max})$$

$$I_{ON} = (V_{CC} - V_R - 1.5 \text{ [internal residual voltage of DC Input Unit]}) / R_{IN}$$

When  $I_{ON}$  is smaller than  $I_{OUT} (\text{min})$ , connect a bleeder resistor R. The bleeder resistor constant can be calculated as follows:

$$R \leq (V_{CC} - V_R) / (I_{OUT} (\text{min}) - I_{ON})$$

$$\text{Power } W \text{ of bleeder resistor} \geq (V_{CC} - V_R)^2 / R \times 4 \text{ [allowable margin]}$$

$V_{CC}$ : Input voltage of DC Input Unit

$V_R$ : Sensor's output residual voltage

$I_{ON}$ : Input current of DC Input Unit

$I_{OUT}$ : Sensor control output (load current)

$R_{IN}$ : Input resistor of DC Input Unit

(c) Relation between OFF current of the DC Input Unit and sensor leakage current

$$I_{OFF} \geq I_{leak}$$

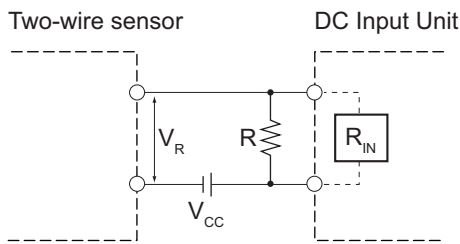
When  $I_{leak}$  is greater than  $I_{OFF}$  connect a bleeder resistor R.

Use the following equation to calculate the bleeder resistance constant.

$$R \leq R_{IN} \times V_{OFF} / (I_{leak} \times R_{IN} - V_{OFF})$$

$$\text{Power } W \text{ of bleeder resistor} \geq (V_{CC} - V_R)^2 / R \times 4 \text{ [allowable margin]}$$





$V_{CC}$ : Power supply voltage  
 $V_{ON}$ : ON voltage of DC Input Unit  
 $V_{OFF}$ : OFF voltage of DC Input Unit  
 $I_{ON}$ : ON current of DC Input Unit  
 $I_{OFF}$ : OFF current of DC Input Unit  
 $R_{IN}$ : Input resistor of DC Input Unit

$V_R$ : Sensor's output residual voltage  
 $I_{OUT}$ : Sensor control output (load current)  
 $I_{leak}$ : Sensor leakage current  
 $R$ : Bleeder resistor

#### (d) Precautions on sensor inrush 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.

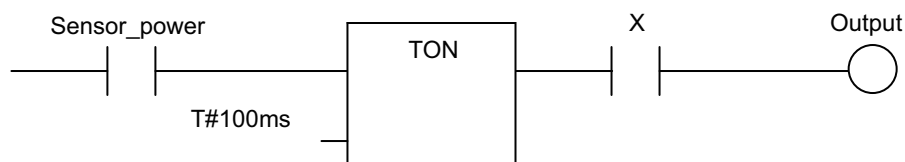
Determine the time required for sensor operation to stabilize after the sensor is turned ON and take appropriate measures, such as inserting an ON delay into the user program after turning ON the sensor.

A programming example is shown below.

The sensor's power supply voltage is used as the input bit to *Sensor\_power*.

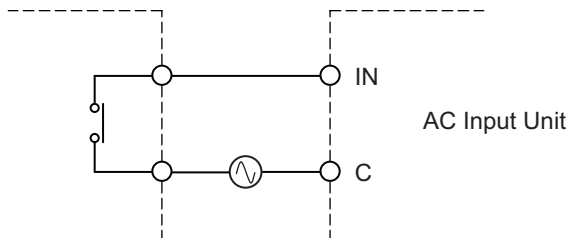
A 100-ms timer delay (the time required for an OMRON Proximity Sensor to stabilize) is created in the user program.

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.

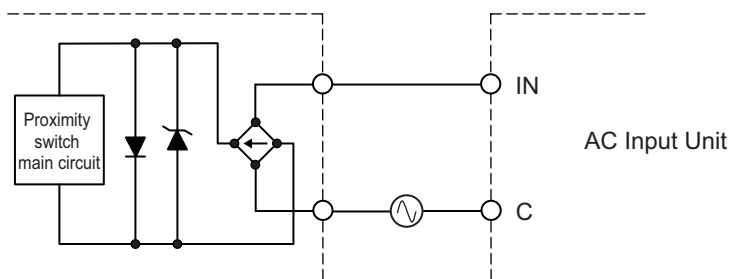


## Wiring to the AC Input Units

### ● Contact Output



### ● AC Switching



### Precautions for Safe Use

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.

## 4-4-2 Precautions when Wiring to the Output Units

### Output Short-circuit Protection

If a load connected to the output terminals is short-circuited, output components and printed circuit boards may be damaged. To guard against this, use the NX Units with load short-circuit protection.

When using the NX Units without load short-circuit protection, incorporate a protective fuse in the external circuit. Use a fuse with a capacity of around twice the rated output.

### Inrush Current

When connecting a transistor to an output device with a high inrush current (such as an incandescent lamp), steps must be taken to avoid damage to the output transistor.

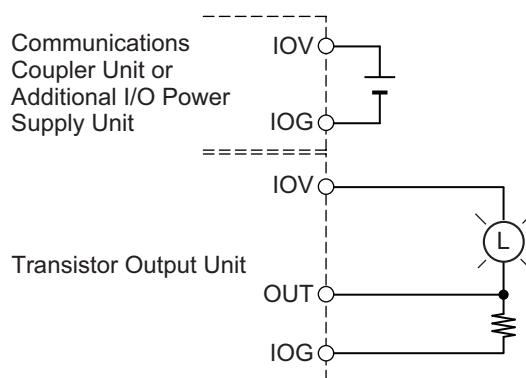
Use either of the following methods to reduce the inrush current.

#### ● Countermeasure 1

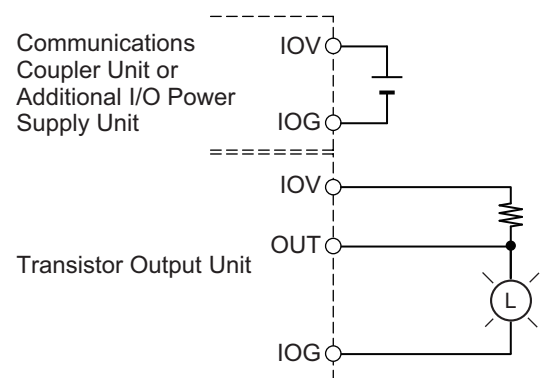
Draw about 1/3 of the current consumed by the load.

When I/O power is supplied from the NX bus, the method is as shown in the following figure.

NPN type

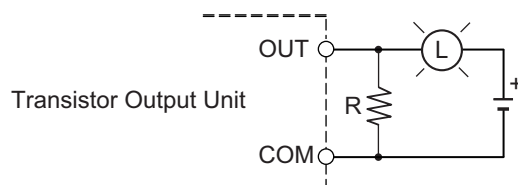


PNP type

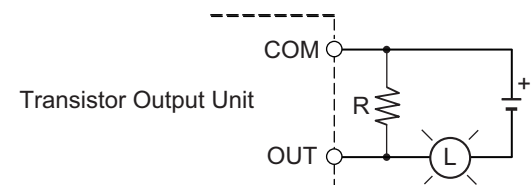


When I/O power is supplied from an external source, the method is as shown in the following figure.

NPN type



PNP type

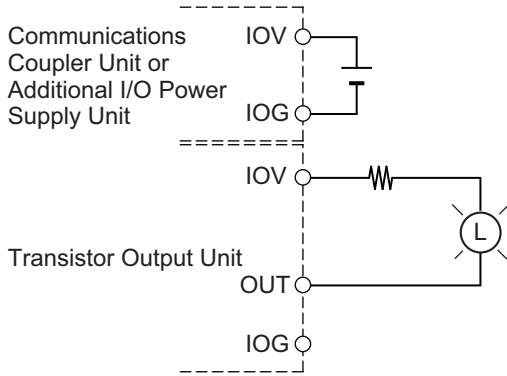


● Countermeasure 2

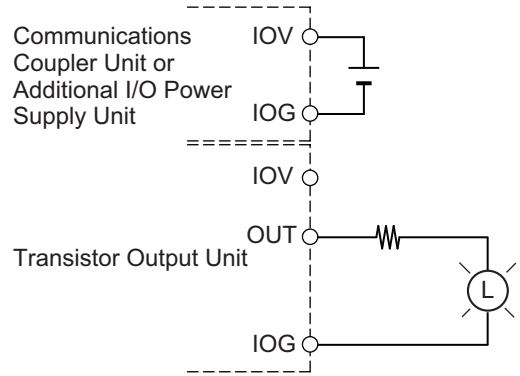
Mount a limiting resistor.

When I/O power is supplied from the NX bus, the method is as shown in the following figure.

NPN type

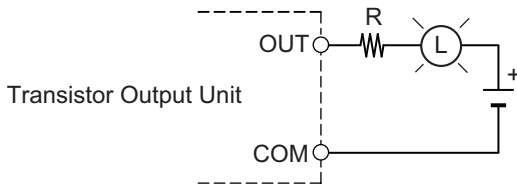


PNP type

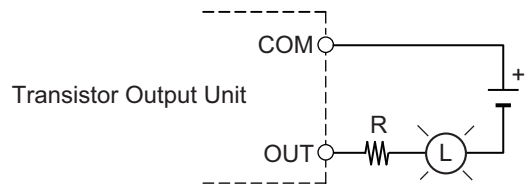


When I/O power is supplied from an external source, the method is as shown in the following figure.

NPN type



PNP type



In countermeasure 1, the current consumption from I/O power supply is increased although the voltage supplied to the load L is not decreased.

In countermeasure 2, the voltage supplied to the load L is decreased although the current consumption from I/O power supply is not increased.

Select the appropriate countermeasures according to the operating conditions.

# 5

## I/O Refreshing

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

---

<b>5-1</b>	<b>I/O Refreshing for Slave Terminals</b> .....	<b>5-2</b>
5-1-1	I/O Refreshing from CPU Unit to Slave Terminal .....	5-2
<b>5-2</b>	<b>I/O Refreshing Methods</b> .....	<b>5-3</b>
5-2-1	Types of I/O Refreshing Methods .....	5-3
5-2-2	Setting the I/O Refreshing Methods .....	5-4
5-2-3	Selecting NX Units .....	5-4
5-2-4	Free-Run Refreshing .....	5-5
5-2-5	Synchronous Input Refreshing .....	5-9
5-2-6	Synchronous Output Refreshing .....	5-13
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5-2-10	An Example of Turning ON Outputs at Specific Times After the Sensor Inputs Change .....	5-29

## 5-1 I/O Refreshing for Slave Terminals

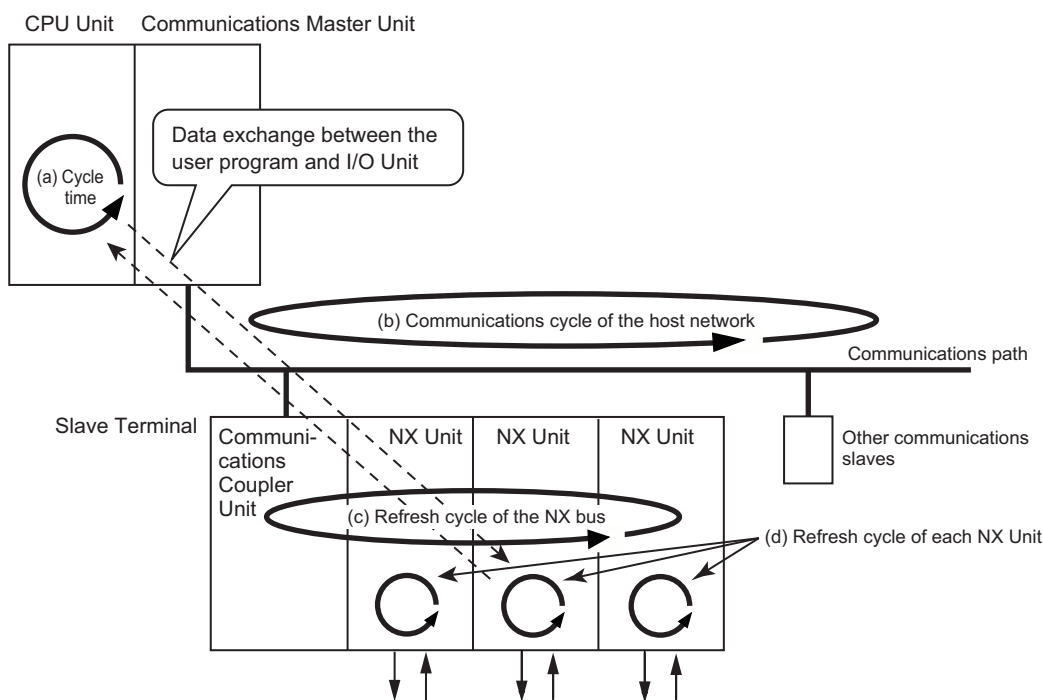
This section describes I/O refreshing for NX-series Slave Terminals.

### 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 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)<sup>\*1</sup> 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.

## 5-2 I/O Refreshing Methods

This section describes I/O refreshing methods for the NX Units.

### 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-series CPU Unit, the I/O refreshing methods that you can use between the EtherCAT Coupler Unit and the NX Units are as follows.

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.
Synchronous I/O refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.
Time stamp refreshing	With this I/O refreshing method, the NX Units record the DC times when inputs change or perform outputs at specified DC times. These times are asynchronous to the NX bus refresh cycles. Data exchange between the NX Units and EtherCAT Coupler Unit are performed cyclically on the NX bus refresh cycles.
Input refreshing with input changed time	With this I/O refreshing method, the Input Units record the DC times when inputs changed.
Output refreshing with specified time stamp	With this I/O refreshing method, the Output Units refresh outputs at specified DC times.

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.

## 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 Units that support only Free-Run refreshing	NX Units that support both Free-Run refreshing and synchronous I/O refreshing	NX Units that support only time stamp refreshing
Enabled (DC Mode)	Free-Run refreshing	Synchronous I/O refreshing	Time stamp refreshing
Disabled (Free-Run Mode)	Free-Run refreshing	Free-Run refreshing	Operation with time stamp refreshing is not possible.*1

\*1. Refer to P. 5-22 and P. 5-27 for information on the operation when the DC is disabled.



### Additional Information

The EtherCAT Slave Terminals with enabled distributed clocks and all EtherCAT slaves that support DC synchronization execute I/O processing based on Sync0 that is shared on the EtherCAT network. However, since the specifications and performance for the timing to read inputs or to refresh outputs for EtherCAT slaves and NX Units are different, the timing to read inputs or to refresh outputs is not simultaneous.

Refer to the manuals for the EtherCAT slaves for information on the timing to read inputs or to refresh outputs in EtherCAT slaves.

## 5-2-3 Selecting NX Units

The I/O refreshing methods that you can use depend on the model of the NX Unit. After you decide on which I/O refreshing method to use, select the NX Units.



## 5-2-4 Free-Run Refreshing

With this I/O refreshing method, the refresh cycle of the NX bus and I/O refresh cycles of the NX Units are asynchronous.

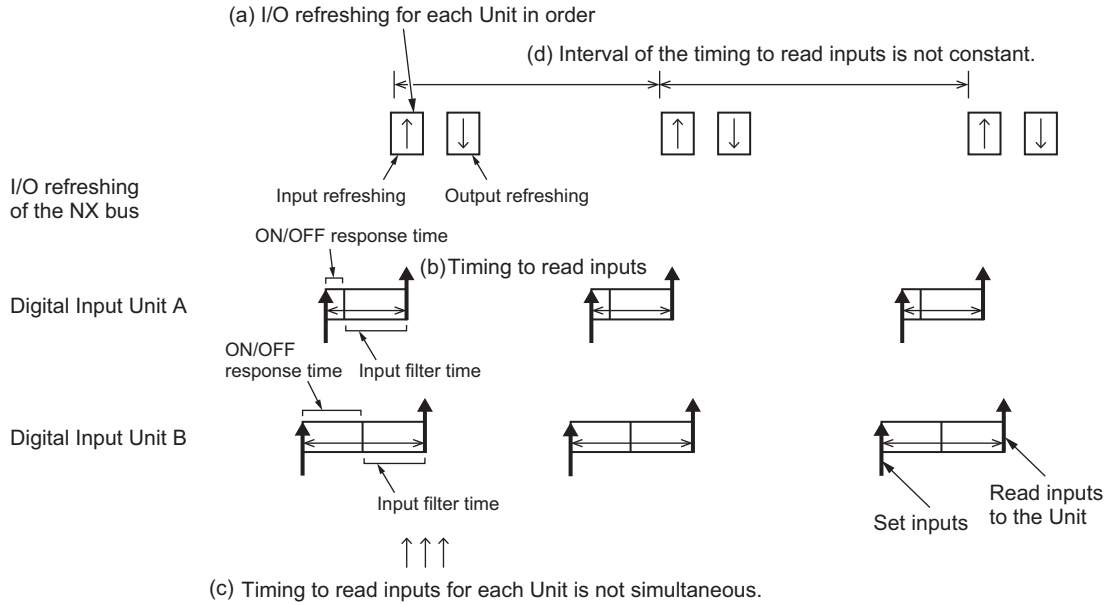
Digital I/O Units read inputs or refresh outputs at the time of I/O refreshing.

This method is used when it is not necessary to be aware of factors such as the I/O timing jitter and the concurrency of the timing to read inputs and refresh outputs between the NX Units.

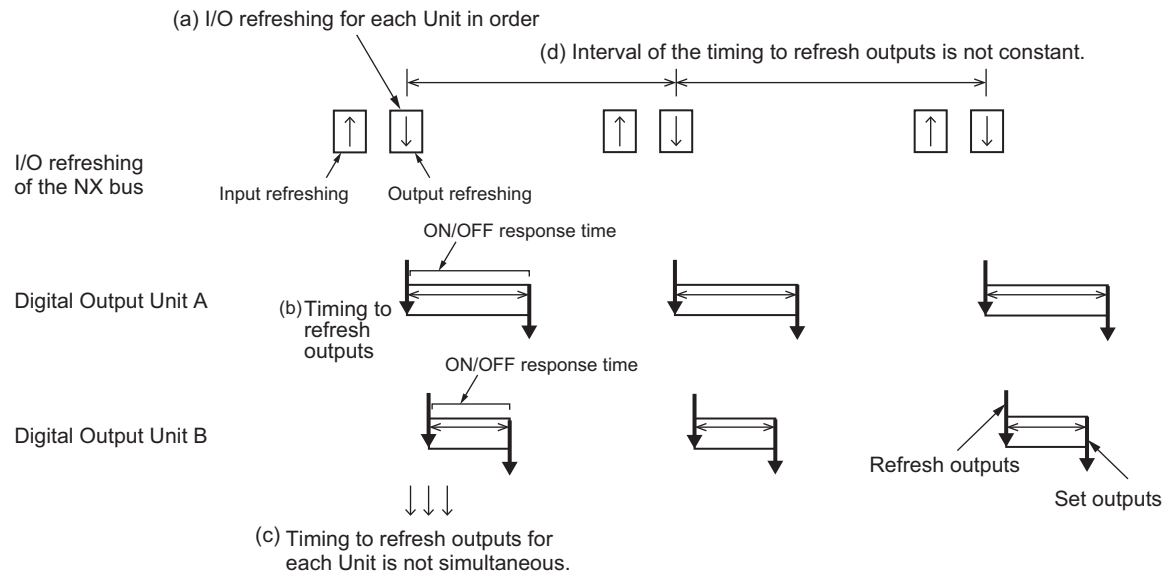
### Description of Operation

- You can connect the following NX Units to the Slave Terminal to use this method.  
The NX Units that support Free-Run refreshing
- The Communications Coupler Unit performs I/O refreshing for NX Units in order. (Refer to (a) in the figure below.)
- The NX Units read inputs or refresh outputs at the time of I/O refreshing. (Refer to (b) in the figure below.)
- The Communications Coupler Unit can read the most recent input value at the time of I/O refreshing and the NX Units can control the most recent output value at the time of I/O refreshing. However, since I/O refreshing is performed in order, timing to read inputs or to refresh outputs for each NX Unit in the Slave Terminal does not occur at the same time. (Refer to (c) in the figure below.)
- The interval of I/O refreshing varies with the processing conditions of the Communications Coupler Unit or the host communications master. Therefore, the interval of the timing to read inputs or to refresh outputs for NX Unit is not always the same. (Refer to (d) in the figure below.)
- In order to read input values correctly, you must set the inputs before the total of the ON/OFF response time and the input filter time from the timing to read inputs for each NX Unit.
- The ON/OFF response time is needed from the timing to refresh outputs until setting the output status of external terminals on the NX Units.

● Inputs



● Outputs



**Settings**

Enable the distributed clock in the EtherCAT slave parameters on the EtherCAT Coupler Unit that is added to the EtherCAT network configuration and add the NX Units that support Free-Run refreshing to the NX Unit configuration.

Or disable the distributed clock in the EtherCAT slave parameters and add NX Units that support either Free-Run refreshing or synchronous I/O refreshing to the NX Unit configuration.

## I/O Port

### ● Digital Input Units

This uses the I/O ports of the input values.

#### Four-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 00	BOOL	RO	Input Bit 00	The input value for input bit 00.	FALSE
Input Bit 01	BOOL	RO	Input Bit 01	The input value for input bit 01.	FALSE
Input Bit 02	BOOL	RO	Input Bit 02	The input value for input bit 02.	FALSE
Input Bit 03	BOOL	RO	Input Bit 03	The input value for input bit 03.	FALSE

#### Eight-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 8 bits	BYTE	RO	Input Bit 8 bits	The input values for 8 bits.	00 hex

#### Sixteen-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 16 bits	WORD	RO	Input Bit 16 bits	The input values for 16 bits.	0000 hex

#### Thirty-two-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 32 bits	DWORD	RO	Input Bit 32 bits	The input values for 32 bits.	00000000 hex

## ● Digital Output Units

This uses the I/O ports of the output set values.

### Two-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 00	BOOL	RW	Output Bit 00	The output set value for output bit 00.	FALSE
Output Bit 01	BOOL	RW	Output Bit 01	The output set value for output bit 01.	FALSE

### Four-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 00	BOOL	RW	Output Bit 00	The output set value for output bit 00.	FALSE
Output Bit 01	BOOL	RW	Output Bit 01	The output set value for output bit 01.	FALSE
Output Bit 02	BOOL	RW	Output Bit 02	The output set value for output bit 02.	FALSE
Output Bit 03	BOOL	RW	Output Bit 03	The output set value for output bit 03.	FALSE

### Eight-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 8 bits	BYTE	RW	Output Bit 8 bits	The output set values for 8 bits.	00 hex

### Sixteen-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 16 bits	WORD	RW	Output Bit 16 bits	The output set values for 16 bits.	0000 hex

### Thirty-two-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 32 bits	DWORD	RW	Output Bit 32 bits	The output set values for 32 bits.	00000000 hex

## ● Digital Mixed I/O Units

This uses the I/O ports of the input values and output set values.

### Thirty-two-point Mixed I/O Units

#### Input section

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 16 bits	WORD	RW	Input Bit 16 bits	The input values for 16 bits.	0000 hex

#### Output section

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 16 bits	WORD	RW	Output Bit 16 bits	The output set values for 16 bits.	0000 hex

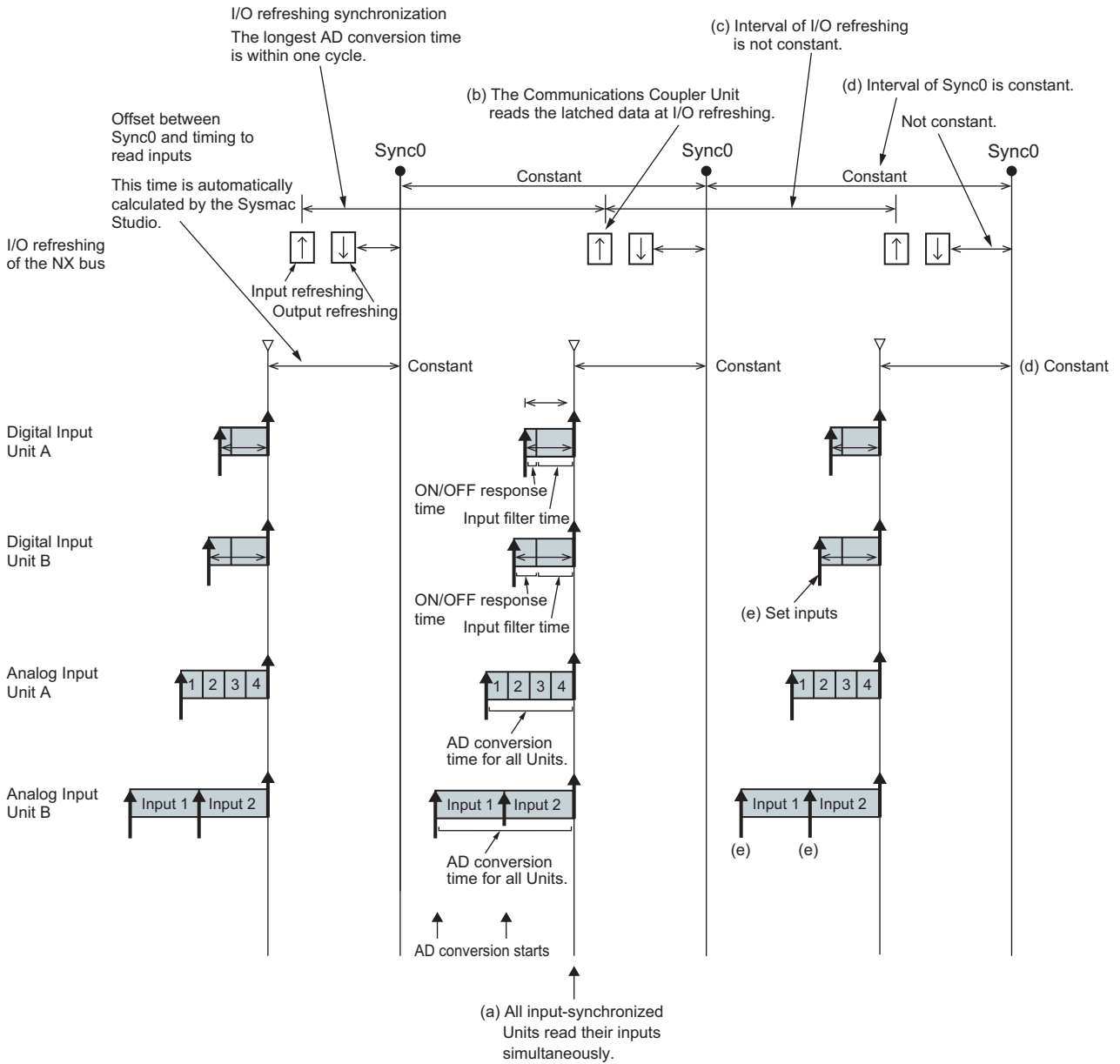
## 5-2-5 Synchronous Input Refreshing

With this I/O refreshing method, the timing to read inputs is synchronized on a fixed interval between more than one NX Unit on the Slave Terminal.

This method is used when the problem such as input timing jitter or offset of timing to read inputs between more than one NX Unit happens.

### Description of Operation

- This method is used when you connect the NX Units that support synchronous I/O refreshing to the EtherCAT Coupler Unit that is connected to the built-in EtherCAT port on the NJ-series CPU Unit.
- All Digital Input Units and Analog Input Units that operate with synchronous input refreshing in the Slave Terminal read their inputs at the same time at a fixed interval bases on Sync0. (Refer to (a) in the figure below.)
- The Communications Coupler Unit reads the input values that are latched at the time to read inputs at immediate I/O refreshing. (Refer to (b) in the figure below.)
- The interval of I/O refreshing varies with the processing conditions of the Communications Coupler Unit or the host communications master. (Refer to (c) in the figure below.) The timing to read inputs will be at a fixed interval. (Refer to (d) in the figure below.)
- The Sync0, the timing to read inputs and the maximum NX bus I/O refresh cycle of the Slave Terminals are automatically calculated by the Sysmac Studio according to the input refresh cycle of the NX Units in the Slave Terminals when the Slave Terminals are configured and set up.
- In order to read input values correctly, you must determine the inputs before the total of the ON/OFF response time and input filter time from the timing to read inputs for each NX Unit. (Refer to (e) in the figure below.)



## Settings

Set the following items.

### ● Adding to the NX Unit Configuration

Enable the distributed clock in the EtherCAT slave parameters on the EtherCAT Coupler Unit that is added to the EtherCAT network configuration and add the NX Units that support synchronous I/O refreshing to the NX Unit configuration.

### ● Setting the Task Period

Set the task period of the primary periodic task.

With the primary periodic task in Configurations and Setup - Task Settings, select the task period in the Period/Execution Conditions from the list.

At this time, set the primary period to a task period in which the value that is greater than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

A warning is given if you set the primary period to a task period in which the value that is smaller than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for a warning on the task periods.

## I/O Port

This uses the I/O ports of the input values.

### ● Four-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 00	BOOL	RO	Input Bit 00	The input value for input bit 00.	FALSE
Input Bit 01	BOOL	RO	Input Bit 01	The input value for input bit 01.	FALSE
Input Bit 02	BOOL	RO	Input Bit 02	The input value for input bit 02.	FALSE
Input Bit 03	BOOL	RO	Input Bit 03	The input value for input bit 03.	FALSE

### ● Eight-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 8 bits	BYTE	RO	Input Bits 8 bits	The input values for 8 bits.	00 hex

- **Sixteen-point Input Units**

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 16 bits	WORD	RO	Input Bits 16 bits	The input values for 16 bits.	0000 hex

- **Thirty-two-point Input Units**

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 32 bits	DWORD	RO	Input Bit 32 bits	The input values for 32 bits.	00000000 hex

- **Thirty-two-point Mixed I/O Units (Input Section)**

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 16 bits	WORD	RO	Input Bits 16 bits	The input values for 16 bits.	0000 hex



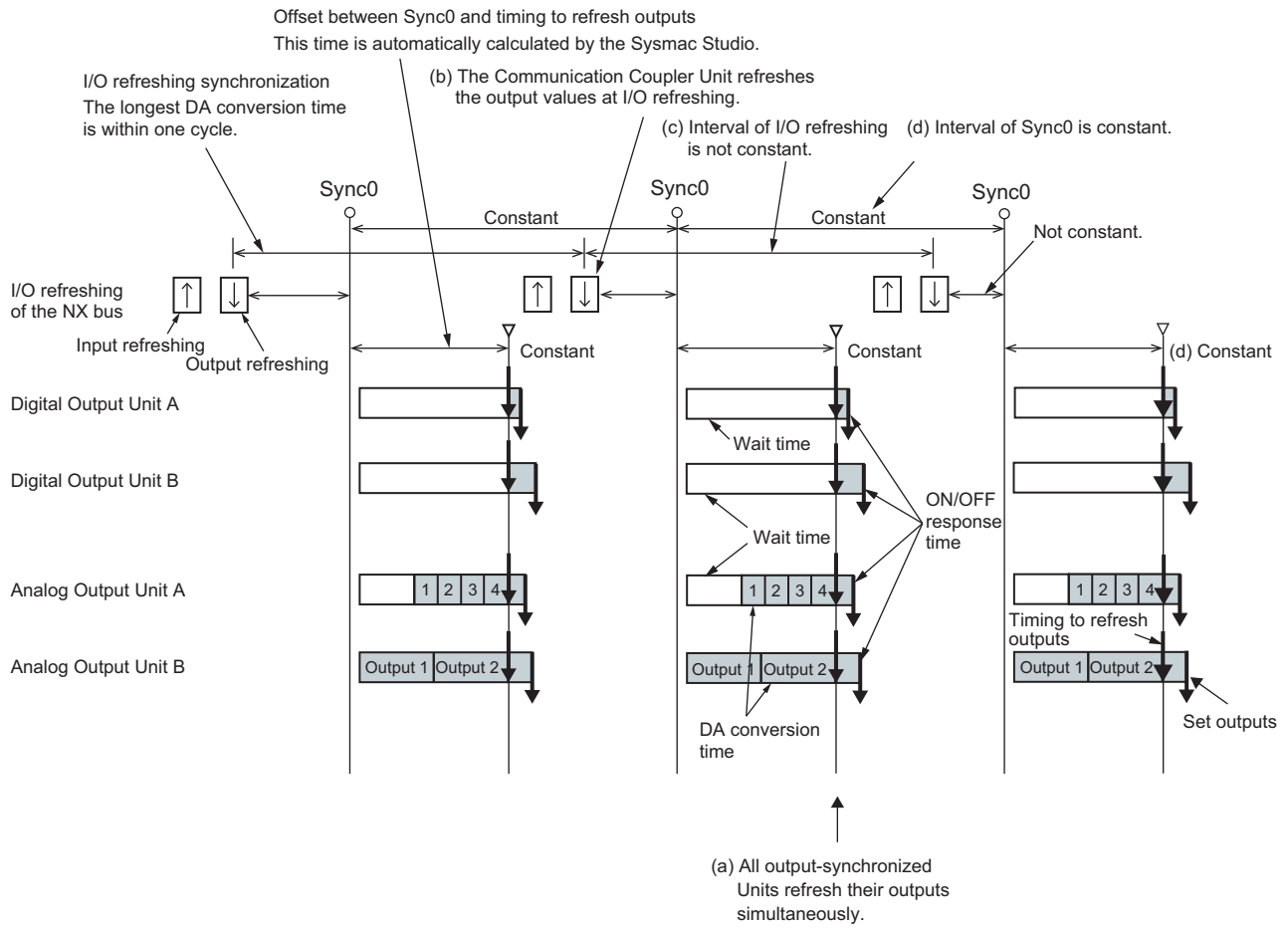
## 5-2-6 Synchronous Output Refreshing

With this I/O refreshing method, the timing to refresh outputs is synchronized on a fixed interval between more than one NX Unit on the Slave Terminal.

This method is used when the problem such as input timing jitter or offset of timing to refresh outputs between more than one NX Unit happens.

### Description of Operation

- This method is used when you connect the NX Units that support synchronous I/O refreshing to the EtherCAT Coupler Unit, that is connected to the built-in EtherCAT port on the NJ-series CPU Unit.
- All Digital Output Units and Analog Output Units that operate with synchronous output refreshing in the Slave Terminal refresh their outputs at the same time at a fixed interval based on Sync0. (Refer to (a) in the figure below.)
- The Communication Coupler Unit refreshes the output values at I/O refreshing. (Refer to (b) in the figure below.)
- The interval of I/O refreshing varies with the processing conditions of the Communications Coupler Unit or the host communications master. (Refer to (c) in the figure below.) The timing to refresh outputs will be at a fixed interval. (Refer to (d) in the figure below.)
- The Sync0, the timing to refresh outputs and the maximum NX bus I/O refresh cycle of the Slave Terminals are automatically calculated by the Sysmac Studio according to the output refresh cycle of the NX Units in the Slave Terminals when the Slave Terminals are configured and set up.
- The ON/OFF response time is needed from the timing to refresh outputs until setting the output status of external terminals on the NX Units. (Refer to (e) in the figure below.)



## Settings

---

Set the following items.

- **Adding to the NX Unit Configuration**

Enable the distributed clock in the EtherCAT slave parameters on the EtherCAT Coupler Unit that is added to the EtherCAT network configuration and add the NX Units that support synchronous I/O refreshing to the NX Unit configuration.

- **Setting the Task Period**

Set the task period of the primary periodic task.

With the primary periodic task in Configurations and Setup - Task Settings, select the task period in the Period/Execution Conditions from the list.

At this time, set the primary period to a task period in which the value that is greater than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

A warning is given if you set the primary period to a task period in which the value that is smaller than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for a warning on the task periods.

## I/O Port

This uses the I/O ports of the output set values.

### ● Two-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 00	BOOL	RW	Output Bit 00	The output set value for output bit 00.	FALSE
Output Bit 01	BOOL	RW	Output Bit 01	The output set value for output bit 01.	FALSE

### ● Four-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 00	BOOL	RW	Output Bit 00	The output set value for output bit 00.	FALSE
Output Bit 01	BOOL	RW	Output Bit 01	The output set value for output bit 01.	FALSE
Output Bit 02	BOOL	RW	Output Bit 02	The output set value for output bit 02.	FALSE
Output Bit 03	BOOL	RW	Output Bit 03	The output set value for output bit 03.	FALSE

### ● Eight-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 8 bits	BYTE	RW	Output Bits 8 bits	The output set values for 8 bits.	00 hex

### ● Sixteen-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 16 bits	WORD	RW	Output Bits 16 bits	The output set values for 16 bits.	0000 hex

### ● Thirty-two-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 32 bits	DWORD	RW	Output Bit 32 bits	The output set values for 32 bits.	00000000 hex

- **Thirty-two-point Mixed I/O Units (Output Section)**

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 16 bits	WORD	RW	Output Bits 16 bits	The output set values for 16 bits.	0000 hex

### 5-2-7 Time Stamp Refreshing

With this I/O refreshing method, the NX Units record the DC times when inputs change or perform outputs at specified DC times. These times are asynchronous to the NX bus refresh cycles.

Data exchange between the NX Units and EtherCAT Coupler Unit are performed cyclically on the NX bus refresh cycles.

There are the following two I/O refreshing methods.

- Input refreshing with input changed time
- Output refreshing with specified time stamp

Each of these I/O refreshing methods is described below.

## 5-2-8 Input Refreshing with Input Changed Time

With this I/O refreshing method, the Input Units record the DC times when the inputs changed. The DC times are asynchronous to the NX bus refresh cycles.

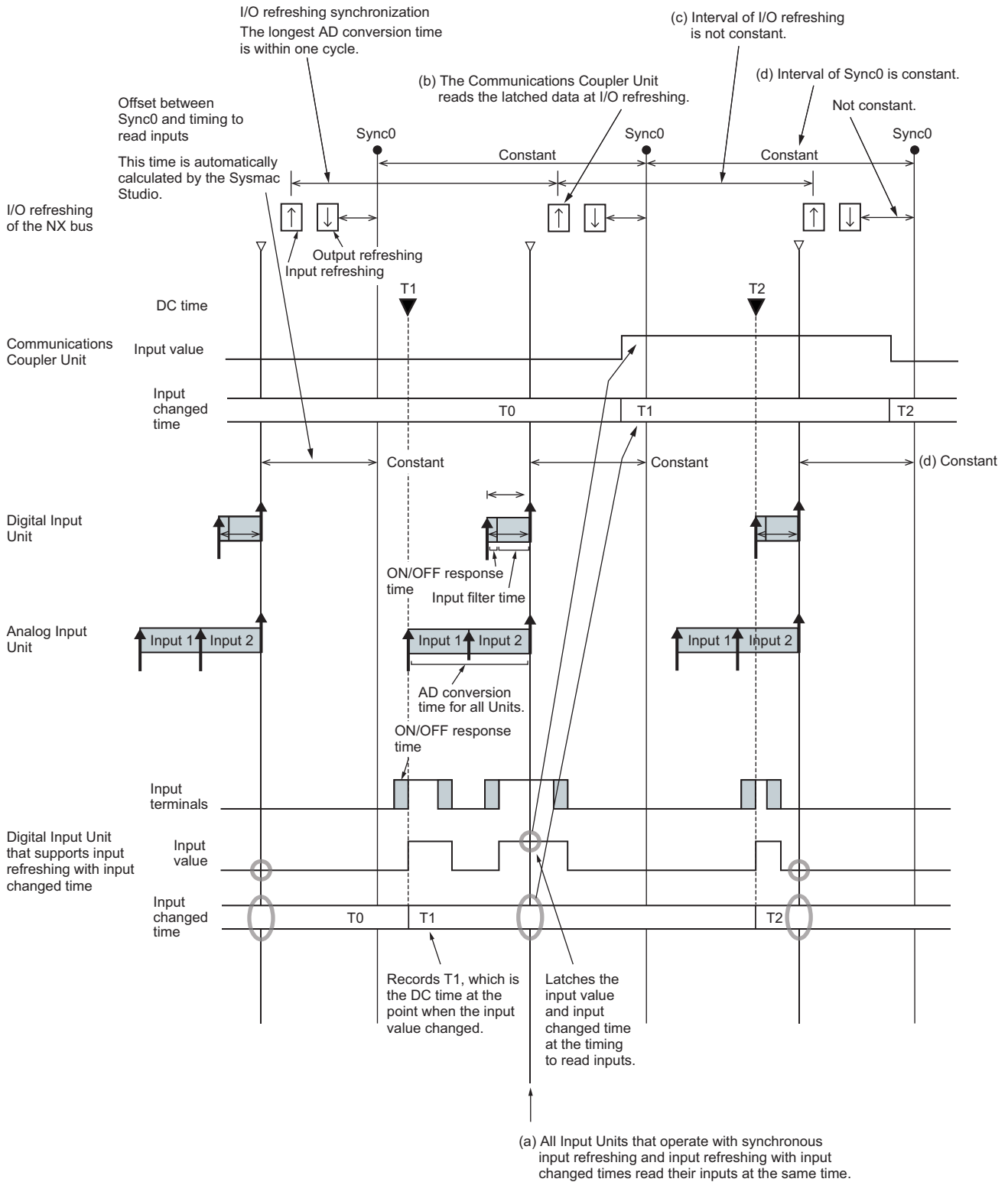
The EtherCAT Coupler Unit cyclically reads both the input values and the DC times when the inputs changed on the NX bus refresh cycles.

In the descriptions below, the DC time when the input changed is called the input changed time.

You can use the Input Units that support input refreshing with input changed time with the Output Units that support output refreshing with specified time stamp to control an output at a fixed interval after a sensor input changes.

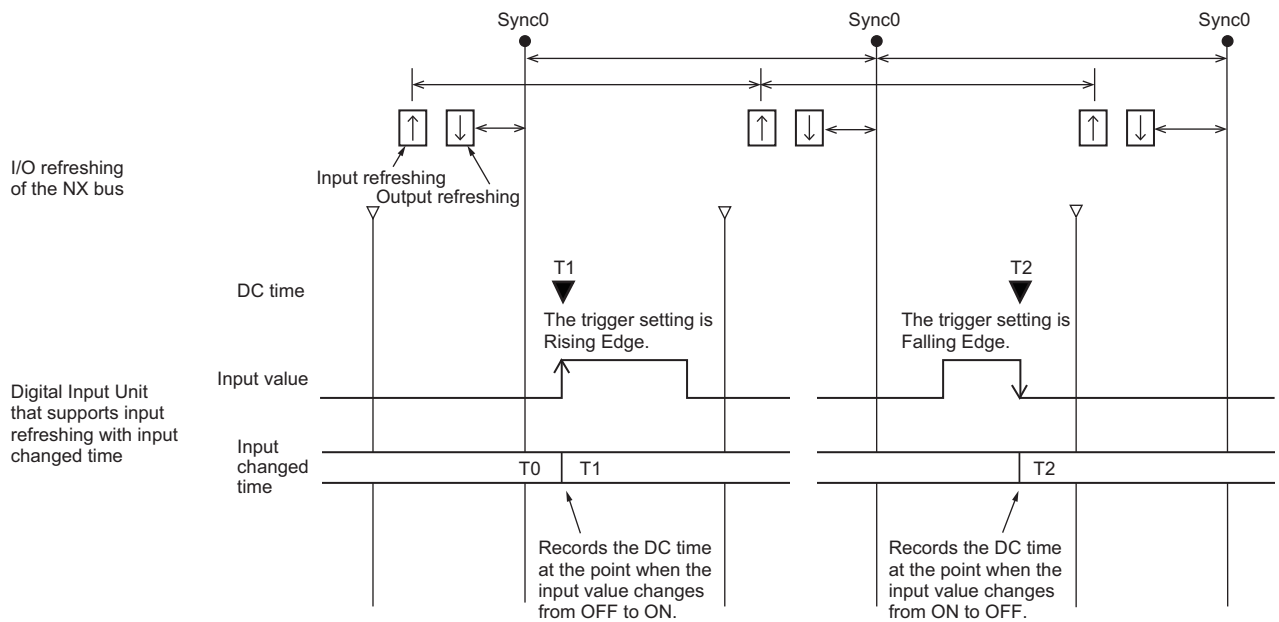
### Description of Operation

- This method is used when you connect the NX Units that support input refreshing with input changed time to the EtherCAT Coupler Unit, that is connected to the built-in EtherCAT port on the NJ-series CPU Unit.
- The NX Units that support input refreshing with input changed time record the DC times when an input changes for each input bit. The DC times that the Units record are the DC times for which the status changes of the input terminals passed the ON/OFF response time and reached the internal circuits.
- The EtherCAT Coupler Unit reads the input values and the input changed times from the NX Units at I/O refreshing. The input values that the EtherCAT Coupler Unit read are not the values at the point when the input change times were recorded, but the values at I/O refreshing.
- All Digital Input Units and Analog Input Units that operate with synchronous input refreshing and input refreshing with input changed times in the Slave Terminal read their inputs at the same time at a fixed interval based on Sync0. (Refer to (a) in the figure below.)
- The EtherCAT Coupler Unit latches the input values on the input read timing and then reads them during the next I/O refresh. (Refer to (b) in the figure below.)
- The interval of I/O refreshing varies with the processing conditions of the EtherCAT Coupler Unit or the EtherCAT master. (Refer to (c) in the figure below.) The timing to read inputs will be at a fixed interval. (Refer to (d) in the figure below.)
- Sync0, the timing of reading inputs, and the maximum NX bus I/O refresh cycle for multiple Slave Terminals are automatically calculated by the Sysmac Studio according to the input refresh cycles of the NX Units in the Slave Terminals when the Slave Terminals are configured and set up.

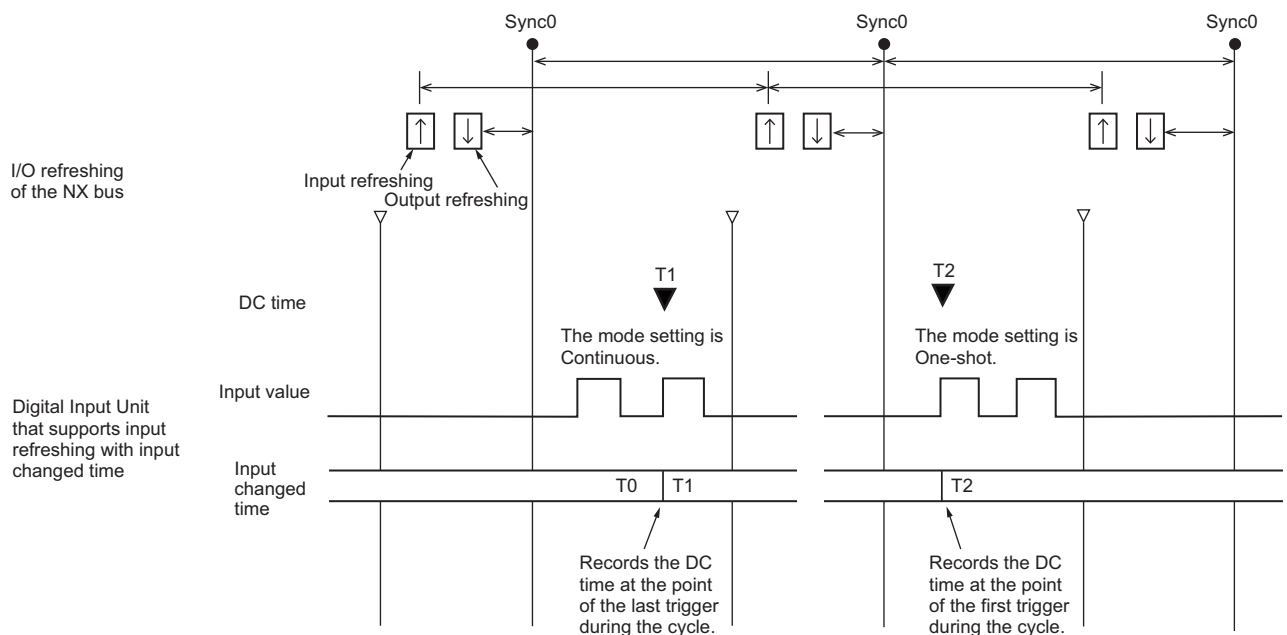




- You can select to either detect changes at the input rising edge, or at the input falling edge. Make the setting in advance.



- NX Units that support input refreshing with input changed time do not have an input filter function.
- You can select at which point the input changed times are recorded when the inputs change more than one time during the NX bus I/O refresh cycle. Make the setting in advance.



- The input changed times are retained if the inputs do not change.
- Sync0, the timing of reading inputs, and the maximum NX bus I/O refresh cycle for multiple Slave Terminals are automatically calculated by the Sysmac Studio according to the input refresh cycles of the NX Units in the Slave Terminals when the Slave Terminals are configured and set up.

## Settings

Set the following items.

### ● Adding to the NX Unit Configuration

Enable the distributed clock in the EtherCAT slave parameters on the EtherCAT Coupler Unit that is added to the EtherCAT network configuration and add the NX Units that support input refreshing with input changed time to the NX Unit configuration.

### ● Setting the Task Period

Set the task period of the primary periodic task.

With the primary periodic task in Configurations and Setup - Task Settings, select the task period in the Period/Execution Conditions from the list.

At this time, set the primary period to a task period in which the value that is greater than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

A warning is given if you set the primary period to a task period in which the value that is smaller than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for a warning on the task periods.



### Additional Information

Do not disable the distributed clock. If it is disabled, the input refreshing with input changed time will not operate correctly. However, an error does not occur even if it is disabled.

If the distributed clock is disabled, the input values reflect the actual input status, but the input changed times retain the default values and do not change.

### ● Editing NX Unit Operation Settings

Four-point Input Units

Setting name	Description	Default value	Unit
Input Bit 00 Trigger Setting	Set the trigger to read the input changed time. FALSE: Rising Edge TRUE: Falling Edge	FALSE	-
Input Bit 01 Trigger Setting			
Input Bit 02 Trigger Setting			
Input Bit 03 Trigger Setting			
Input Bit 00 Mode Setting	Set the operation mode to read the input changed time. FALSE: Continuous (Last changed time) TRUE: One-shot (First changed time)	FALSE	-
Input Bit 01 Mode Setting			
Input Bit 02 Mode Setting			
Input Bit 03 Mode Setting			

## I/O Port

This uses the I/O ports of the input values.

### ● Four-point Input Units

I/O port name	Type	R/W	Name	Description	Default value	Unit
Input Bit 00	BOOL	RO	Input Bit 00	The input value for input bit 00.	FALSE	–
Input Bit 01	BOOL	RO	Input Bit 01	The input value for input bit 01.	FALSE	–
Input Bit 02	BOOL	RO	Input Bit 02	The input value for input bit 02.	FALSE	–
Input Bit 03	BOOL	RO	Input Bit 03	The input value for input bit 03.	FALSE	–
Input Bit 00 Time Stamp	ULINT	RO	Input Bit 00 Time Stamp	The input changed time for input bit 00.	0	ns
Input Bit 01 Time Stamp	ULINT	RO	Input Bit 01 Time Stamp	The input changed time for input bit 01.	0	ns
Input Bit 02 Time Stamp	ULINT	RO	Input Bit 02 Time Stamp	The input changed time for input bit 02.	0	ns
Input Bit 03 Time Stamp	ULINT	RO	Input Bit 03 Time Stamp	The input changed time for input bit 03.	0	ns

### 5-2-9 Output Refreshing with Specified Time Stamp

With this I/O refreshing method, the Output Units refresh outputs at the DC times specified by the user program. The specified DC times are asynchronous to the NX bus refresh cycles.

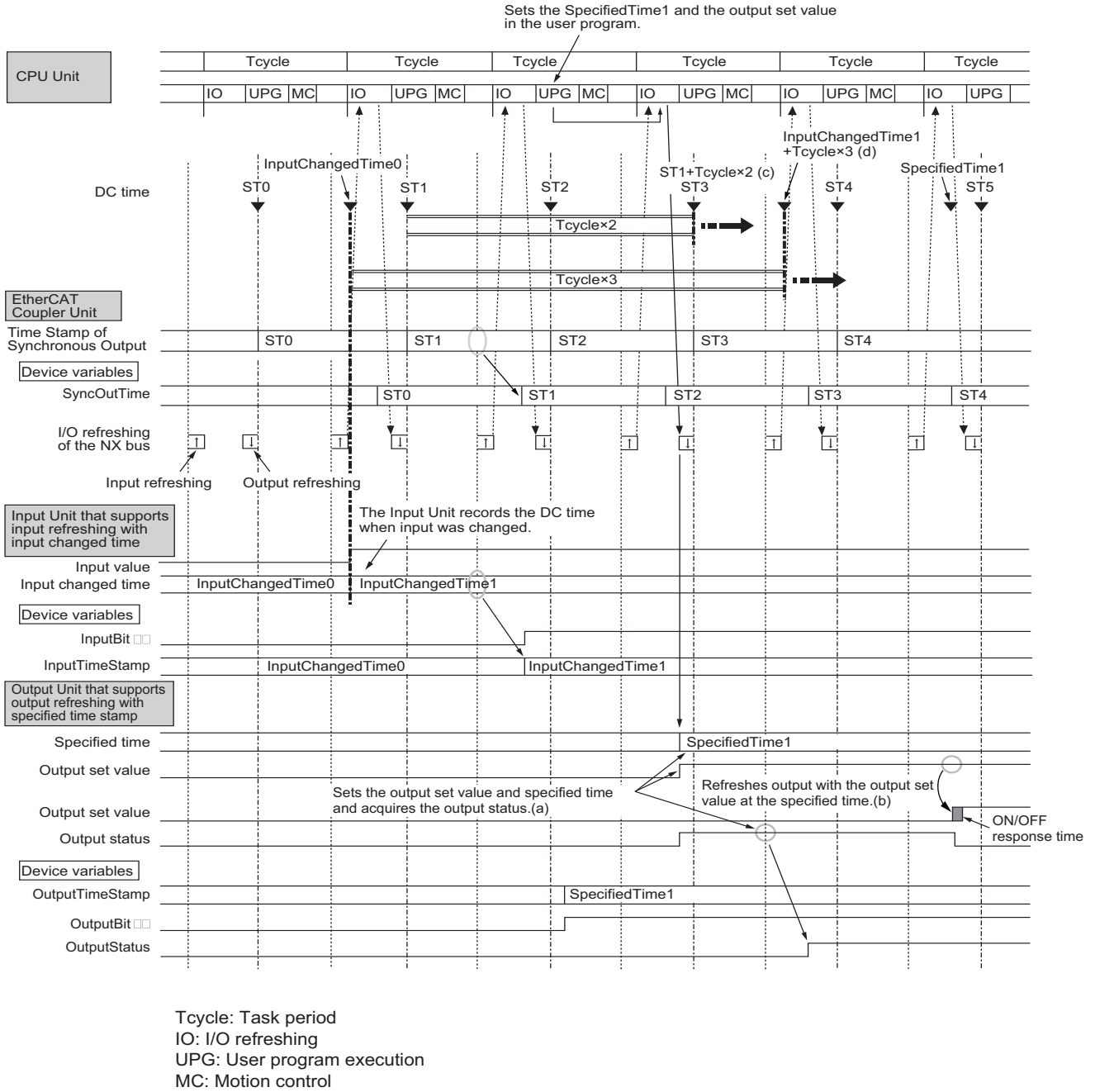
The EtherCAT Coupler Unit cyclically sets the output set values and the DC times to refresh outputs to the Output Units on the NX bus refresh cycles.

In the descriptions below, the DC time to refresh the output is called the specified time.

You can use the Input Units that support input refreshing with input changed time with the Output Units that support output refreshing with specified time stamp to control outputs at fixed intervals after the sensor inputs change.

## Description of Operation

- This method is used when you connect the NX Units that support output refreshing with specified time stamp to the EtherCAT Coupler Unit, that is connected to the built-in EtherCAT port on the NJ-series CPU Unit.
- You can specify the specified time and the output set value for each output bit. You can also set the same specified time for multiple output bits.
- The EtherCAT Coupler Unit sets the output set values and the specified times to the NX Units and acquires the output status at I/O refreshing. (Refer to (a) in the figure below.)
- The output status is used when you determine that the output was refreshed normally at the specified time. Refer to *5-2-10 An Example of Turning ON Outputs at Specific Times After the Sensor Inputs Change* on page 5-29 for an example of determining that the output was refreshed.
- The NX Units turn ON the output status when the specified times are set.
- The NX Units refresh outputs and turn OFF the output status at the specified times. The values of outputs that the NX Units refresh are the output set values at the specified times. (Refer to (b) in the figure below.)
- The ON/OFF response time is needed from the specified time until setting the output status of external terminals on the NX Units.
- If the next specified time is set before the current specified time is reached, the NX Units overwrite the current specified time to the next specified time. The current specified time is ignored.
- If the value of the specified time is 0, the output is refreshed immediately. At this time, the Output Units refresh outputs according to the output set values.
- When the specified time is set to the NX Units, if the specified time is a previous DC time, a Previous Time Specified event (event code: 7001000 hex) occurs.
- To make the specified time as a future DC time when it is set to the NX Units, set the specified time to satisfy both the following conditions.
  - a) A future DC time at least twice the task period from the previous value of the Time Stamp of Synchronous Output (Refer to (c) in the figure below.)
  - b) A future DC time at least three times the task period from the input changed time read from the Input Units that support input refreshing with input changed time (Refer to (d) in the figure below.)
- The Time Stamp of Synchronous Output is one of I/O data in the EtherCAT Coupler Unit, and contains the DC time of synchronous outputs from the NX Unit. By default, it is not assigned to the I/O entry mapping, so edit the settings and assign it to the I/O entry mapping. The added I/O data is 0x200A: 02 (Time Stamp of Synchronous Output).



**Additional Information**

With the NX\_DOutTimeStamp instruction, if you set a previous DC time unintentionally, a Previous Time Specified event will not occur and you can refresh the output immediately. Refer to the *NJ-series Instructions Reference Manual* (Cat. No. W502-E1-08 or later) for details on the NX\_DOutTimeStamp instruction.

## Settings

---

Set the following items.

### ● Adding to the NX Unit Configuration

Enable the distributed clock in the EtherCAT slave parameters on the EtherCAT Coupler Unit that is added to the EtherCAT network configuration and add the NX Units that support output refreshing with specified time stamp to the NX Unit configuration.

### ● Setting the Task Period

Set the task period of the primary periodic task.

With the primary periodic task in Configurations and Setup - Task Settings, select the task period in the Period/Execution Conditions from the list.

At this time, set the primary period to a task period in which the value that is greater than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

A warning is given if you set the primary period to a task period in which the value that is smaller than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for a warning on the task periods.



### Additional Information

---

Do not disable the distributed clock. If it is disabled, the output refreshing with specified time stamp will not operate correctly. However, an error does not occur even if it is disabled.

If the distributed clock is disabled, outputs are not refreshed regardless of the output set values and values of the specified time.

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## I/O Port

This uses the I/O ports of the output set values.

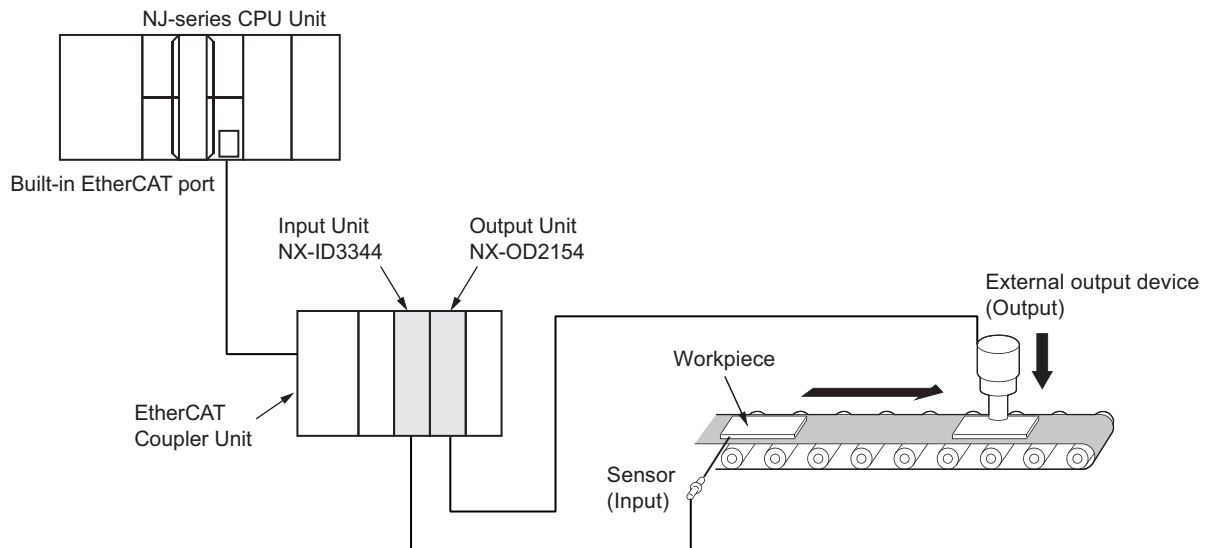
### ● Two-point Output Units

I/O port name	Type	R/W	Name	Description	Default value	Unit
Output Bit 00	BOOL	RW	Output Bit 00	The output set value for output bit 00.	FALSE	–
Output Bit 01	BOOL	RW	Output Bit 01	The output set value for output bit 01.	FALSE	–
Output Bit 00 Time Stamp	ULINT	RW	Output Bit 00 Time Stamp	The specified operation time for output bit 00. If the value is 0, the output is refreshed immediately.	0	ns
Output Bit 01 Time Stamp	ULINT	RW	Output Bit 01 Time Stamp	The specified operation time for output bit 01. If the value is 0, the output is refreshed immediately.	0	ns
Output Bit 00 Output Status	BOOL	RO	Output Bit 00 Output Status	The specified time output status for output bit 00.	FALSE	–
Output Bit 01 Output Status	BOOL	RO	Output Bit 01 Output Status	The specified time output status for output bit 01.	FALSE	–



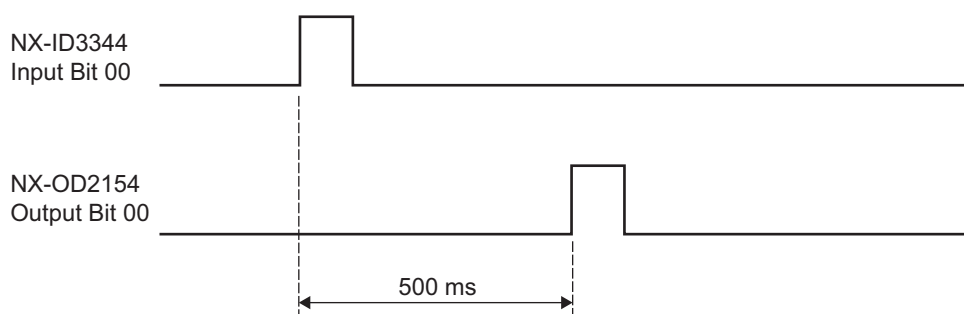
## 5-2-10 An Example of Turning ON Outputs at Specific Times After the Sensor Inputs Change

The following shows an example that uses an Input Unit NX-ID3344 that supports input refreshing with input changed time and an Output Unit NX-OD2154 that supports output refreshing with specified time stamp to turn ON the output to the external output device at a specific time after the input changed time from the sensor.



### Specifications of Sample Programming

- In this example, 500 ms after the sensor input that is connected to input bit 00 of an Input Unit NX-ID3344 changes to ON, output bit 00 of an Output Unit NX-OD2154 changes to ON.



- The following determinations are performed to normally operate the programming.
  - When the specified time is set to an Output Unit NX-OD2154, the validity of the specified time is determined to make sure that the specified time is not a previous DC time.
  - With an Output Unit NX-OD2154, the output was normally refreshed at the specified time is determined.

## Network Configuration

The network configuration is as follows.

A Slave Terminal with the following configuration is connected at EtherCAT node address 1. The device names that are given in the following table are used.

Unit number	Model	Unit	Device name
0	NX-ECC201	EtherCAT Coupler Unit	E001
1	NX-ID3344	Digital Input Unit that supports input refreshing with input changed time	N1
2	NX-OD2154	Digital Output Unit that supports output refreshing with specified time stamp	N2

## Task Settings

The task period of the primary periodic task is 1 ms.

## Unit Operation Settings

The Unit operation settings of the Input Unit NX-ID3344 are as follows.

Item	Set value	Meaning
Time Stamp (Trigger Setting) : Input Bit 00 Trigger Setting	FALSE	Trigger to read the input changed time: Rising Edge
Time Stamp (mode Setting) : Input Bit 00 Mode Setting	FALSE	Operation mode to read the input changed time: Continuous (Last changed time)

## I/O Map

The following I/O map settings are used.

However, add 0x200A: 02 (Time Stamp of Synchronous Output) to an I/O entry mapping of the Ether-CAT Coupler Unit.

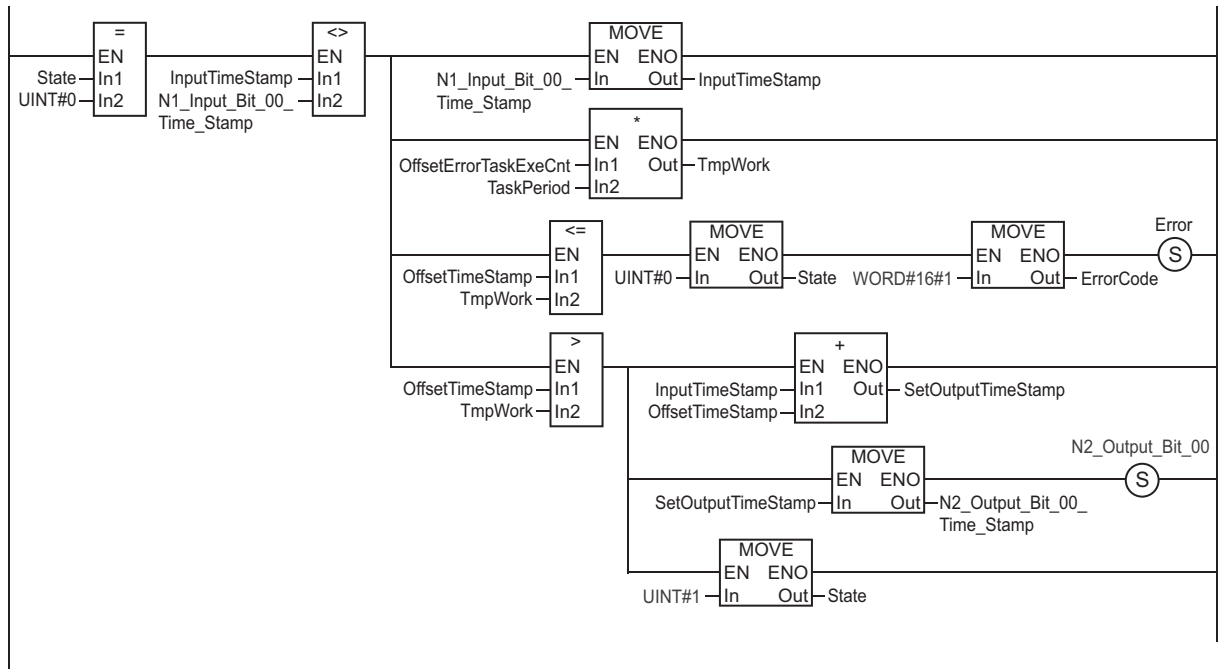
Position	Port	Description	R/W	Data type	Variable	Variable type
Node1	Time Stamp of Synchronous Output	Contains the time stamp for the timing of synchronous outputs from the connected NX Unit. (Unit: ns)	R	ULINT	E001_Time_Stamp_of_Synchronous_Output	Global variable
Unit1	Input Bit 00 Time Stamp	Input changed time for input bit 00	R	ULINT	N1_Input_Bit_00_Time_Stamp	Global variable
Unit2	Output Bit 00 Time Stamp	Specified time for output bit 00	W	ULINT	N2_Output_Bit_00_Time_Stamp	Global variable
Unit2	Output Bit 00	Output bit 00	W	BOOL	N2_Output_Bit_00	Global variable
Unit2	Output Bit 00 Output Status	Output status 00	R	BOOL	N2_Output_Bit_00_Output_Status	Global variable

## LD

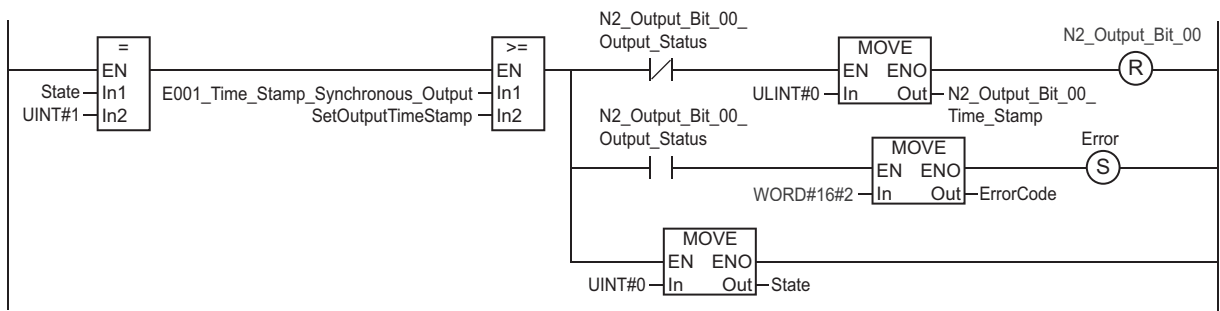
Internal Variables	Name	Data type	Default value	Comment
	State	UINT	0	Internal status of program
	Error	BOOL	FALSE	Error flag
	ErrorCode	WORD	16#0000	Error code
	InputTimeStamp	ULINT	0	Recorded input changed time
	SetOutputTimeStamp	ULINT	0	DC time set for the specified time
	OffsetTimeStamp	ULINT	ULINT#500000000	Time from the input changed time until the specified time (ms)
	OffsetErrorTaskExeCnt	ULINT	ULINT#3	Error criteria for specified time
	TaskPeriod	ULINT	ULINT#1000000	Task period (ms)
	TmpWork	ULINT	-	Workpiece for determining specified time error

External Variables	Name	Data type	Comment
	E001_Time_Stamp_of_Synchronous_Output	ULINT	DC time for the timing of synchronous outputs from the NX Unit
	N1_Input_Bit_00_Time_Stamp	ULINT	Input changed time for input bit 00
	N2_Output_Bit_00	BOOL	Output bit 00
	N2_Output_Bit_00_Time_Stamp	ULINT	Specified time for output bit 00
	N2_Output_Bit_00_Output_Status	BOOL	Output status for output bit 00

- 0 State0: Wait for input bit 00 to change.  
If the specified time is 3 task periods or less, error end.  
Transit to set the specified time and to check the output.



- 1 State1: Check the output.  
Check the output status after the specified time has passed.  
Output error or output completion (Turn OFF the output.).



## ST

Internal Variables	Name	Data type	Default value	Comment
	State	UINT	0	Internal status of program
	Error	BOOL	FALSE	Error flag
	ErrorCode	WORD	16#0000	Error code
	InputTimeStamp	ULINT	0	Recorded input changed time
	SetOutputTimeStamp	ULINT	0	DC time set for the specified time
	OffsetTimeStamp	ULINT	ULINT#500000000	Time from the input changed time until the specified time (ms)
	OffsetErrorTaskExeCnt	ULINT	ULINT#3	Error criteria for specified time
	TaskPeriod	ULINT	ULINT#1000000	Task period (ms)

External Variables	Name	Data type	Comment
	E001_Time_Stamp_of_Synchronous_Output	ULINT	DC time for the timing of synchronous outputs from the NX Unit
	N1_Input_Bit_00_Time_Stamp	ULINT	Input changed time for input bit 00
	N2_Output_Bit_00	BOOL	Output bit 00
	N2_Output_Bit_00_Time_Stamp	ULINT	Specified time for output bit 00
	N2_Output_Bit_00_Output_Status	BOOL	Output status for output bit 00

```

CASE State OF
0:    //Wait for input bit 00 to change.
      IF( InputTimeStamp <> N1_Input_Bit_00_Time_Stamp )THEN

          InputTimeStamp:=N1_Input_Bit_00_Time_Stamp;    //Save the input changed time for input bit 00.

          IF( OffsetTimeStamp <= (OffsetErrorTaskExeCnt * TaskPeriod) )THEN
              //If the specified time is 3 task periods or less, error end.
              State:=0;                                //Transit to waiting for input bit 00 to change.
              Error:=TRUE;                            //Error registration
              ErrorCode:=WORD#16#0001;
          ELSE
              //Set the specified time.
              SetOutputTimeStamp:=InputTimeStamp+OffsetTimeStamp;
              N2_Output_Bit_00_Time_Stamp:=SetOutputTimeStamp;
              N2_Output_Bit_00:=TRUE;
              State:=1;                                //Transit to output check.
          END_IF;
      END_IF;

1:    //Check the output.
      IF( E001_Time_Stamp_of_Synchronous_Output < SetOutputTimeStamp )THEN
          ; //Continue output check because the specified time has not been reached.
      ELSE
          //Check the output status because the specified time has passed.
          IF( N2_Output_Bit_00_Output_Status=FALSE )THEN
              //Output completion
              N2_Output_Bit_00_Time_Stamp:=0;
              N2_Output_Bit_00:=FALSE;                //Turn OFF the output.
              State:=0;                                //Transit to waiting for input bit 00 to change.
          ELSE
              //Output error
              Error:=TRUE;                            //Error registration
              ErrorCode:=WORD#16#0002;
              State:=0;                                //Transit to waiting for input bit 00 to change.
          END_IF;
      END_IF;
ELSE
;
END_CASE;

```





# 6

## Digital Input Units

This section describes the types and functions of Digital Input Units.

---

<b>6-1</b>	<b>Types of Digital Input Units</b> .....	<b>6-2</b>
<b>6-2</b>	<b>Specifications of I/O Data</b> .....	<b>6-4</b>
6-2-1	Allocable I/O Data .....	6-4
<b>6-3</b>	<b>List of Settings</b> .....	<b>6-7</b>
<b>6-4</b>	<b>Function</b> .....	<b>6-13</b>
6-4-1	List of Digital Input Unit Functions .....	6-13
6-4-2	Input Filter .....	6-14

## 6-1 Types of Digital Input Units

Digital Input Units are parts of NX Units, and process inputs of digital signals (ON/OFF signals). The Digital Input Unit types are described below.

### DC Input Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-ID3317	4 points	NPN	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 $\mu$ s max./400 $\mu$ s max.	P. A-7
NX-ID3343			24 VDC	Input refreshing with input changed time only	100 ns max./100 ns max.	P. A-8
NX-ID3344						P. A-9
NX-ID3417		PNP	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 $\mu$ s max./400 $\mu$ s max.	P. A-10
NX-ID3443						100 ns max./100 ns max.
NX-ID3444			Input refreshing with input changed time only	P. A-12		
NX-ID4342	8 points	NPN	24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 $\mu$ s max./400 $\mu$ s max.	P. A-13
NX-ID4442		PNP				P. A-14
NX-ID5342	16 points	NPN				P. A-15
NX-ID5442		PNP				P. A-16

### DC Input Units (MIL Connector, 30 mm Width)

Model	Number of points	Internal I/O common	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-ID5142-5	16 points	For both NPN/PNP	24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 $\mu$ s max./400 $\mu$ s max.	P. A-17
NX-ID6142-5	32 points	For both NPN/PNP	24 VDC			P. A-19

## AC Input Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-IA3117	4 points	200 to 240 VAC, 50/60 Hz (170 to 264 VAC, $\pm 3$ Hz)	Free-Run refreshing	10 ms max./40 ms max.	P. A-22

## 6-2 Specifications of I/O Data

This section describes I/O data for the Digital Input Units.

### 6-2-1 Allocable I/O Data

This section describes the allocable I/O data in the Digital Input Unit.

An I/O entry mapping is assigned to the I/O allocation settings for the Digital Input Unit.

A specific I/O entry is assigned to the I/O entry mapping for each NX Unit model. These allocations are fixed, so you cannot add others or change them.

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.

To assign the I/O allocation information of the EtherCAT Slave Terminal to an NJ-series CPU Unit, use the I/O ports for the allocated I/O data.

## NX Units in Free-Run Refreshing or Synchronous I/O Refreshing

### ● Four-point Input Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex
Input Bit 00	The input value for input bit 00.	BOOL	FALSE	Input Bit 00	6000 hex	01 hex
Input Bit 01	The input value for input bit 01.	BOOL	FALSE	Input Bit 01		02 hex
Input Bit 02	The input value for input bit 02.	BOOL	FALSE	Input Bit 02		03 hex
Input Bit 03	The input value for input bit 03.	BOOL	FALSE	Input Bit 03		04 hex

### ● Eight-point Input Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex
Input Bit 8 bits	The input values for 8 bits. The following 8 BOOL data are included.	BYTE	00 hex	Input Bit 8 bits	6001 hex	01 hex
Input Bit 00	The input value for input bit 00.	BOOL	FALSE	Input Bit 00		
Input Bit 01	The input value for input bit 01.	BOOL	FALSE	Input Bit 01		
Input Bit 02	The input value for input bit 02.	BOOL	FALSE	Input Bit 02		
Input Bit 03	The input value for input bit 03.	BOOL	FALSE	Input Bit 03		
Input Bit 04	The input value for input bit 04.	BOOL	FALSE	Input Bit 04		
Input Bit 05	The input value for input bit 05.	BOOL	FALSE	Input Bit 05		
Input Bit 06	The input value for input bit 06.	BOOL	FALSE	Input Bit 06		
Input Bit 07	The input value for input bit 07.	BOOL	FALSE	Input Bit 07		

### ● Sixteen-point Input Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex
Input Bit 16 bits	The input values for 16 bits. The following 16 BOOL data are included.	WORD	0000 hex	Input Bit 16 bits	6002 hex	01 hex
Input Bit 00	The input value for input bit 00.	BOOL	FALSE	Input Bit 00		
Input Bit 01	The input value for input bit 01.	BOOL	FALSE	Input Bit 01		
•						
•						
•						
Input Bit 15	The input value for input bit 15.	BOOL	FALSE	Input Bit 15		

### ● Thirty-two-point Input Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex
Input Bit 32 bits	The input values for 32 bits. The following 32 BOOL data are included.	DWORD	00000000 hex	Input Bit 32 bits	6003 hex	01 hex
Input Bit 00	The input value for input bit 00.	BOOL	FALSE	Input Bit 00		
Input Bit 01	The input value for input bit 01.	BOOL	FALSE	Input Bit 01		
• • •						
Input Bit 31	The input value for input bit 31.	BOOL	FALSE	Input Bit 31		

## NX Units in Input Refreshing with Input Changed Time

### ● Four-point Input Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex	Unit
Input Bit 00	The input value for input bit 00.	BOOL	FALSE	Input Bit 00	6000 hex	01 hex	–
Input Bit 01	The input value for input bit 01.	BOOL	FALSE	Input Bit 01		02 hex	–
Input Bit 02	The input value for input bit 02.	BOOL	FALSE	Input Bit 02		03 hex	–
Input Bit 03	The input value for input bit 03.	BOOL	FALSE	Input Bit 03		04 hex	–
Input Bit 00 Time Stamp	The input changed time for input bit 00.	ULINT	0	Input Bit 00 Time Stamp	6010 hex	01 hex	ns
Input Bit 01 Time Stamp	The input changed time for input bit 01.	ULINT	0	Input Bit 01 Time Stamp		02 hex	ns
Input Bit 02 Time Stamp	The input changed time for input bit 02.	ULINT	0	Input Bit 02 Time Stamp		03 hex	ns
Input Bit 03 Time Stamp	The input changed time for input bit 03.	ULINT	0	Input Bit 03 Time Stamp		04 hex	ns

## 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 Digital Input Units.

The settings are reflected after the Unit is restarted.



### Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Sysmac Studio is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

## NX Units in Free-Run Refreshing or Synchronous I/O Refreshing

### ● Four-point Input Units

NX-ID3317/ID3417/IA3117

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Input Filter Value Setting	Set the filter time of input signal. *1	*1	*1	–	5000 hex	01 hex	P. 6-14
Input Filter Mode Setting	Set the operating mode for the filter. *2	*2	*2	–		02 hex	

\*1. The descriptions of Input Filter Value Setting are as follows.

Set value	Setting description	Default value	Setting range
0	No Filter	3	0 to 11
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 ms		

\*2. The descriptions of Input Filter Mode Setting are as follows.

Set value	Setting description	Default value	Setting range
0	Enable ON Filter and OFF Filter	0	0/1
1	Enable Only OFF Filter		

NX-ID3343/ID3443

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Input Filter Value Setting	Set the filter time of input signal. *1	*1	*1	-	5001 hex	01 hex	P. 6-14
Input Filter Mode Setting	Set the operating mode for the filter. *2	*2	*2			02 hex	

\*1. The descriptions of Input Filter Value Setting are as follows.

Set value	Setting description	Default value	Setting range
0	No Filter	4	0 to 9
1	1 $\mu$ s		
2	2 $\mu$ s		
3	4 $\mu$ s		
4	8 $\mu$ s		
5	16 $\mu$ s		
6	32 $\mu$ s		
7	64 $\mu$ s		
8	128 $\mu$ s		
9	256 $\mu$ s		

\*2. The descriptions of Input Filter Mode Setting are as follows.

Set value	Setting description	Default value	Setting range
0	Enable ON Filter and OFF Filter	0	0/1
1	Enable Only OFF Filter		



## ● Eight-point Input Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Input Filter Value Setting	Set the filter time of input signal. *1	*1	*1	–	5000 hex	01 hex	P. 6-14
Input Filter Mode Setting	Set the operating mode for the filter. *2	*2	*2	–		02 hex	

\*1. The descriptions of Input Filter Value Setting are as follows.

Set value	Setting description	Default value	Setting range
0	No Filter	3	0 to 11
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 ms		

\*2. The descriptions of Input Filter Mode Setting are as follows.

Set value	Setting description	Default value	Setting range
0	Enable ON Filter and OFF Filter	0	0/1
1	Enable Only OFF Filter		

### ● Sixteen-point Input Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Input Filter Value Setting	Set the filter time of input signal. *1	*1	*1	–	5000 hex	01 hex	P. 6-14
Input Filter Mode Setting	Set the operating mode for the filter. *2	*2	*2	–		02 hex	P. 6-14

\*1. The descriptions of Input Filter Value Setting are as follows.

Set value	Setting description	Default value	Setting range
0	No Filter	3	0 to 11
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 ms		

\*2. The descriptions of Input Filter Mode Setting are as follows.

Set value	Setting description	Default value	Setting range
0	Enable ON Filter and OFF Filter	0	0/1
1	Enable Only OFF Filter		

## ● Thirty-two-point Input Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Input Filter Value Setting	Set the filter time of input signal. *1	*1	*1	–	5000 hex	01 hex	P. 6-14
Input Filter Mode Setting	Set the operating mode for the filter. *2	*2	*2	–		02 hex	P. 6-14

\*1. The descriptions of Input Filter Value Setting are as follows.

Set value	Setting description	Default value	Setting range
0	No Filter	3	0 to 11
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 ms		

\*2. The descriptions of Input Filter Mode Setting are as follows.

Set value	Setting description	Default value	Setting range
0	Enable ON Filter and OFF Filter	0	0/1
1	Enable Only OFF Filter		

## NX Units in Input Refreshing with Input Changed Time

### ● Four-point Input Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Input Bit 00 Trigger Setting	Set the trigger to read the input changed time. FALSE: Rising Edge TRUE: Falling Edge	FALSE	TRUE or FALSE	-	5005 hex	01 hex	P. 5-21
Input Bit 01 Trigger Setting						02 hex	
Input Bit 02 Trigger Setting						03 hex	
Input Bit 03 Trigger Setting						04 hex	
Input Bit 00 Mode Setting	Set the operation mode to read the input changed time. FALSE: Continuous (Last changed time) TRUE: One-shot (First changed time)	FALSE	TRUE or FALSE	-	5006 hex	01 hex	P. 5-21
Input Bit 01 Mode Setting						02 hex	
Input Bit 02 Mode Setting						03 hex	
Input Bit 03 Mode Setting						04 hex	

## 6-4 Function

This section describes the Digital Input Unit functions.

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

### 6-4-1 List of Digital Input Unit Functions

Function name	Description	Reference
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.	5-2-4 <i>Free-Run Refreshing</i> on page 5-5
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	5-2-5 <i>Synchronous Input Refreshing</i> on page 5-9
Time Stamp Refreshing	With this I/O refreshing method, the NX Units record the DC times when inputs change or perform outputs at specified DC times. These times are asynchronous to the NX bus refresh cycles. Data exchange between the NX Units and EtherCAT Coupler Unit are performed cyclically on the NX bus refresh cycles.	5-2-7 <i>Time Stamp Refreshing</i> on page 5-18
Input refreshing with input changed time	With this I/O refreshing method, the Input Units record the DC times when inputs changed.	5-2-8 <i>Input Refreshing with Input Changed Time</i> on page 5-19
Input Filter	This function eliminates the chattering or the noises from input signals. It is used to prevent the error reading due to the noises. You can set the filter time constant.	6-4-2 <i>Input Filter</i> on page 6-14

## 6-4-2 Input Filter

### Purpose

This function prevents data changes and unstable data caused by changes of input data and unstable status of input bits due to chattering and noise.

You can also use this function to make the settings to easily read the pulses that ON time is short.

### Details on the Function

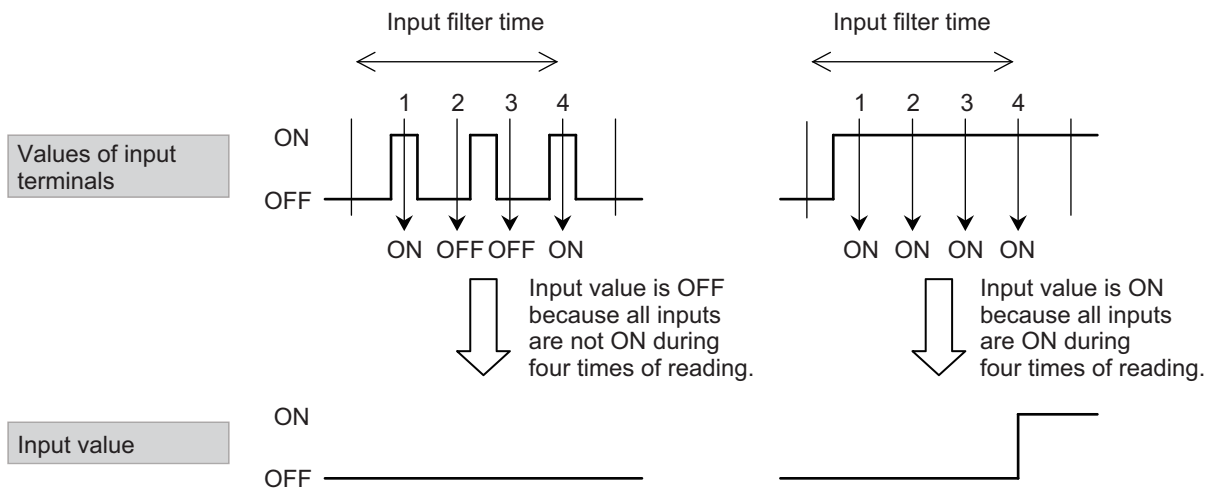
#### ● If Input Filter Mode Setting is Enable ON Filter and OFF Filter

Read the inputs at a 1/4 interval of the input filter time. When all inputs are ON or OFF, the input values turn ON or OFF.

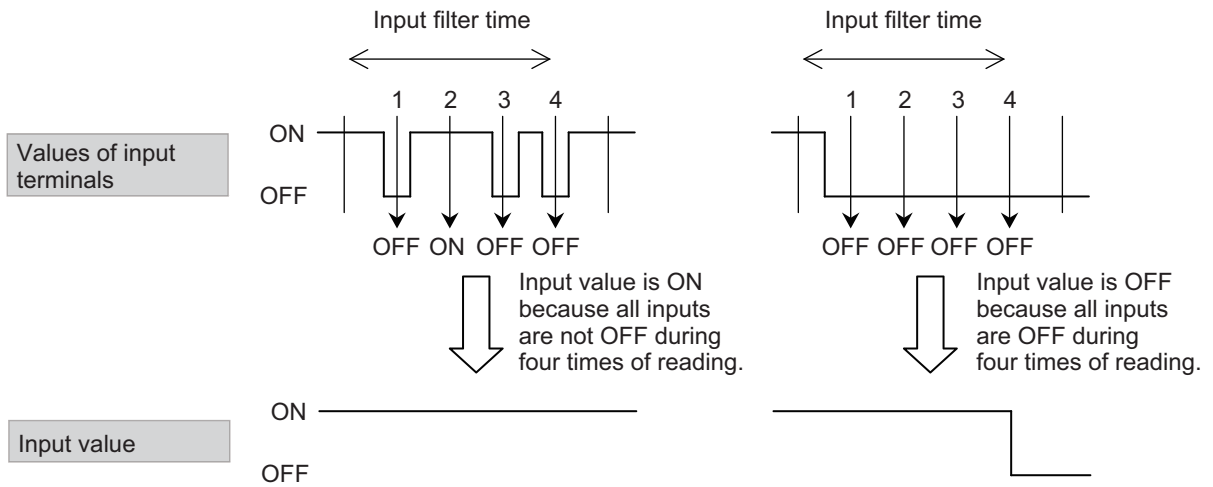
This prevents data changes and unstable data.

This function works for all inputs of the NX Units at the same time.

Operation when the input turns from OFF to ON (ON filter)



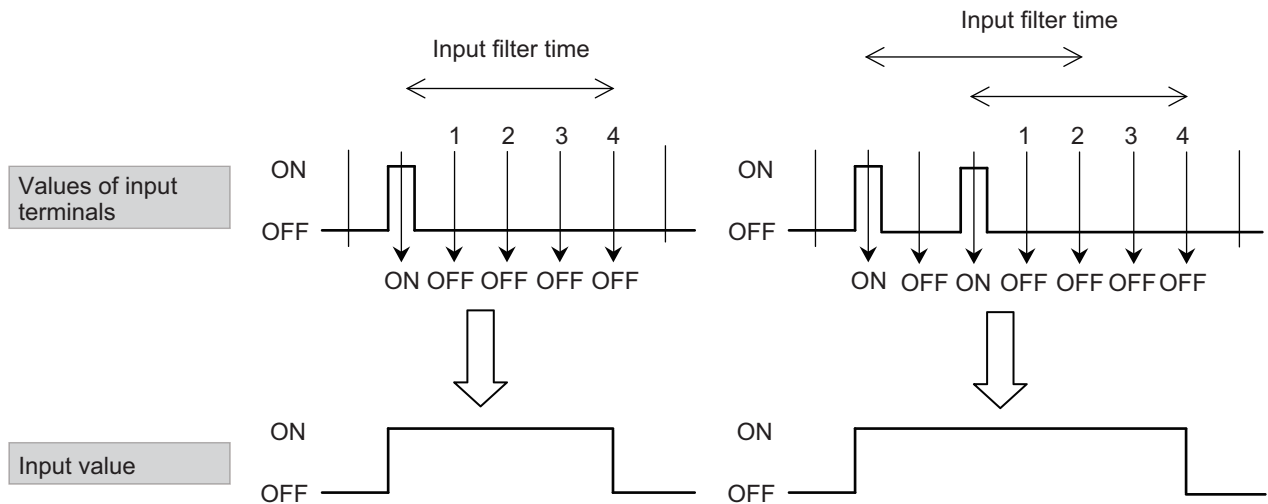
Operation when the input turns from ON to OFF (OFF filter)



● If Input Filter Mode Setting is Enable Only OFF Filter

ON filter is disabled and OFF filter is enabled.

This makes easily to read the pulses that ON time is short.



When input is ON (ON filter disabled)  
If the status of input terminals turns ON, the input value will turn ON immediately.

When input is OFF (OFF filter enabled)  
If the status of input terminals does not turn ON again during the input filter time, the input value will turn OFF after the input filter time has passed.

When input is ON (ON filter disabled)  
If the status of input terminals turns ON, the input value will turn ON immediately.

When input is OFF (OFF filter enabled)  
If the status of input terminals turns ON again during the input filter time, the input value stays ON from that time during the input filter time.

You can use this function to set the following parameters.

- Input Filter Value Setting
- Input Filter Mode Setting

The values you can set for the Input Filter Value Setting depend on the model of Digital Input Units.

Target Units	Setting name	Description	Default value <sup>*1</sup>	Unit
Input Units and Mixed I/O Units in which input ON/OFF response time exceeds 1 $\mu$ s.	Input Filter Value Setting	Set the filter time for input signals. 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 ms	3	—
Input Units and Mixed I/O Units in which input ON/OFF response time is 1 $\mu$ s maximum.		Set the filter time for input signals. 0: No Filter 1: 1 $\mu$ s 2: 2 $\mu$ s 3: 4 $\mu$ s 4: 8 $\mu$ s 5: 16 $\mu$ s 6: 32 $\mu$ s 7: 64 $\mu$ s 8: 128 $\mu$ s 9: 256 $\mu$ s	4	—
All Units	Input Filter Mode Setting	Set the operating mode for the filter. 0: Enable ON Filter and OFF Filter 1: Enable Only OFF Filter	0	—

\*1. If a value is set for the input filter time that is smaller than the default value, incorrect input caused by external noises occurs more easily. If an incorrect input occurs, either change the setting to make a long input filter time or take countermeasures, such as separate the Unit or signal lines and noise source, or protect the Unit or signal lines.



## Target NX Units

The Digital Input Units that support switching Free-Run refreshing and Synchronous I/O refreshing.

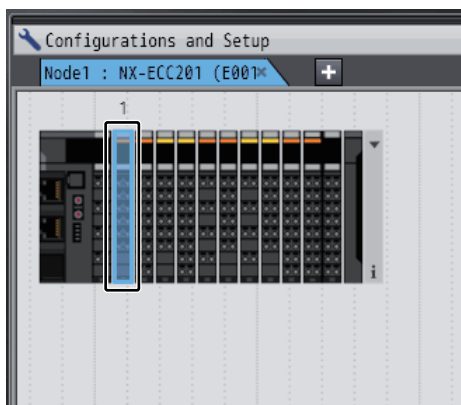
You cannot use this function for the NX Units that support input refreshing with input changed time.

## Setting Method

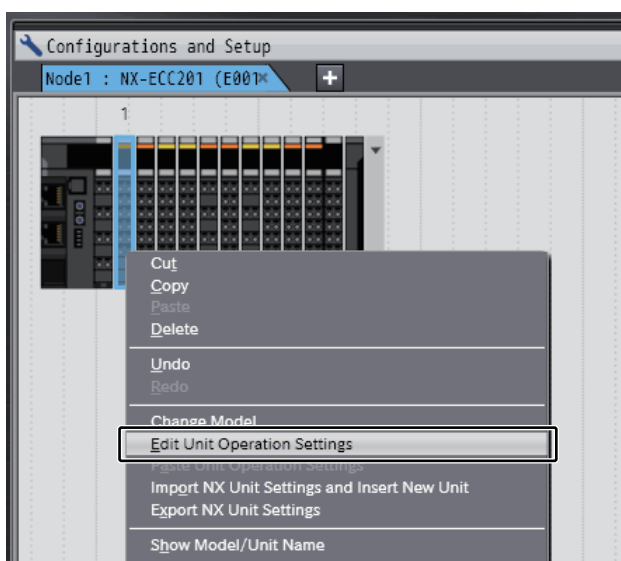
### ● Use the Sysmac Studio

- 1 Use any of the following methods to display the Edit Unit Operation Settings Tab Page on the Edit Slave Terminal Configuration Tab Page.

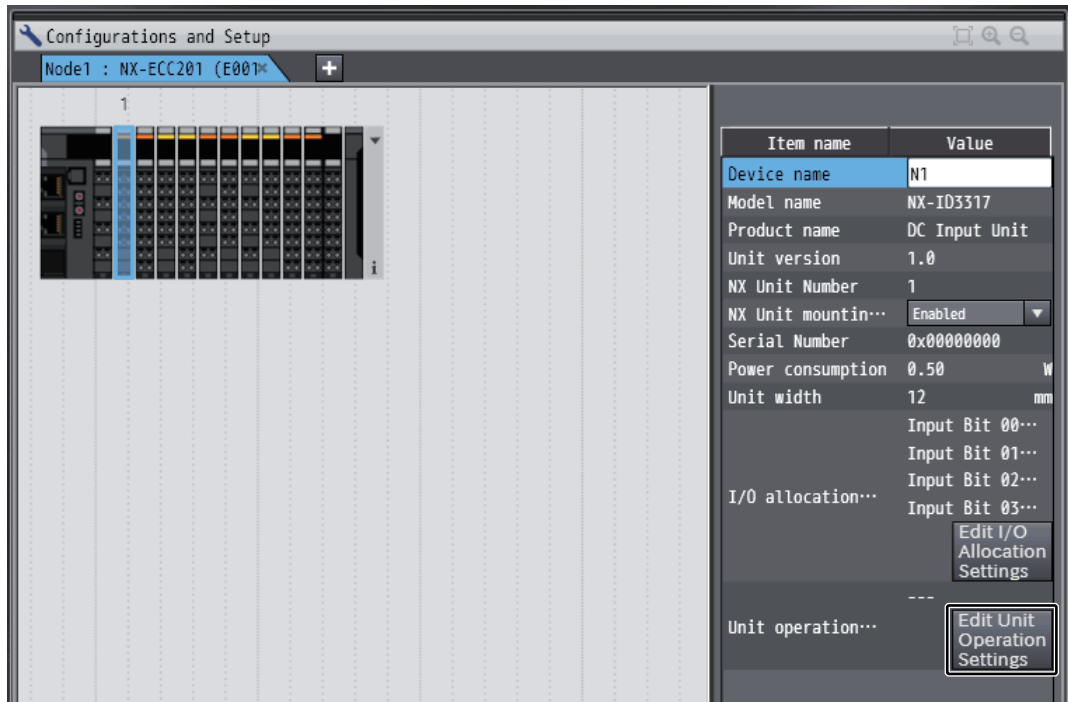
Double-click the NX Unit.



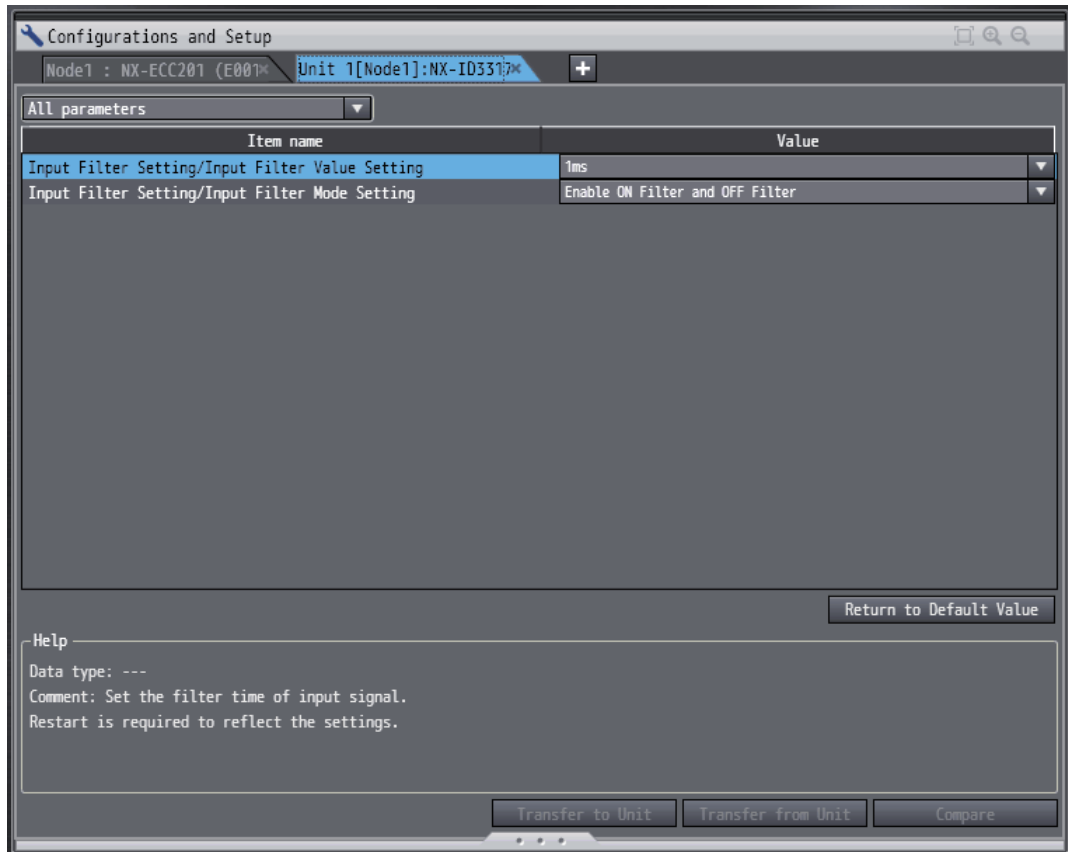
Right-click the NX Unit, then select *Edit Unit Operation Settings* from the menu.



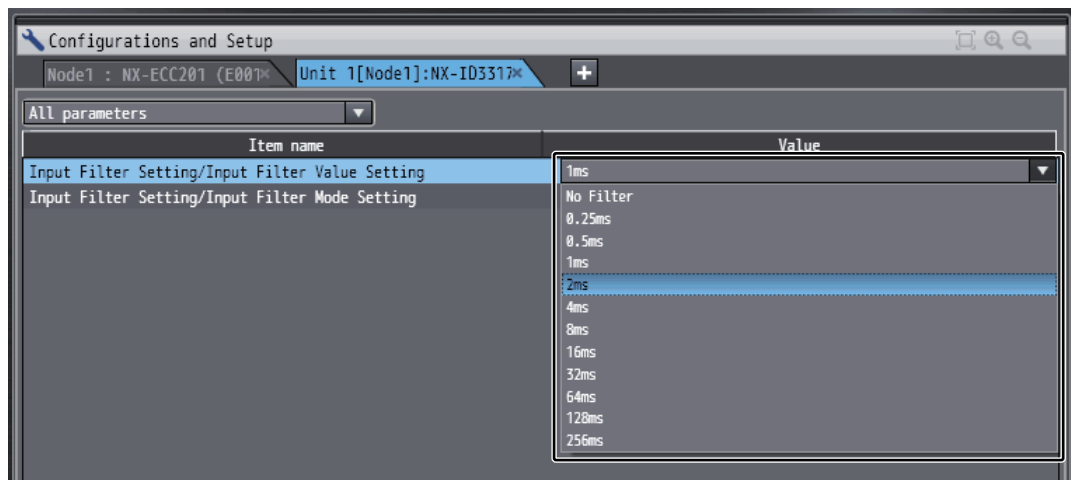
Select the NX Unit, then click the **Edit Unit Operation Settings** Button.



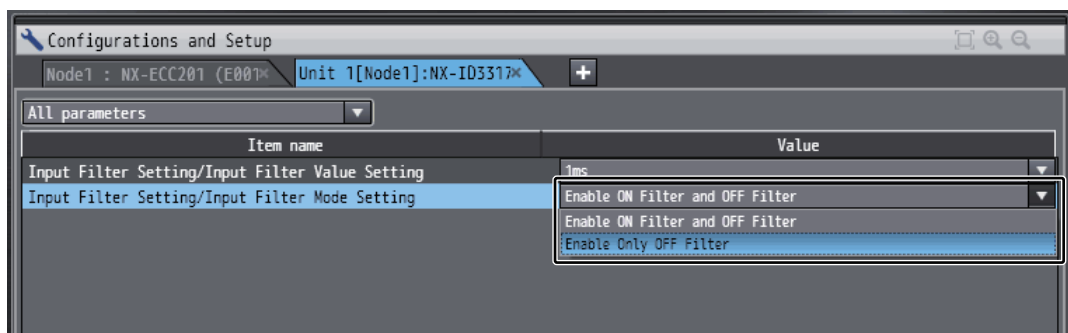
The Edit Unit Operation Settings Tab Page is displayed.



- 2 Select the filter time you want to set from the upper list of Input Filter Setting.



- 3 Select the input filter mode you want to set from the lower list of Input Filter Setting.

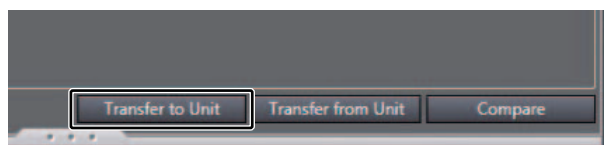


#### Additional Information

- If you set a value different from the default value, the Value on the Sysmac Studio is displayed in a different color.
- You can click the **Return to Default Value** Button to return all set values on the Sysmac Studio to the default values.
- Help for the settings is displayed at the bottom of the Edit Unit Operation Settings Tab Page.

**4** Click the **Transfer to Unit** Button.

The settings are transferred from the Sysmac Studio to the NX Unit.



The settings are reflected after the Unit is restarted.

**Precautions for Safe Use**

The Unit is required to restart after the transfer of Unit operation settings on the Sysmac Studio is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

**Precautions**

Note that when you use this function, the time for which the input value actually turns ON or turns OFF is delayed from the initial input to the input terminals until ON delay time or OFF delay time in the following table.

Delay time	Description
ON delay time	ON response time + input filter time
OFF delay time	OFF response time + input filter time



# Digital Output Units

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This section describes the types and functions of Digital Output Units and points to consider when these Units are used.

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<b>7-1</b>	<b>Types of Digital Output Units</b>	<b>7-2</b>
<b>7-2</b>	<b>Specifications of I/O Data</b>	<b>7-4</b>
7-2-1	Allocable I/O Data	7-4
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## 7-1 Types of Digital Output Units

Digital Input Units are parts of NX Units, and process outputs of digital signals (ON/OFF signals). The Digital Output Unit types are described below.

### Transistor Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-OD2154	2 points	NPN	0.5 A/point, 1 A/Unit	24 VDC	Output refreshing with specified time stamp only	300 ns max./300 ns max.	P. A-26
NX-OD2258		PNP					P. A-28
NX-OD3121	4 points	NPN	0.5 A/point, 2 A/Unit	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	0.1 ms max./0.8 ms max.	P. A-29
NX-OD3153						300 ns max./300 ns max.	P. A-30
NX-OD3256		PNP		0.5 ms max./1.0 ms max.		P. A-31	
NX-OD3257				300 ns max./300 ns max.		P. A-32	
NX-OD4121	8 points	NPN	0.5 A/point, 4 A/Unit	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	0.1 ms max./0.8 ms max.	P. A-34
NX-OD4256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-35
NX-OD5121	16 points	NPN		12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-36
NX-OD5256		PNP		24 VDC			

## Transistor Output Units (MIL Connector, 30 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-OD5121-5	16 points	NPN	0.5 A/point, 2 A/Unit	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	0.1 ms max./0.8 ms max.	P. A-38
NX-OD5256-5		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-40
NX-OD6121-5	32 points	NPN	0.5 A/point, 2 A/common, 4 A/Unit	12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-41
NX-OD6256-5		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-43

## Relay Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Relay type	Maximum switching capacity	I/O refreshing method	ON/OFF response time	Reference
NX-OC2633	2 points	N.O.	250 VAC/2 A ( $\cos\Phi = 1$ ), 250 VAC/2 A ( $\cos\Phi = 0.4$ ), 24 VDC/2 A, 4 A/Unit	Free-Run refreshing	15 ms max./15 ms max.	P. A-45
NX-OC2733		N.O. + N.C.				P. A-47

## 7-2 Specifications of I/O Data

This section describes I/O data for the Digital Output Units.

### 7-2-1 Allocable I/O Data

This section describes the allocable I/O data in the Digital Output Unit.

An I/O entry mapping is assigned to the I/O allocation settings for the Digital Output Unit except the Unit that supports output refreshing with specified time stamp.

In the Unit that supports output refreshing with specified time stamp, one I/O entry mapping for input and one I/O entry mapping for output are assigned.

A specific I/O entry is assigned to the I/O entry mapping for each NX Unit model. These allocations are fixed, so you cannot add others or change them.

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.

To assign the I/O allocation information of the EtherCAT Slave Terminal to an NJ-series CPU Unit, use the I/O ports for the allocated I/O data.

### NX Units in Free-Run Refreshing or Synchronous I/O Refreshing

#### ● Two-point Output Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00	7000 hex	01 hex
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		02 hex



### ● Four-point Output Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00	7000 hex	01 hex
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		02 hex
Output Bit 02	The output set value for output bit 02.	BOOL	FALSE	Output Bit 02		03 hex
Output Bit 03	The output set value for output bit 03.	BOOL	FALSE	Output Bit 03		04 hex

### ● Eight-point Output Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex
Output Bit 8 bits	The output values for 8 bits. The following 8 BOOL data are included.	BYTE	00 hex	Output Bit 8 bits	7001 hex	01 hex
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00		
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		
Output Bit 02	The output set value for output bit 02.	BOOL	FALSE	Output Bit 02		
Output Bit 03	The output set value for output bit 03.	BOOL	FALSE	Output Bit 03		
Output Bit 04	The output set value for output bit 04.	BOOL	FALSE	Output Bit 04		
Output Bit 05	The output set value for output bit 05.	BOOL	FALSE	Output Bit 05		
Output Bit 06	The output set value for output bit 06.	BOOL	FALSE	Output Bit 06		
Output Bit 07	The output set value for output bit 07.	BOOL	FALSE	Output Bit 07		

### ● Sixteen-point Output Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex
Output Bit 16 bits	The output values for 16 bits. The following 16 BOOL data are included.	WORD	0000 hex	Output Bit 16 bits	7002 hex	01 hex
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00		
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		
• • •						
Output Bit 15	The output set value for output bit 15.	BOOL	FALSE	Output Bit 15		

### ● Thirty-two-point Output Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex
Output Bit 32 bits	The output values for 32 bits. The following 32 BOOL data are included.	DWORD	00000000 hex	Output Bit 32 bits	7003 hex	01 hex
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00		
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		
• • •						
Output Bit 31	The output set value for output bit 31.	BOOL	FALSE	Output Bit 31		

## NX Units in Output Refreshing with Specified Time Stamp

### ● Two-point Output Units

Data name	Description	Data type	Default value	I/O port name	Index	Subindex	Unit
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00	7000 hex	01 hex	–
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		02 hex	–
Output Bit 00 Time Stamp	The specified operation time for output bit 00. If the value is 0, the output is refreshed immediately.	ULINT	0	Output Bit 00 Time Stamp	7010 hex	01 hex	ns
Output Bit 01 Time Stamp	The specified operation time for output bit 01. If the value is 0, the output is refreshed immediately.	ULINT	0	Output Bit 01 Time Stamp		02 hex	ns
Output Bit 00 Output Status	The specified time output status for output bit 00.	BOOL	FALSE	Output Bit 00 Output Status	6011 hex	01 hex	–
Output Bit 01 Output Status	The specified time output status for output bit 01.	BOOL	FALSE	Output Bit 01 Output Status		02 hex	–

## 7-3 List of Settings

The followings are the setting descriptions, setting ranges, and default values of the functions that can be used in the Digital Output Units.

The settings are reflected after the Unit is restarted.



### Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Sysmac Studio is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

## NX Units in Free-Run Refreshing or Synchronous I/O Refreshing

### ● Two-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Load Rejection Output for Output Bit 00	Set the output at load OFF. FALSE: OFF TRUE: Hold the present value.	FALSE	TRUE or FALSE	–	5010 hex	01 hex	P. 7-12
Load Rejection Output for Output Bit 01		FALSE	TRUE or FALSE	–		02 hex	

### ● Four-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Load Rejection Output for Output Bit 00	Set the output at load OFF. FALSE: OFF TRUE: Hold the present value.	FALSE	TRUE or FALSE	–	5010 hex	01 hex	P. 7-12
Load Rejection Output for Output Bit 01		FALSE	TRUE or FALSE	–		02 hex	
Load Rejection Output for Output Bit 02		FALSE	TRUE or FALSE	–		03 hex	
Load Rejection Output for Output Bit 03		FALSE	TRUE or FALSE	–		04 hex	

### ● Eight-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Load Rejection Output for Output Bit (8 bits)	Set the output at load OFF in units of 8 bits. Bit 0: Setting for output bit 00 Bit 1: Setting for output bit 01 Bit 2: Setting for output bit 02 Bit 3: Setting for output bit 03 Bit 4: Setting for output bit 04 Bit 5: Setting for output bit 05 Bit 6: Setting for output bit 06 Bit 7: Setting for output bit 07  FALSE: OFF TRUE: Hold the present value.	00 hex	00 to FF hex	–	5011 hex	01 hex	P. 7-12

### ● Sixteen-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Load Rejection Output for Output Bit (16 bits)	Set the output at load OFF in units of 16 bits. Bit 0: Setting for output bit 00 Bit 1: Setting for output bit 01 • • •  Bit 15: Setting for output bit 15 FALSE: OFF TRUE: Hold the present value.	0000 hex	0000 to FFFF hex	–	5012 hex	01 hex	P. 7-12

### ● Thirty-two-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Load Rejection Output for Output Bit (32 bits)	Set the output at load OFF in units of 32 bits. Bit 0: Setting for output bit 00 Bit 1: Setting for output bit 01 • • • Bit 31: Setting for output bit 31 FALSE: OFF TRUE: Hold the present value.	000000 00 hex	0000000 0 to FFFFFFF F hex	–	5013 hex	01 hex	P. 7-12

## NX Units in Output Refreshing with Specified Time Stamp

### ● Two-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Load Rejection Output for Output Bit 00	Set the output at load OFF. FALSE: OFF TRUE: Hold the present value.	FALSE	TRUE or FALSE	–	5010 hex	01 hex	P. 7-12
Load Rejection Output for Output Bit 01		FALSE	TRUE or FALSE	–		02 hex	

## 7-4 Function

This section describes the Digital Output Unit functions.

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

### 7-4-1 List of Digital Output Unit Functions

Function name	Description	Reference
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.	5-2-4 <i>Free-Run Refreshing</i> on page 5-5
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	5-2-6 <i>Synchronous Output Refreshing</i> on page 5-13
Time Stamp Refreshing	With this I/O refreshing method, the NX Units record the DC times when inputs change or perform outputs at specified DC times. These times are asynchronous to the NX bus refresh cycles. Data exchange between the NX Units and EtherCAT Coupler Unit are performed cyclically on the NX bus refresh cycles.	5-2-7 <i>Time Stamp Refreshing</i> on page 5-18
Output refreshing with specified time stamp	With this I/O refreshing method, the Output Units refresh outputs at specified DC times.	5-2-9 <i>Output Refreshing with Specified Time Stamp</i> on page 5-24
Load Rejection Output Setting	A function that performs the preset output operation when the Digital Output Unit cannot receive output data due to a host error on the Communications Coupler Unit or an error on the NX bus.	7-4-2 <i>Load Rejection Output Setting</i> on page 7-12
Load Short-circuit Protection	A function in which the output will turn OFF to protect the output circuit when an overload or load short-circuit occurs due to a failure of the connected external devices.	7-4-3 <i>Load Short-circuit Protection</i> on page 7-18

## 7-4-2 Load Rejection Output Setting

### Purpose

This function maintains a safe output status by performing the preset output operations when Digital Output Units cannot receive the output data from the Communications Coupler Unit due to a host error on the Communications Coupler Unit or an error on the NX bus.

### Details on the Function

Sets whether to hold the output or turn it OFF when an error occurred.

Each output bit can be set independently.

#### ● Two-point Output Units

Setting name	Description	Default value	Unit
Load Rejection Output for Output Bit 00	Set the output at load OFF. FALSE: OFF	FALSE	–
Load Rejection Output for Output Bit 01	TRUE: Hold the present value.	FALSE	–

#### ● Four-point Output Units

Setting name	Description	Default value	Unit
Load Rejection Output for Output Bit 00	Set the output at load OFF. FALSE: OFF	FALSE	–
Load Rejection Output for Output Bit 01	TRUE: Hold the present value.	FALSE	–
Load Rejection Output for Output Bit 02		FALSE	–
Load Rejection Output for Output Bit 03		FALSE	–



### ● Eight-point Output Units

Setting name	Description	Default value	Unit
Load Rejection Output for Output Bit (8 bits)	Set the output at load OFF in units of 8 bits. Bit 0: Setting for output bit 00 Bit 1: Setting for output bit 01 Bit 2: Setting for output bit 02 Bit 3: Setting for output bit 03 Bit 4: Setting for output bit 04 Bit 5: Setting for output bit 05 Bit 6: Setting for output bit 06 Bit 7: Setting for output bit 07 FALSE: OFF TRUE: Hold the present value.	00 hex	–

### ● Sixteen-point Output Units

Setting name	Description	Default value	Unit
Load Rejection Output for Output Bit (16 bits)	Set the output at load OFF in units of 16 bits. Bit 0: Setting for output bit 00 Bit 1: Setting for output bit 01 • • • Bit 15: Setting for output bit 15 FALSE: OFF TRUE: Hold the present value.	0000 hex	–

### ● Thirty-two-point Output Units

Setting name	Description	Default value	Unit
Load Rejection Output for Output Bit (32 bits)	Set the output at load OFF in units of 32 bits. Bit 0: Setting for output bit 00 Bit 1: Setting for output bit 01 • • • Bit 31: Setting for output bit 31 FALSE: OFF TRUE: Hold the present value.	00000000 hex	–

## Target NX Units

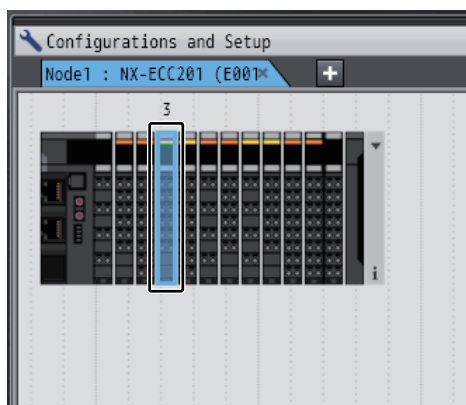
All Digital Output Units

## Setting Method

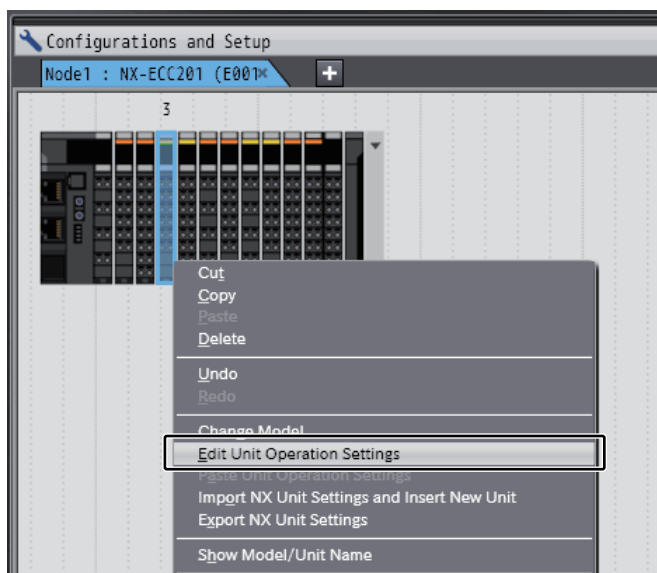
### ● Use the Sysmac Studio

- 1 Use any of the following methods to display the Edit Unit Operation Settings Tab Page on the Edit Slave Terminal Configuration Tab Page.

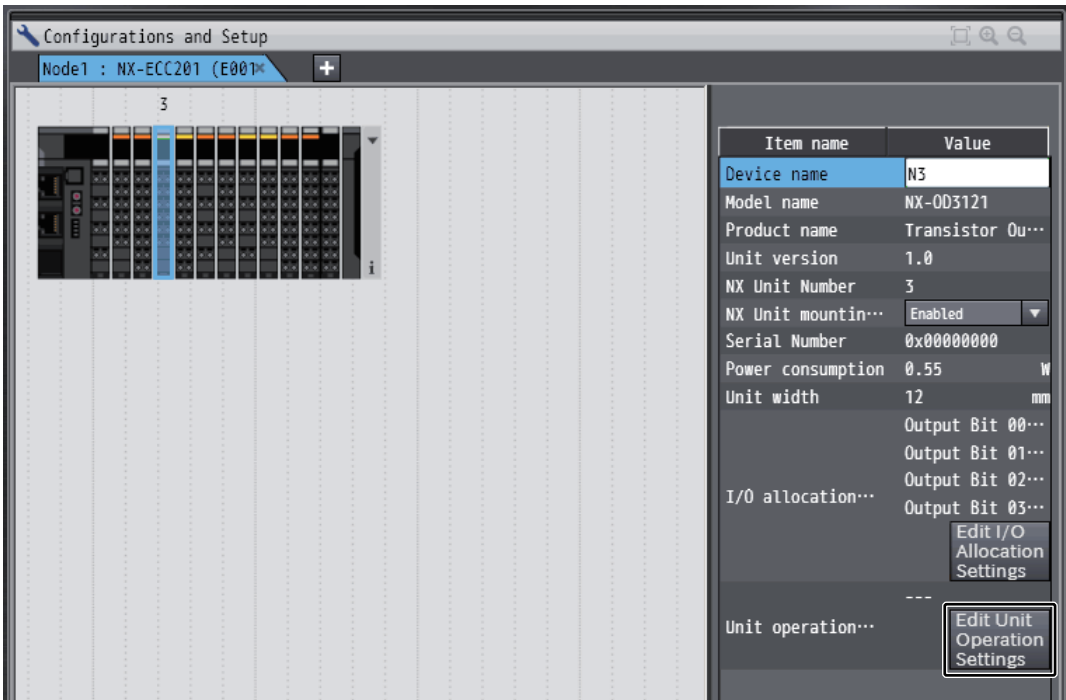
Double-click the NX Unit.



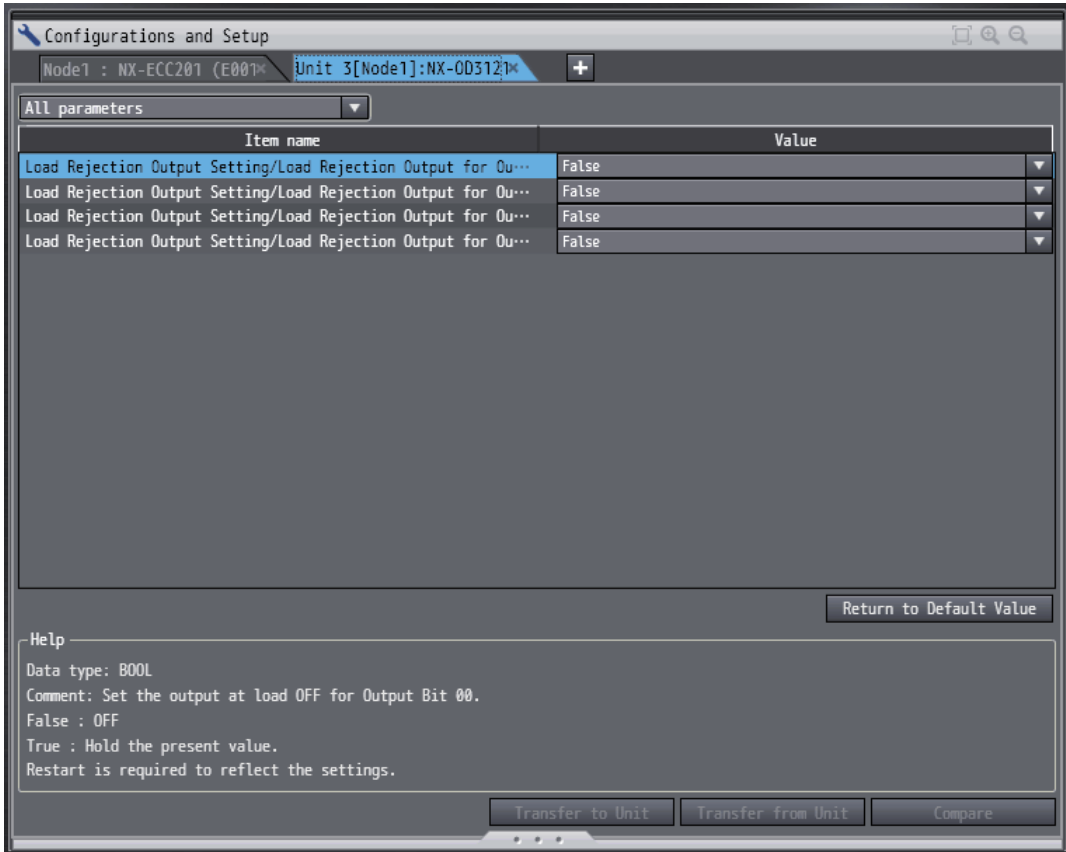
Right-click the NX Unit, then select *Edit Unit Operation Settings* from the menu.



Select the NX Unit, then click the **Edit Unit Operation Settings** Button.



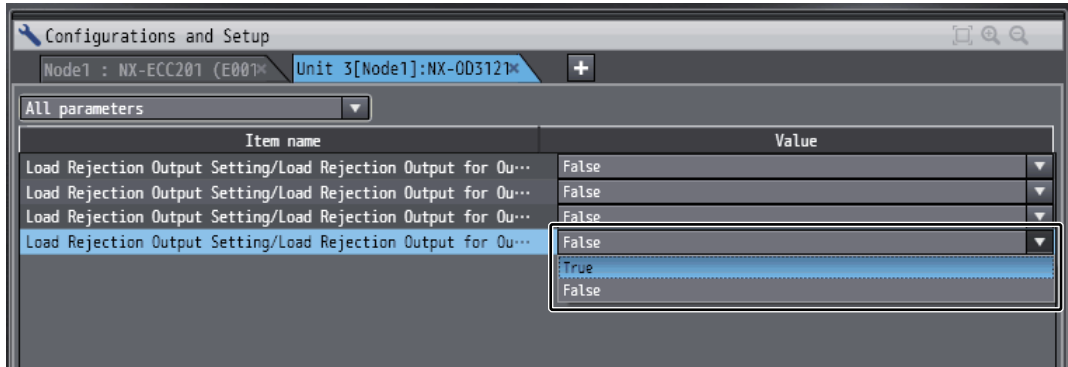
The Edit Unit Operation Settings Tab Page is displayed.



- 2** Make the following settings according to the type of NX Unit you want to set.

Two-point or Four-point Output Unit (Data type: BOOL)

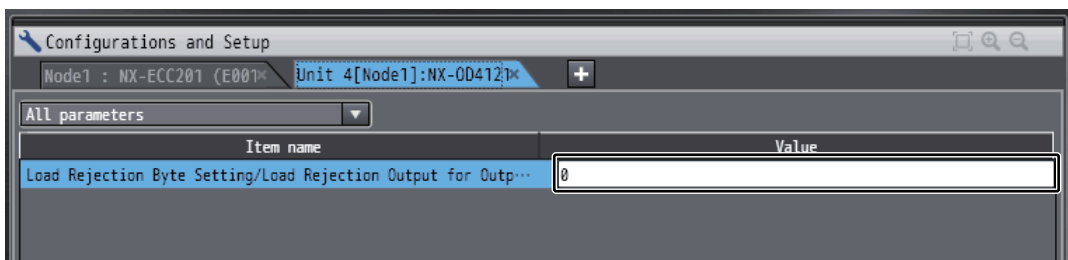
Select *False* (OFF) or *True* (Hold the present value) from the list of Load Rejection Output Setting for which the output bit you want to set.



Eight-point, Sixteen-point, and Thirty-two-point Output Units

Enter a set value in the Value text box. The data type of the set values and the range of the values that you can set vary depending on the number of output points.

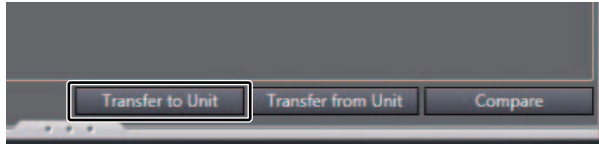
Number of output points	Data type	Set value
8 points	USINT	0 to 255
16 points	UINT	0 to 65535
32 points	UDINT	0 to 4294967295



#### Additional Information

- If you set a value different from the default value, the Value on the Sysmac Studio is displayed in a different color.
- You can click the **Return to Default Value** Button to return all set values on the Sysmac Studio to the default values.
- Help for the settings is displayed at the bottom of the Edit Unit Operation Settings Tab Page.

- 3** Click the **Transfer to Unit** Button.  
The settings are transferred from the Sysmac Studio to the NX Unit.



The settings are reflected after the Unit is restarted.



#### **Precautions for Safe Use**

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The Unit is required to restart after the transfer of Unit operation settings on the Sysmac Studio is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

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### 7-4-3 Load Short-circuit Protection

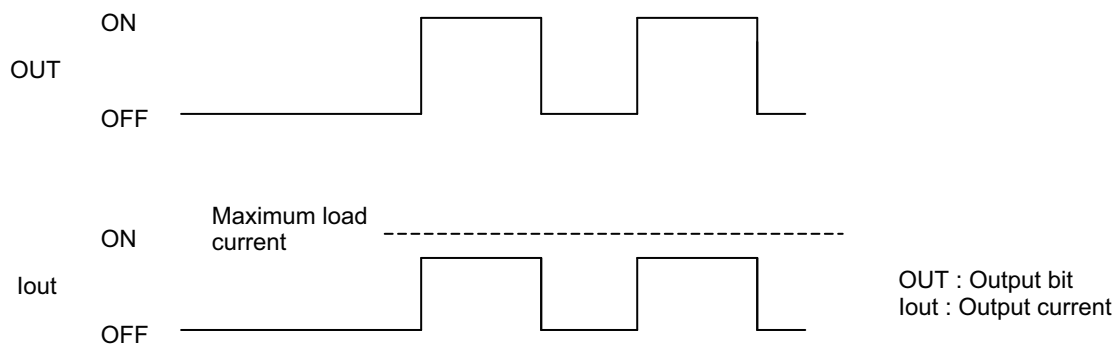
#### Purpose

This function is used to protect the output circuits of the Digital Output Units when an external connection load short-circuit occurs.

#### Details on the Function

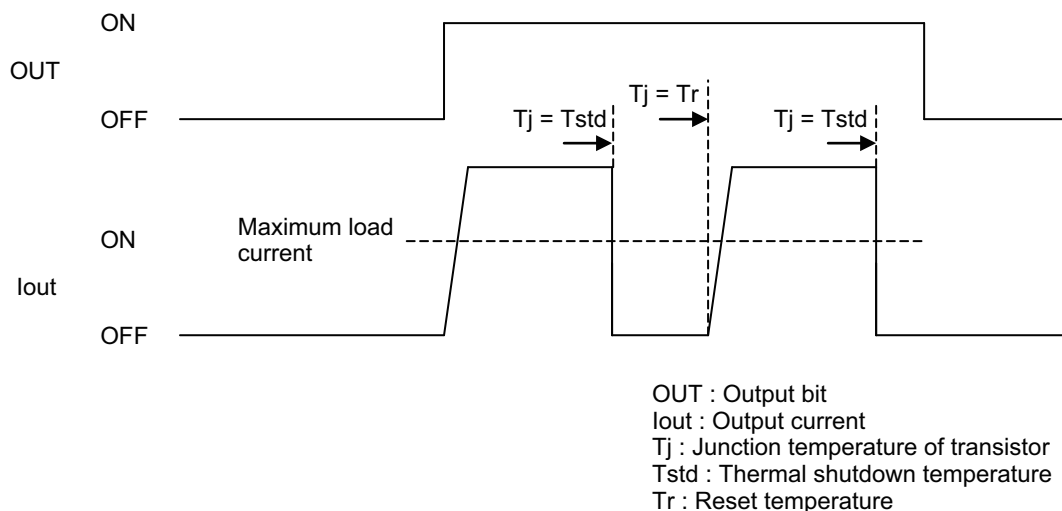
As shown in the figure below, normally when the output bit (OUT) turns ON, the transistor turns ON and then output current (Iout) will flow.

The transistor of the Transistor Output Units generates heat when output current (Iout) flows.



If an overload or short-circuit occurs, causing the output current (Iout) to exceed the maximum value of load current as shown in the figure below and the junction temperature ( $T_j$ ) of the transistor to reach the thermal shutdown temperature ( $T_{std}$ ) in which a load short-circuit protection operates, the output will turn OFF to protect the transistor from being damaged.

When the junction temperature ( $T_j$ ) of the transistor drops down to the reset temperature ( $T_r$ ), the output OFF will be automatically reset and the output current will start flowing.



### ● Restrictions on Use

The load short-circuit protection function only protects internal circuits for a short period.

As shown in the figure above, the load short-circuit protection of this NX Unit is automatically released when the  $T_j$  equals to  $T_r$ .

Therefore, unless the cause of short-circuit is removed, ON/OFF operations are repeated in the output.

If the short-circuit is not corrected, output elements deteriorate. If any external load is short-circuited, immediately turn OFF the applicable output and remove the cause of the short-circuit.

## Target NX Units

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Digital Output Units of PNP outputs

## Setting Method

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No setting is required.

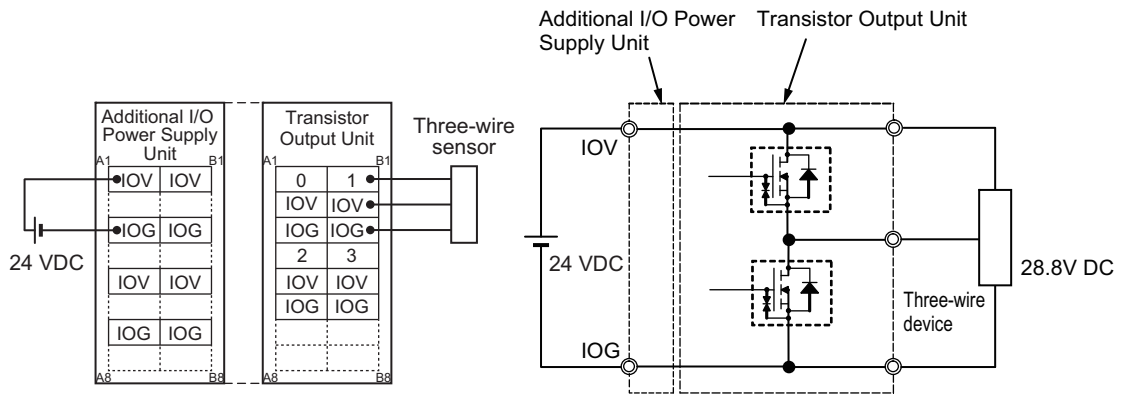
# 7-5 Push-pull Output

The Digital Output Units with the ON/OFF response time of 1  $\mu$ s or less use a push-pull output to increase the speed of the output ON/OFF response.

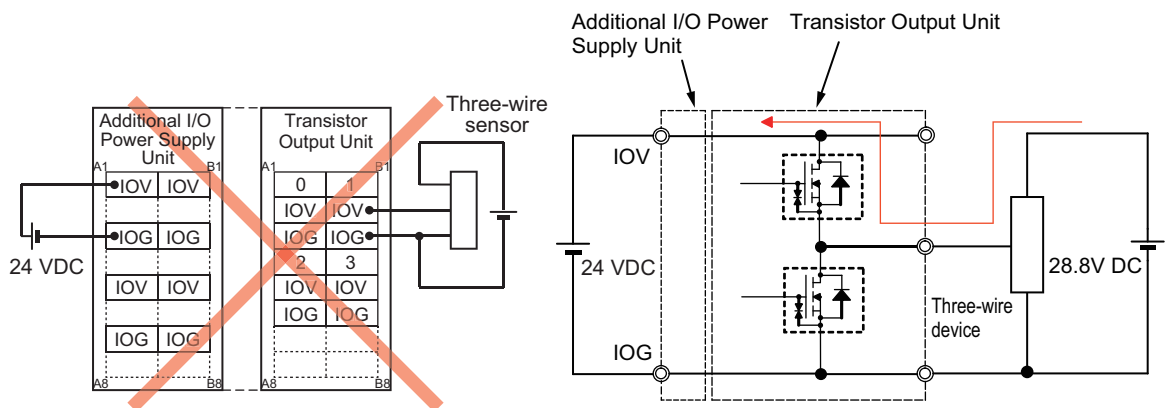
For this type of the Output Units, use the single load power supply for the I/O power and connected external devices.

If multiple power supplies are used, the current may flow into the output bits via the diodes built in the I/O circuit and cause the Output Units to malfunction.

● **Good Example**



● **Bad Example**





## 7-6 Precautions when Using the Relay Output Units

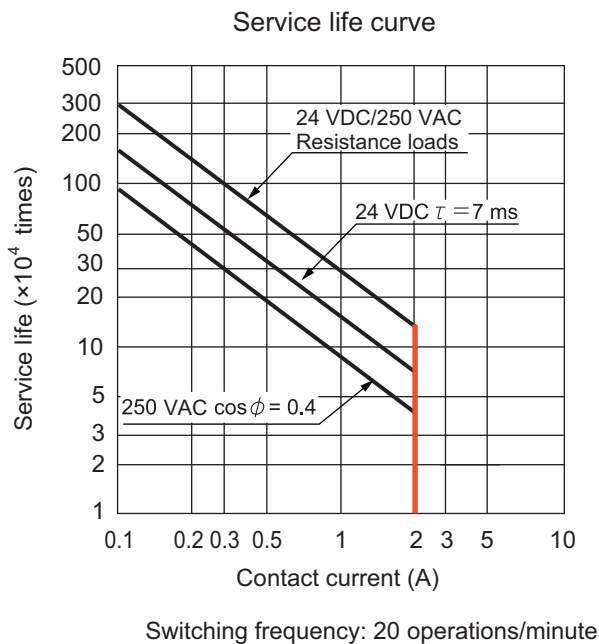
This section describes precautions when using the Relay Output Units.

### Relay Service Life

The service life of Relay Output Units depends on the type of load, contact current and ambient temperature.

Use the following diagrams to calculate the relay service life based on the operating conditions, and replace the NX Unit before the end of its service life.

#### ● Contact Current vs. Service Life Characteristic



#### Precautions for Correct Use

The above chart shows the life characteristics for individual relays. Do not exceed the specifications of the Relay Output Units. If a switching capacity exceeding the specifications is used, the reliability and life expectancy of other parts will be reduced and the NX Unit may malfunction.

## Inductive Load

The life of the Relay varies with the load inductance.

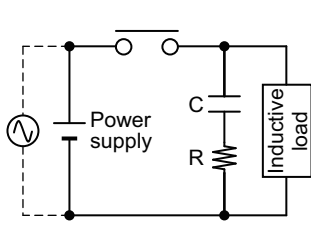
If any inductive load is used, we recommend that you use a contact protection circuit. (*Contact Protection Circuit* on page 7-22).

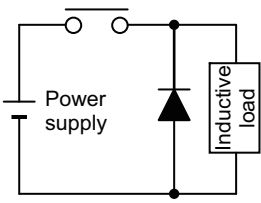
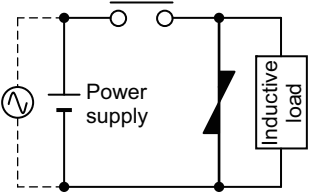
Be sure to connect a contact protection circuit in parallel with every DC inductive load that is connected to the Contact Output Unit because the usage of a contact protection circuit has a significant effect on the service life of the contact.

## Contact Protection Circuit

Contact protection circuits are used with the Contact Output Unit in order to prolong the life of each relay mounted to the Contact Output Unit, prevent noise, and reduce the generation of carbide and nitrate deposits caused by arcs. However, if contact protection circuits are used incorrectly, they can reduce relay service life. Using a contact protection circuit can also cause a delay in the resetting time (shut-off time).

Contact protection circuit examples are listed in the following table.

Circuit	Current		Feature	Required element
	AC	DC		
CR method 	Yes	Yes	If the load is a relay or solenoid, there is a delay in the resetting time. If the power supply voltage is 24 or 48 V, connect the contact protection circuit in parallel with the load. If the supply voltage is 100 to 200 V, connect the contact protection circuit between the contacts.	The capacitance of the capacitor should be approx. 1 to 0.5 $\mu\text{F}$ per contact current of 1 A and resistance of the resistor should be approx. 0.5 to 1 $\Omega$ per contact voltage of 1 V. C: The capacitance of the capacitor should be approx. 0.5 to 1 $\mu\text{F}$ per contact current of 1 A. R: The resistance of the resistor should be approx. 0.5 to 1 $\Omega$ per contact voltage of 1 V. These values, however, vary depending on the load and the characteristics of the relay. Decide these values from experiments, and take into consideration that the capacitance suppresses spark discharge when the contacts are separated and the resistance restricts the current that flows into the load when the circuit is closed again. The dielectric strength of the capacitor must be 200 to 300 V. If the circuit is an AC circuit, use a capacitor with no polarity.

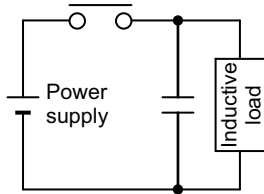
	Circuit	Current		Feature	Required element
		AC	DC		
Diode method		x	Yes	<p>The diode connected in parallel with the load changes energy accumulated by the coil into a current, which then flows into the coil so that the current will be converted into Joule heat by the resistance of the inductive load.</p> <p>The delay in resetting time caused by this method is longer than that caused by the CR method.</p>	<p>The reversed dielectric strength value of the diode must be at least 10 times as large as the circuit voltage value. The forward current of the diode must be the same as or larger than the load current.</p> <p>The reversed dielectric strength value of the diode may be two to three times larger than the power supply voltage if the contact protection circuit is applied to electronic circuits with low circuit voltages.</p>
Varistor method		Yes	Yes	<p>The varistor method prevents the imposition of high voltage between the contacts by using the constant voltage characteristic of the varistor. There is a delay in the resetting time.</p> <p>If the power supply voltage is 24 to 48 V, insert the varistor in parallel with the load. If the supply voltage is 100 to 200 V, insert the varistor between the contacts.</p>	-



### Precautions for Correct Use

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Do not connect a contact protection circuit with an inductive load as shown in the diagram below.



This contact protection circuit is very effective for preventing spark discharge when the circuit is opened. However, when the contacts are closed, the contacts may be welded due to the current charged in the capacitor. DC inductive loads can be more difficult to switch than resistive loads. If an appropriate contact protection circuit is used, however, DC inductive loads are as easy to switch as resistive loads.

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# 8

## Digital Mixed I/O Units

This section describes the types and functions of Digital Mixed I/O Units and points to consider when these Units are used.

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<b>8-1</b>	<b>Types of Digital Mixed I/O Units</b>	<b>8-2</b>
<b>8-2</b>	<b>Specifications of I/O Data</b>	<b>8-3</b>
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<b>8-3</b>	<b>List of Settings</b>	<b>8-5</b>
8-3-1	Input Settings	8-5
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8-4-2	Output Functions	8-7

## 8-1 Types of Digital Mixed I/O Units

Digital Mixed I/O Units are parts of NX Units, and process both inputs and outputs of digital signals (ON/OFF signals).

The Digital Mixed I/O Unit types are described below.

### DC Input/Transistor Output Units (MIL Connector, 30 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-MD6121-5	Outputs: 16 points	Outputs: NPN Inputs: For both NPN/PNP	0.5 A/point, 2 A/Unit	Outputs: 12 to 24 VDC Inputs: 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	Outputs: 0.1 ms max./0.8 ms max. Inputs: 20 $\mu$ s max./400 $\mu$ s max.	P. A-51
NX-MD6256-5	Inputs: 16 points	Outputs: PNP Inputs: For both NPN/PNP		Outputs: 24 VDC Inputs: 24 VDC		Outputs: 0.5 ms max./1.0 ms max. Inputs: 20 $\mu$ s max./400 $\mu$ s max.	P. A-55

## 8-2 Specifications of I/O Data

This section describes I/O data for the Digital Mixed I/O Units.

### 8-2-1 Allocable I/O Data

This section describes the allocable I/O data in the Digital Mixed I/O Units.

An I/O entry mapping is assigned to the I/O allocation settings for the Digital Mixed I/O Units.

A specific I/O entry is assigned to the I/O entry mapping for each NX Unit model. These allocations are fixed, so you cannot add others or change them.

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.

To assign the I/O allocation information of the EtherCAT Slave Terminal to an NJ-series CPU Unit, use the I/O ports for the allocated I/O data.

### NX Units in Free-Run Refreshing or Synchronous I/O Refreshing

#### ● Thirty-two-point Mixed I/O Units

Input section

Data name	Description	Data type	Default value	I/O port name	Index	Sub-index
Input Bit 16 bits	The input values for 16 bits. The following 16 BOOL data are included.	WORD	0000 hex	Input Bit 16 bits	6002 hex	01 hex
Input Bit 00	The input value for input bit 00.	BOOL	FALSE	Input Bit 00		
Input Bit 01	The input value for input bit 01.	BOOL	FALSE	Input Bit 01		
•						
•						
•						
Input Bit 15	The input value for input bit 15.	BOOL	FALSE	Input Bit 15		

## Output section

Data name	Description	Data type	Default value	I/O port name	Index	Subindex
Output Bit 16 bits	The output values for 16 bits. The following 16 BOOL data are included.	WORD	0000 hex	Output Bit 16 bits	7002 hex	01 hex
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00		
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		
• • •						
Output Bit 15	The output set value for output bit 15.	BOOL	FALSE	Output Bit 15		



## 8-3 List of Settings

The following are the setting descriptions, setting ranges, and default values of the functions that can be used in the Digital Mixed I/O Units.

The settings are reflected after the Unit is restarted.



### Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Sysmac Studio is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

### 8-3-1 Input Settings

This section describes the allocable I/O data in the Digital Mixed I/O Units.

## NX Units in Free-Run Refreshing or Synchronous I/O Refreshing

### ● Sixteen-point Input Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Input Filter Value Setting	Set the filter time of input signal. *1	*1	*1	–	5000 hex	01 hex	P. 6-14
Input Filter Mode Setting	Set the operating mode for the filter. *2	*2	*2	–		02 hex	P. 6-14

\*1. The descriptions of Input Filter Value Setting are as follows.

Set value	Setting description	Default value	Setting range
0	No Filter	3	0 to 11
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 ms		

\*2. The descriptions of Input Filter Mode Setting are as follows.

Set value	Setting description	Default value	Setting range
0	Enable ON Filter and OFF Filter	0	0/1
1	Enable Only OFF Filter		

## 8-3-2 Output Settings

### NX Units in Free-Run Refreshing or Synchronous I/O Refreshing

#### ● Sixteen-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Load Rejection Output for Output Bit (16 bits)	Set the output at load OFF in units of 16 bits. Bit 0: Setting for output bit 00 Bit 1: Setting for output bit 01 • • • Bit 15: Setting for output bit 15 FALSE: OFF TRUE: Hold the present value.	0000 hex	0000 to FFFF hex	–	5012 hex	01 hex	P. 7-12

## 8-4 Function

This section describes the Digital Mixed I/O Unit functions.

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

### 8-4-1 Input Functions

Function name	Description	Reference
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.	5-2-4 <i>Free-Run Refreshing</i> on page 5-5
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	5-2-5 <i>Synchronous Input Refreshing</i> on page 5-9
Input Filter	This function eliminates the chattering or the noises from input signals. It is used to prevent the error reading due to the noises. You can set the filter time constant.	6-4-2 <i>Input Filter</i> on page 6-14

### 8-4-2 Output Functions

Function name	Description	Reference
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.	5-2-4 <i>Free-Run Refreshing</i> on page 5-5
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	5-2-5 <i>Synchronous Input Refreshing</i> on page 5-9
Load Rejection Output Setting	A function that performs the preset output operation when the Digital Output Unit cannot receive output data due to a host error on the Communications Coupler Unit or an error on the NX bus.	7-4-2 <i>Load Rejection Output Setting</i> on page 7-12
Load Short-circuit Protection	A function in which the output will turn OFF to protect the output circuit when an overload or load short-circuit occurs due to a failure of the connected external devices.	7-4-3 <i>Load Short-circuit Protection</i> on page 7-18



# 9

## Troubleshooting

This section describes the error information and corrections for errors that can occur when the Digital I/O Units are used.

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9-3-1	Checking for Errors from the Sysmac Studio .....	9-5
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<b>9-6</b>	<b>Troubleshooting Flowchart</b> .....	<b>9-19</b>

## 9-1 How to Check for Errors

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Use one of the following error checking methods.

- Checking the indicators
- Troubleshooting with the Sysmac Studio

Refer to the user's manual for the connected Communications Coupler Unit for details on troubleshooting with the Sysmac Studio.

## 9-2 Checking for Errors with the Indicators

You can use the TS indicators on the NX Units to check the NX Unit status and level of errors.

This section describes the meanings of errors that the TS indicator shows and the troubleshooting procedures for them.

In this section, the status of the indicator is indicated with the following abbreviations.

Abbreviation	Indicator status
Lit	Lit
Not Lit	Not lit
FS ( )	Flashing. The numeric value in parentheses is the flashing interval.
–	Undefined

### Main Errors and Corrections

TS indicator		Cause	Correction
Green	Red		
Lit	Not Lit	–	– (This is the normal status.)
FS (2 s)	Not Lit	<ul style="list-style-type: none"> <li>• Initializing</li> <li>• Downloading</li> </ul>	–(Normal. Wait until the processing is completed.)
Lit	Lit	This status is not present.	
Not Lit	Not Lit	<p>The Unit power supply is not supplied.</p> <ul style="list-style-type: none"> <li>• Waiting for initialization to start</li> <li>• Restarting</li> </ul> <p>If you cannot resolve the problem after you check the above items and cycle the Slave Terminal power supply, the Unit may have a hardware failure. If this happens, replace the Unit.</p>	<p>Check the following items and supply the Unit power supply correctly.</p> <p>[Check items for power supply]</p> <ul style="list-style-type: none"> <li>• Make sure that the power supply cable is wired correctly.</li> <li>• Make sure that the power supply cable is not disconnected.</li> <li>• Make sure that power supply voltage is within the specified range.</li> <li>• Make sure that the power supply has enough capacity.</li> <li>• Make sure that power supply has not failed.</li> </ul> <p>– (Normal. Wait until the processing is completed.)</p>
Not Lit	Lit	Hardware failure	If this error occurs after you cycle the Slave Terminal power supply, replace the Unit.
Not Lit	Lit	Non-volatile Memory Hardware Error	Refer to Event <i>Non-volatile Memory Hardware Error</i> on page 9-10.
Not Lit	Lit	Control Parameter Error in Master	Refer to Event <i>Control Parameter Error in Master</i> on page 9-11.
Not Lit	FS (1 s)	NX Unit I/O Communications Error	Refer to Event <i>NX Unit I/O Communications Error</i> on page 9-12.

TS indicator		Cause	Correction
Green	Red		
Not Lit	FS (1 s)	NX Unit Output Synchronization Error	Refer to Event <i>NX Unit Output Synchronization Error</i> on page 9-13.
Not Lit	Lit	NX Unit Clock Not Synchronized Error	Refer to Event <i>NX Unit Clock Not Synchronized Error</i> on page 9-14.



## 9-3 Checking for Errors and Troubleshooting on the Sysmac Studio

Error management on the NX Series is based on the methods used for the NJ-series Controllers. This allows you to use the Sysmac Studio to check the meanings of errors and troubleshooting procedures.

### 9-3-1 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
Digital I/O Unit	Since current errors are managed in the Communications Coupler Unit, the number of current errors is limited by the number of errors for the Communications Coupler Unit.

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

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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

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#### Number of Logs of Past Errors

Event logs in the Digital I/O Units are stored in the Communications Coupler Unit.

Refer to the user's manual for the connected Communications Coupler Unit for details on the amount of event logs that are stored in the Unit.

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Refer to the *NJ-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 9-3-2 *Event Codes and Corrections for Errors* on page 9-7 for details on event codes.

### 9-3-2 Event Codes and Corrections for Errors

The errors (i.e., events) that occur in the Digital I/O Unit is shown below.

The following abbreviations are used in the event level column.

Abbreviation	Name
Maj	Major fault level
Prt	Partial fault level
Min	Minor fault level
Obs	Observation
Info	Information

Refer to the *NJ-series Troubleshooting Manual* (Cat. No. W503) for all NJ-series event codes.

Event code	Event name	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	
00200000 hex	Non-volatile Memory Hardware Error	An error occurred in non-volatile memory.	<ul style="list-style-type: none"> <li>Non-volatile memory failure</li> </ul>			Yes			P. 9-10
10410000 hex	Control Parameter Error in Master	An error occurred in the control parameters that are saved in the master.	<ul style="list-style-type: none"> <li>There is an error in the area of the non-volatile memory in the Communications Coupler Unit in which the control parameters for the NX Unit are saved.</li> <li>The power supply to the NX Unit was turned OFF or Sysmac Studio communications were disconnected while writing the control parameters.</li> </ul>			Yes			P. 9-11
80200000 hex	NX Unit I/O Communications Error	An I/O communications error occurred between the Communications Coupler Unit and the NX Unit.	<ul style="list-style-type: none"> <li>The NX Unit is not mounted properly.</li> <li>The power cable for the Unit power supply is disconnected. Or, the wiring from the Unit power supply to the NX Units is incorrect.</li> <li>The power cable for the Unit power supply is broken.</li> <li>The voltage of the Unit power supply is outside the specified range. Or, the capacity of the Unit power supply is insufficient.</li> <li>There is a hardware error in the NX Unit.</li> </ul>			Yes			P. 9-12

Event code	Event name	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	
80210000 hex	NX Unit Output Synchronization Error	An output synchronization error occurred in the NX Unit.	<ul style="list-style-type: none"> <li>The NX Unit is not mounted properly.</li> <li>The Slave Terminal Configuration Information when the EtherCAT Coupler Unit synchronization settings were downloaded did not agree with the actual configuration of the Slave Terminal.</li> <li>There is an NX Unit that cannot be synchronized to the specified output synchronization timing. (This will not cause an error when the synchronization setting is made from the Sysmac Studio.)</li> </ul>			Yes			P. 9-13
80240000 hex	NX Unit Clock Not Synchronized Error	An error occurred in the clock information between the EtherCAT Coupler Unit and the NX Unit.	<ul style="list-style-type: none"> <li>There is a hardware error in the NX Unit.</li> <li>There is a hardware error in the EtherCAT Coupler Unit.</li> </ul>			Yes			P. 9-14
70010000 hex	Previous Time Specified	A previous time was specified for output refreshing with a specified time stamp.	<ul style="list-style-type: none"> <li>A mistake in the user program caused the specification of a previous time.</li> <li>A Communications Synchronization Error caused a delay in the I/O data reaching the NX Unit.</li> </ul>				Yes		P. 9-14
90400000 hex	Event Log Cleared	The event log was cleared.	<ul style="list-style-type: none"> <li>The event log was cleared by the user.</li> </ul>					Yes	P. 9-15

### 9-3-3 Meaning of Error

This section describes the information that is given for individual errors.

#### Error Descriptions

The items that are used to describe individual errors (events) are described in the following copy of an error table.

<b>Event name</b>	Gives the name of the error.		<b>Event code</b>	Gives the code of the error.		
<b>Meaning</b>	Gives a short description of the error.					
<b>Source</b>	Gives the source of the error.		<b>Source details</b>	Gives details on the source of the error.	<b>Detection timing</b>	Tells when the error is detected.
<b>Error attributes</b>	<b>Level</b>	Tells the level of influence on control.*1	<b>Recovery</b>	Gives the recovery method.*2	<b>Log category</b>	Tells which log the error is saved in.*3
<b>Effects</b>	<b>User program</b>	Tells what will happen to execution of the user program.*4	<b>Operation</b>	Provides special information on the operation that results from the error.		
<b>Indicators</b>	Gives the status of the built-in EtherNet/IP port and built-in EtherCAT port indicators. Indicator status is given only for errors in the EtherCAT Master Function Module and the EtherNet/IP Function Module.					
<b>System-defined variables</b>	<b>Variable</b>	<b>Data type</b>		<b>Name</b>		
	Lists the variable names, data types, and meanings for system-defined variables that provide direct error notification, that are directly affected by the error, or that contain settings that cause the error.					
<b>Cause and correction</b>	<b>Assumed cause</b>	<b>Correction</b>		<b>Prevention</b>		
	Lists the possible causes, corrections, and preventive measures for the error.					
<b>Attached information</b>	This is the attached information that is displayed by the Sysmac Studio or an NS-series PT.*5					
<b>Precautions/Remarks</b>	Provides precautions, restrictions, and supplemental information. If the user can set the event level, the event levels that can be set, the recovery method, operational information, and other information are also provided.					

\*1. One of the following:

- Major fault: Major fault level
- Partial fault: Partial fault level
- Minor fault: Minor fault level
- Observation
- Information

\*2. One of the following:

- Automatic recovery: Normal status is restored automatically when the cause of the error is removed.
- Error reset: Normal status is restored when the error is reset after the cause of the error is removed.
- Cycle the power supply: Normal status is restored when the power supply to the Controller is turned OFF and then back ON after the cause of the error is removed.
- Controller reset: Normal status is restored when the Controller is reset after the cause of the error is removed.
- Depends on cause: The recovery method depends on the cause of the error.

\*3. One of the following:

- System: System event log
- Access: Access event log

\*4. One of the following:

- Continues: Execution of the user program will continue.
- Stops: Execution of the user program stops.
- Starts: Execution of the user program starts.

\*5. "System information" indicates internal system information that is used by OMRON.

<b>Event name</b>	Non-volatile Memory Hardware Error		<b>Event code</b>	00200000 hex		
<b>Meaning</b>	An error occurred in non-volatile memory.					
<b>Source</b>	Depends on where the Sysmac Studio is connected and the system configuration.		<b>Source details</b>	NX Unit	<b>Detection timing</b>	When power is turned ON to the NX Unit
<b>Error attributes</b>	<b>Level</b>	Minor fault	<b>Recovery</b>	Restart the Slave Terminal and then reset all errors in Controller.	<b>Log category</b>	System
<b>Effects</b>	<b>User program</b>	Continues.	<b>Operation</b>	I/O refreshing for the NX Unit stops. Messages cannot be sent to the NX Unit.		
<b>System-defined variables</b>	<b>Variable</b>		<b>Data type</b>		<b>Name</b>	
	None		---		---	
<b>Cause and correction</b>	<b>Assumed cause</b>		<b>Correction</b>		<b>Prevention</b>	
	Non-volatile memory failure		Replace the NX Unit.		None	
<b>Attached information</b>	None					
<b>Precautions/Remarks</b>	None					

<b>Event name</b>	Control Parameter Error in Master		<b>Event code</b>	10410000 hex	
<b>Meaning</b>	An error occurred in the control parameters that are saved in the master.				
<b>Source</b>	Depends on where the Sysmac Studio is connected and the system configuration.		<b>Source details</b>	NX Unit	<b>Detection timing</b> When power is turned ON to the NX Unit
<b>Error attributes</b>	<b>Level</b>	Minor fault	<b>Recovery</b>	When the fail-soft operation for the Communications Coupler Unit is set to stop, restart the NX Unit and then reset all errors in Controller.  When the fail-soft operation for the Communications Coupler Unit is set to fail-soft, restart the NX Unit and then reset errors in Communications Coupler Unit.	<b>Log category</b> System
<b>Effects</b>	<b>User program</b>	Continues.	<b>Operation</b>	I/O refreshing for the NX Unit stops.	
<b>Sys-tem-defined variables</b>	<b>Variable</b>	<b>Data type</b>		<b>Name</b>	
	None	---		---	
<b>Cause and correction</b>	<b>Assumed cause</b>		<b>Correction</b>		<b>Prevention</b>
	There is an error in the area of the non-volatile memory in the Communications Coupler Unit in which the control parameters for the NX Unit are saved.  The power supply to the NX Unit was turned OFF or Sysmac Studio communications were disconnected while writing the control parameters.		Write the control parameters again and restart the Communications Coupler Unit.  If the error occurs again even after you make the above correction, replace the Communications Coupler Unit.		
<b>Attached information</b>	None				
<b>Precautions/Remarks</b>	None				

<b>Event name</b>	NX Unit I/O Communications Error		<b>Event code</b>	8020000 hex	
<b>Meaning</b>	An I/O communications error occurred between the Communications Coupler Unit and the NX Unit.				
<b>Source</b>	Depends on where the Sysmac Studio is connected and the system configuration.		<b>Source details</b>	NX Unit	<b>Detection timing</b> Continuously
<b>Error attributes</b>	<b>Level</b>	Minor fault	<b>Recovery</b>	When the fail-soft operation for the Communications Coupler Unit is set to stop, reset all errors in Controller.  When the fail-soft operation for the Communications Coupler Unit is set to fail-soft, reset errors in Communications Coupler Unit and NX Unit.	<b>Log category</b> System
<b>Effects</b>	<b>User program</b>	Continues.	<b>Operation</b>	The NX Unit will continue to operate.  Input data: Updating input values stops.  Output data: The output values depend on the Load Rejection Output Setting.	
<b>Sys-tem-defined variables</b>	<b>Variable</b>	<b>Data type</b>		<b>Name</b>	
	None	---		---	
<b>Cause and correction</b>	<b>Assumed cause</b>	<b>Correction</b>		<b>Prevention</b>	
	The NX Unit is not mounted properly.	Mount the NX Units and End Cover securely and secure them with End Plates.		Mount the NX Units and End Cover securely and secure them with End Plates.	
	The power cable for the Unit power supply is disconnected. Or, the wiring from the Unit power supply to the NX Units is incorrect.	Correctly wire the Unit power supply to the NX Units.		Correctly wire the Unit power supply to the NX Units.	
	The power cable for the Unit power supply is broken.	Replace the power cable between the Unit power supply and the NX Units.		None	
	The voltage of the Unit power supply is outside the specified range. Or, the capacity of the Unit power supply is insufficient.	Correctly configure the power supply system according to the power supply design methods.		Correctly configure the power supply system according to the power supply design methods.	
	There is a hardware error in the NX Unit.	If the error occurs again even after you make the above correction, replace the NX Unit.		None	
<b>Attached information</b>	None				
<b>Precautions/Remarks</b>	None				



<b>Event name</b>	NX Unit Output Synchronization Error		<b>Event code</b>	80210000 hex	
<b>Meaning</b>	An output synchronization error occurred in the NX Unit.				
<b>Source</b>	Depends on where the Sysmac Studio is connected and the system configuration.		<b>Source details</b>	NX Unit	<b>Detection timing</b> Continuously
<b>Error attributes</b>	<b>Level</b>	Minor fault	<b>Recovery</b>	Reset all errors in Controller.	<b>Log category</b> System
<b>Effects</b>	<b>User program</b>	Continues.	<b>Operation</b>	The NX Unit will continue to operate. Input data: Updating input values stops. Output data: The output values depend on the Load Rejection Output Setting.	
<b>System-defined variables</b>	<b>Variable</b>	<b>Data type</b>		<b>Name</b>	
	None	---		---	
<b>Cause and correction</b>	<b>Assumed cause</b>	<b>Correction</b>		<b>Prevention</b>	
	The NX Unit is not mounted properly.	Mount the NX Units and End Cover securely and secure them with End Plates.		Mount the NX Units and End Cover securely and secure them with End Plates.	
	The Slave Terminal Configuration Information when the EtherCAT Coupler Unit synchronization settings were downloaded did not agree with the actual configuration of the Slave Terminal.	Correct the actual configuration of the Slave Terminal so that it agrees with the Slave Terminal Configuration Information when the EtherCAT Coupler Unit synchronization settings are downloaded. Or, download synchronization settings that agree with the actual configuration of the Slave Terminal.		Correct the actual configuration of the Slave Terminal so that it agrees with the Slave Terminal Configuration Information when the EtherCAT Coupler Unit synchronization settings are downloaded. Or, download synchronization settings that agree with the actual configuration of the Slave Terminal.	
	There is an NX Unit that cannot be synchronized to the specified output synchronization timing. (This will not cause an error when the synchronization setting is made from the Sysmac Studio.)	Adjust the timing of output synchronization to the slowest NX Unit of the NX Units to synchronize.		Adjust the timing of output synchronization to the slowest NX Unit of the NX Units to synchronize.	
<b>Attached information</b>	None				
<b>Precautions/Remarks</b>	None				

<b>Event name</b>	NX Unit Clock Not Synchronized Error		<b>Event code</b>	80240000 hex	
<b>Meaning</b>	An error occurred in the clock information between the EtherCAT Coupler Unit and the NX Unit.				
<b>Source</b>	Depends on where the Sysmac Studio is connected and the system configuration.		<b>Source details</b>	NX Unit	<b>Detection timing</b> Continuously
<b>Error attributes</b>	<b>Level</b>	Minor fault	<b>Recovery</b>	Restart the NX Unit.	<b>Log category</b> System
<b>Effects</b>	<b>User program</b>	Continues.	<b>Operation</b>	The NX Unit will continue to operate. Input data: Updating input values stops. Output data: The output values depend on the Load Rejection Output Setting.	
<b>System-defined variables</b>	<b>Variable</b>		<b>Data type</b>		<b>Name</b>
	None		---		---
<b>Cause and correction</b>	<b>Assumed cause</b>		<b>Correction</b>		<b>Prevention</b>
	There is a hardware error in the NX Unit. There is a hardware error in the EtherCAT Coupler Unit.		If the error occurred in only a specific NX Unit in the Slave Terminal, replace the NX Unit. If the error occurred in all of the NX Units on the Slave Terminal except for the System Units, replace the EtherCAT Coupler Unit.		None
<b>Attached information</b>	None				
<b>Precautions/Remarks</b>	None				

<b>Event name</b>	Previous Time Specified		<b>Event code</b>	70010000 hex	
<b>Meaning</b>	A previous time was specified for output refreshing with a specified time stamp.				
<b>Source</b>	Depends on where the Sysmac Studio is connected and the system configuration.		<b>Source details</b>	NX Unit	<b>Detection timing</b> Continuously
<b>Error attributes</b>	<b>Level</b>	Observation	<b>Recovery</b>	Reset error in the NX Unit.	<b>Log category</b> System
<b>Effects</b>	<b>User program</b>	Continues.	<b>Operation</b>	The output value that is specified for the previous time is not output.	
<b>System-defined variables</b>	<b>Variable</b>		<b>Data type</b>		<b>Name</b>
	None		---		---
<b>Cause and correction</b>	<b>Assumed cause</b>		<b>Correction</b>		<b>Prevention</b>
	A mistake in the user program caused the specification of a previous time. A Communications Synchronization Error caused a delay in the I/O data reaching the NX Unit.		Check the user program to see if it specifies a previous time. Refer to the corrections for the Communications Synchronization Error and take steps to prevent the error.		Check the user program to see if it specifies a previous time. Refer to the corrections for the Communications Synchronization Error and take steps to prevent the error.
<b>Attached information</b>	None				
<b>Precautions/Remarks</b>	None				

<b>Event name</b>	Event Log Cleared		<b>Event code</b>	90400000 hex		
<b>Meaning</b>	The event log was cleared.					
<b>Source</b>	Depends on where the Sysmac Studio is connected and the system configuration.		<b>Source details</b>	NX Unit	<b>Detection timing</b>	When commanded from user
<b>Error attributes</b>	<b>Level</b>	Information	<b>Recovery</b>	---	<b>Log category</b>	Access
<b>Effects</b>	<b>User program</b>	Continues.	<b>Operation</b>	Not affected.		
<b>System-defined variables</b>	<b>Variable</b>		<b>Data type</b>		<b>Name</b>	
	None		---		---	
<b>Cause and correction</b>	<b>Assumed cause</b>		<b>Correction</b>		<b>Prevention</b>	
	The event log was cleared by the user.		---		---	
<b>Attached information</b>	Attached information: Events that were cleared 1: The system event log was cleared. 2: The access event log was cleared.					
<b>Precautions/Remarks</b>	None					

## 9-4 Resetting Errors

---

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

## 9-5 Troubles Specific To Each Type of NX Units

### 9-5-1 Digital Inputs

Problem	Assumed 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 within the rated 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.

## 9-5-2 Digital Outputs

Problem	Assumed cause	Correction
When the output is ON, nothing is output although the output indicator is lit.	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 within the rated 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.
Although the output is ON, nothing is output and the output indicator is not lit either.	A communications error occurred.	Check if a communications (NX bus) error occurred.
Cannot hold outputs when communications errors occur.	The load rejection output setting is set to "OFF".	Set the load rejection output setting to "Hold the present value".
Cannot clear outputs when communications errors occur.	The load rejection output setting is set to "Hold the present value".	Set the load rejection output setting to "OFF".

## 9-6 Troubleshooting Flowchart

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





# 10

## Inspection and Maintenance

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

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<b>10-1 Cleaning and Inspection</b> .....	<b>10-2</b>
10-1-1 Cleaning .....	10-2
10-1-2 Periodic Inspection .....	10-2
<b>10-2 Maintenance Procedures</b> .....	<b>10-5</b>

# 10-1 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 Digital I/O Unit's functions in the best operating condition.

## 10-1-1 Cleaning

Perform the following cleaning procedures periodically to ensure Digital I/O Units are maintained in the best 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.

## 10-1-2 Periodic Inspection

NX Units do not have parts with a specific life. However, its elements can deteriorate under improper environmental conditions. Periodic inspections are thus required to ensure that the required conditions are being maintained.

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**

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### ● **Required Tools**

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

### ● **Tools Required Occasionally**

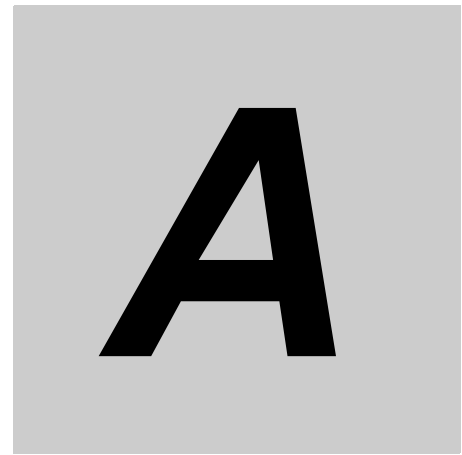
- Oscilloscope
- Thermometer and hygrometer

# 10-2 Maintenance Procedures

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When you replace a Digital I/O Unit, follow the procedure in the user's manual for the connected Communications Coupler Unit.





# Appendices

This section describes the data sheets of the Digital I/O Units and their dimensions.

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# A-1 Data Sheet

The specifications of individual Digital I/O Unit are shown below.

## A-1-1 Model List

### DC Input Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference			
NX-ID3317	4 points	NPN	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 μs max./400 μs max.	P. A-7			
NX-ID3343			24 VDC	Input refreshing with input changed time only	100 ns max./100 ns max.	P. A-8			
NX-ID3344						P. A-9			
NX-ID3417		PNP	12 to 24 VDC	24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 μs max./400 μs max.	P. A-10		
NX-ID3443							Input refreshing with input changed time only	100 ns max./100 ns max.	P. A-11
NX-ID3444									P. A-12
NX-ID4342	8 points	NPN	24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 μs max./400 μs max.	P. A-13			
NX-ID4442	PNP	P. A-14							
NX-ID5342	16 points	NPN				P. A-15			
NX-ID5442	PNP	P. A-16							

### DC Input Units (MIL Connector, 30 mm Width)

Model	Number of points	Internal I/O common	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-ID5142-5	16 points	For both NPN/PNP	24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 μs max./400 μs max.	P. A-17
NX-ID6142-5	32 points	For both NPN/PNP	24 VDC			P. A-19



## AC Input Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-IA3117	4 points	200 to 240 VAC, 50/60 Hz (170 to 264 VAC, $\pm 3$ Hz)	Free-Run refreshing	10 ms max./40 ms max.	P. A-22

## Transistor Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-OD2154	2 points	NPN	0.5 A/point, 1 A/Unit	24 VDC	Output refreshing with specified time stamp only	300 ns max./300 ns max.	P. A-26
NX-OD2258		PNP					P. A-28
NX-OD3121	4 points	NPN	0.5 A/point, 2 A/Unit	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	0.1 ms max./0.8 ms max.	P. A-29
NX-OD3153				24 VDC		300 ns max./300 ns max.	P. A-30
NX-OD3256		PNP				0.5 ms max./1.0 ms max.	P. A-31
NX-OD3257				300 ns max./300 ns max.		P. A-32	
NX-OD4121	8 points	NPN	0.5 A/point, 4 A/Unit	12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-34
NX-OD4256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-35
NX-OD5121	16 points	NPN		12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-36
NX-OD5256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-37

### Transistor Output Units (MIL Connector, 30 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-OD5121-5	16 points	NPN	0.5 A/point, 2 A/Unit	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	0.1 ms max./0.8 ms max.	P. A-38
NX-OD5256-5		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-40
NX-OD6121-5	32 points	NPN	0.5 A/point, 2 A/common, 4 A/Unit	12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-41
NX-OD6256-5		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-43

### Relay Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Relay type	Maximum switching capacity	I/O refreshing method	ON/OFF response time	Reference
NX-OC2633	2 points	N.O.	250 VAC/2 A (cosΦ = 1), 250 VAC/2 A (cosΦ = 0.4), 24 VDC/2 A, 4 A/Unit	Free-Run refreshing	15 ms max./15 ms max.	P. A-45
NX-OC2733		N.O. + N.C.				P. A-47

### DC Input/Transistor Output Units (MIL Connector, 30 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-MD6121-5	Outputs: 16 points	Outputs: NPN Inputs: For both NPN/PNP	0.5 A/point, 2 A/Unit	Outputs: 12 to 24 VDC Inputs: 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	Outputs: 0.1 ms max./0.8 ms max. Inputs: 20 μs max./400 μs max.	P. A-51
NX-MD6256-5	Inputs: 16 points	Outputs: PNP Inputs: For both NPN/PNP		Outputs: 24 VDC Inputs: 24 VDC		Outputs: 0.5 ms max./1.0 ms max. Inputs: 20 μs max./400 μs max.	P. A-55

## A-1-2 Digital Input Units

### Description of Items on Data Sheet of the DC Input Units

The meanings of the items on the data sheet of the DC Input Unit are explained in the table below.


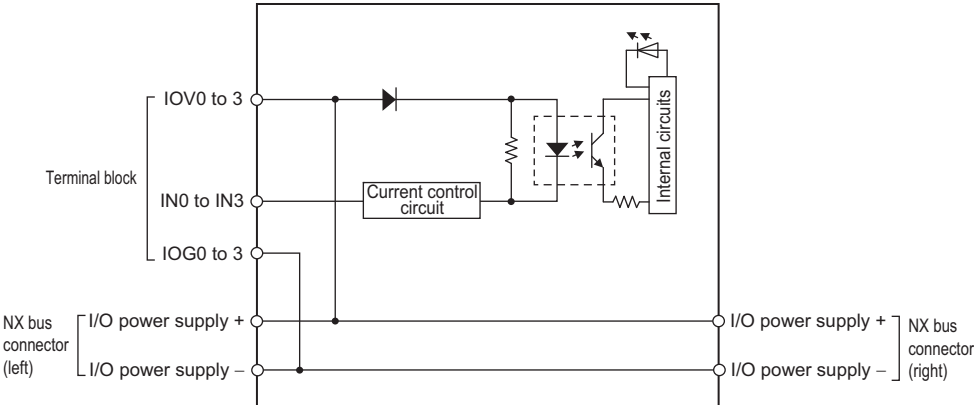
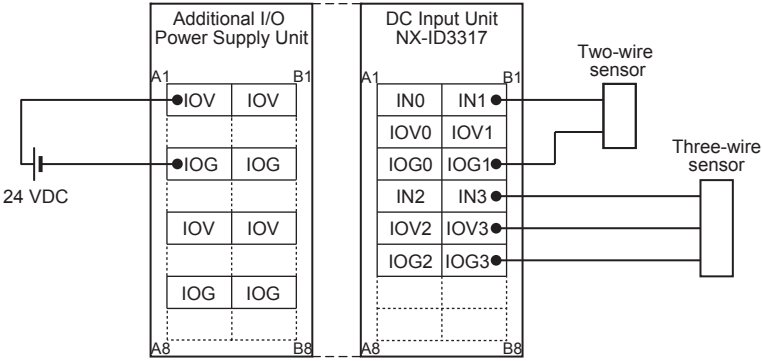
Item	Description
<b>Unit name</b>	The name of the Unit.
<b>Model</b>	The model of the Unit.
<b>Number of points</b>	The number of input points provided by the Unit.
<b>External connection terminals</b>	The type of terminal block and connector that is used for connecting the Unit. The number of terminals on the terminal block is also described when a screwless clamping terminal block is used.
<b>I/O refreshing method</b>	The I/O refreshing methods that are used by the Unit. Free-Run refreshing, synchronous I/O refreshing and input refreshing with input changed time are available.
<b>Indicators</b>	The type of indicators on the Unit and the layout of those indicators.
<b>Internal I/O common</b>	The polarity of the input devices that are connected to the Unit. NPN connection and PNP connection are available.
<b>Rated input voltage</b>	The rated input voltage and range of the Unit.
<b>Input current</b>	The input current at the rated voltage of the Unit.
<b>ON voltage/ON current</b>	The input voltage in which the Unit input turns ON, and corresponding input current.
<b>OFF voltage/OFF current</b>	The input voltage in which the Unit input turns OFF, and corresponding input current.
<b>ON/OFF response time</b>	The delay time for which the status change of the input terminals reaches the internal circuit of the Unit. The input filter time below is not included. It is described according to the ON/OFF sequence.
<b>Input filter time</b>	The filter time when the status of the internal circuit is read as the data to the internal of the Unit. It is same for both ON/OFF. The filter time to be set by the Support Software is described.
<b>Dimensions</b>	The dimensions of the Unit. They are described as W x H x D. The unit is "mm".
<b>Isolation method</b>	The isolation method between the input circuit and internal circuit of the Unit.
<b>Insulation resistance</b>	The insulation resistance between the input circuit and internal circuit of the Unit.
<b>Dielectric strength</b>	The dielectric strength between the input circuit and internal circuit of the Unit.
<b>I/O power supply method</b>	The method for supplying I/O power to the Unit. The supply method is determined for each Unit. The power is supplied from the NX bus or the external source.
<b>Current capacity of I/O power supply terminal</b>	The current capacity of the power supply terminals (IOV/IOG) of the Unit. Do not exceed this value when supplying the I/O power to the connected external devices.
<b>NX Unit power consumption</b>	The power consumption of the NX Unit power supply of the Unit.
<b>Current consumption from I/O power supply</b>	The current consumption from I/O power supply of the Unit. The above input current and current consumption of any connected external devices are excluded.
<b>Weight</b>	The weight of the Unit.
<b>Circuit layout</b>	The input circuit layout of the Unit.
<b>Installation orientation and restrictions</b>	The installation orientation of the Slave Terminal including the Unit, and the details of restrictions on the specifications due to the installation orientation.
<b>Terminal connection diagram</b>	A diagram of the connection between the Unit and connected external devices. When an I/O Power Supply Connection Unit or a Shield Connection Unit is required to be connected to the connected external devices, the description for such is included.
<b>Disconnection/Short-circuit detection</b>	The function of the Unit to detect a disconnection/short-circuit.
<b>Protective function</b>	The protective function that the Unit has.


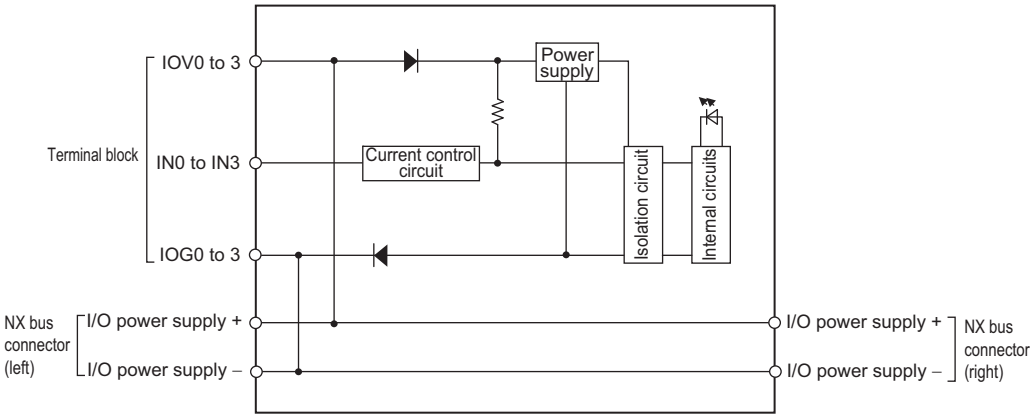
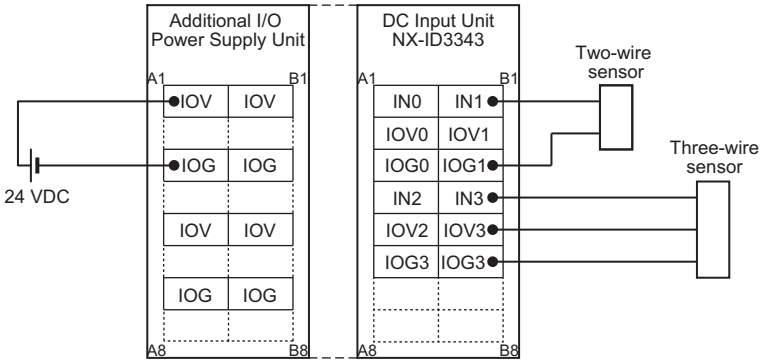
## Description of Items on Data Sheet of the AC Input Units


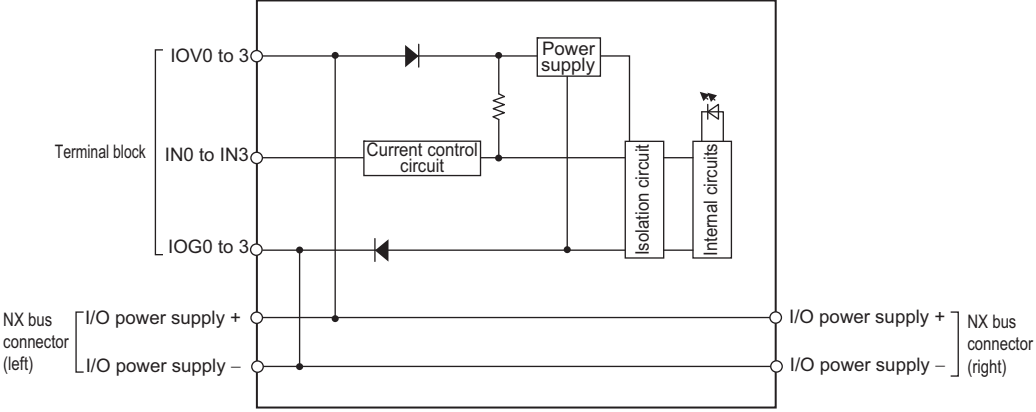
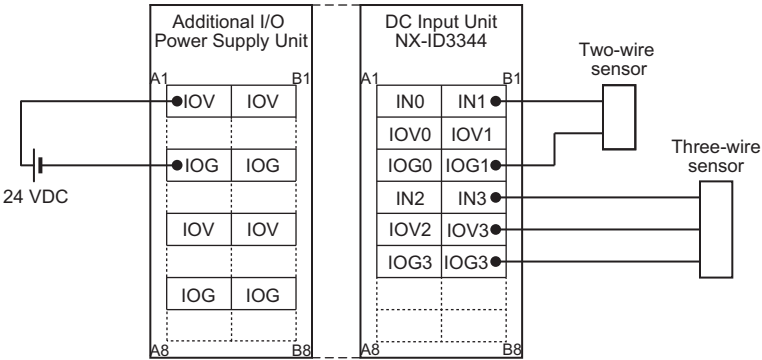
The meanings of the items on the data sheet of the AC Input Units are explained in the table below.


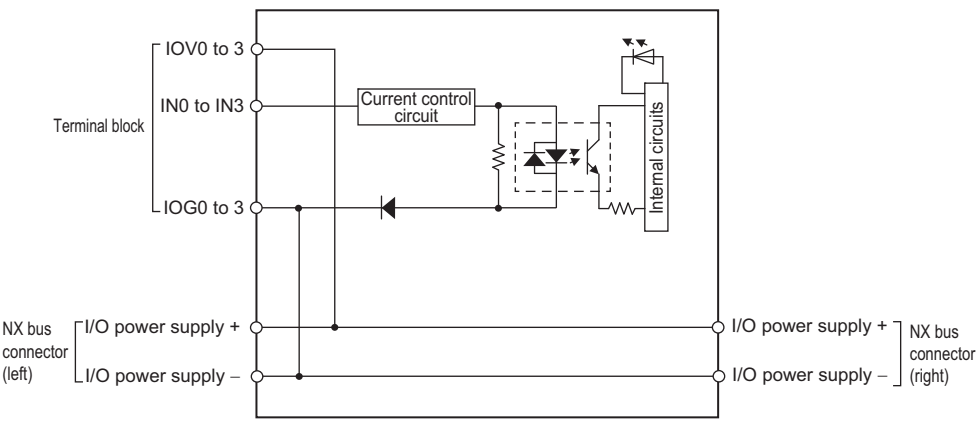
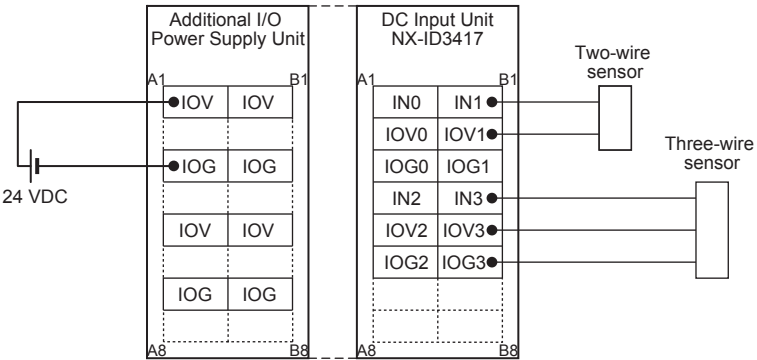
Item	Description
<b>Unit name</b>	The name of the Unit.
<b>Model</b>	The model of the Unit.
<b>Number of points</b>	The number of input points provided by the Unit.
<b>External connection terminals</b>	The type of terminal block and connector that is used for connecting the Unit. The number of terminals on the terminal block is also described when a screwless clamping terminal block is used.
<b>I/O refreshing method</b>	The I/O refreshing methods that are used by the Unit. Free-Run refreshing, synchronous I/O refreshing and input refreshing with input changed time are available.
<b>Indicators</b>	The type of indicators on the Unit and the layout of those indicators.
<b>Internal I/O common</b>	The polarity of the input devices that are connected to the Unit. NPN connection and PNP connection are available.
<b>Rated input voltage</b>	The rated input voltage and range of the Unit.
<b>Input current</b>	The input current at the rated voltage of the Unit.
<b>ON voltage/ON current</b>	The input voltage in which the Unit input turns ON, and corresponding input current.
<b>OFF voltage/OFF current</b>	The input voltage in which the Unit input turns OFF, and corresponding input current.
<b>ON/OFF response time</b>	The delay time for which the status change of the input terminals reaches the internal circuit of the Unit. The input filter time below is not included. It is described according to the ON/OFF sequence.
<b>Input filter time</b>	The filter time when the status of the internal circuit is read as the data to the internal of the Unit. It is same for both ON/OFF. The filter time to be set by the Support Software is described.
<b>Dimensions</b>	The dimensions of the Unit. They are described as W x H x D. The unit is "mm".
<b>Isolation method</b>	The isolation method between the input circuit and internal circuit of the Unit.
<b>Insulation resistance</b>	The insulation resistance between the input circuit and internal circuit of the Unit.
<b>Dielectric strength</b>	The dielectric strength between the input circuit and internal circuit of the Unit.
<b>I/O power supply method</b>	The method for supplying I/O power to the Unit. The supply method is determined for each Unit. The power is supplied from the NX bus or the external source.
<b>Current capacity of I/O power supply terminal</b>	The current capacity of the power supply terminals of the Unit. Do not exceed this value when supplying the I/O power to the connected external devices.
<b>NX Unit power consumption</b>	The power consumption of the NX Unit power supply of the Unit.
<b>Current consumption from I/O power supply</b>	The current consumption from I/O power supply of the Unit. The above input current and current consumption of any connected external devices are excluded.
<b>Weight</b>	The weight of the Unit.
<b>Circuit layout</b>	The input circuit layout of the Unit.
<b>Installation orientation and restrictions</b>	The installation orientation of the Slave Terminal including the Unit, and the details of restrictions on the specifications due to the installation orientation.
<b>Terminal connection diagram</b>	A diagram of the connection between the Unit and connected external devices. When an I/O Power Supply Connection Unit or a Shield Connection Unit is required to be connected to the connected external devices, the description for such is included.
<b>Disconnection/Short-circuit detection</b>	The function of the Unit to detect a disconnection/short-circuit.
<b>Protective function</b>	The protective function that the Unit has.

## DC Input Units (Screwless Clamping Terminal Block, 12 mm Width)


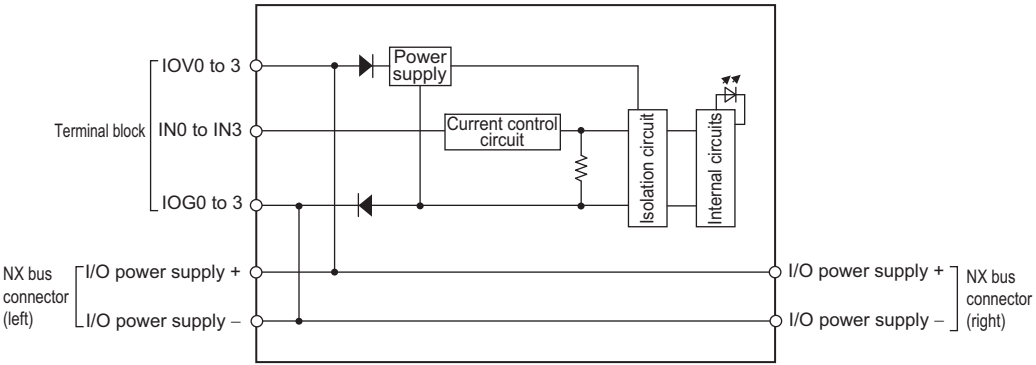
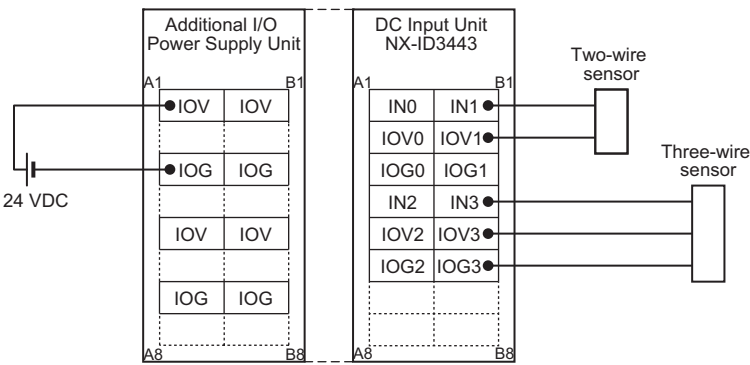
<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID3317
<b>Number of points</b>	4 points	<b>External connection terminals</b>	Screwless clamping terminal block (12 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>		<b>Internal I/O common</b>	NPN
		<b>Rated input voltage</b>	12 to 24 VDC (9 to 28.8 VDC)
		<b>Input current</b>	6 mA typical (at 24 VDC), rated current
		<b>ON voltage/ON current</b>	9 VDC min./3 mA min. (between IOV and each signal)
		<b>OFF voltage/OFF current</b>	2 VDC max./1 mA max. (between IOV and each signal)
		<b>ON/OFF response time</b>	20 μs max./400 μs max.
		<b>Input filter time</b>	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
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Photocoupler isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.1 A/terminal max., IOG: 0.1 A/terminal max.
<b>NX Unit power consumption</b>	0.50 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>Weight</b>	65 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.


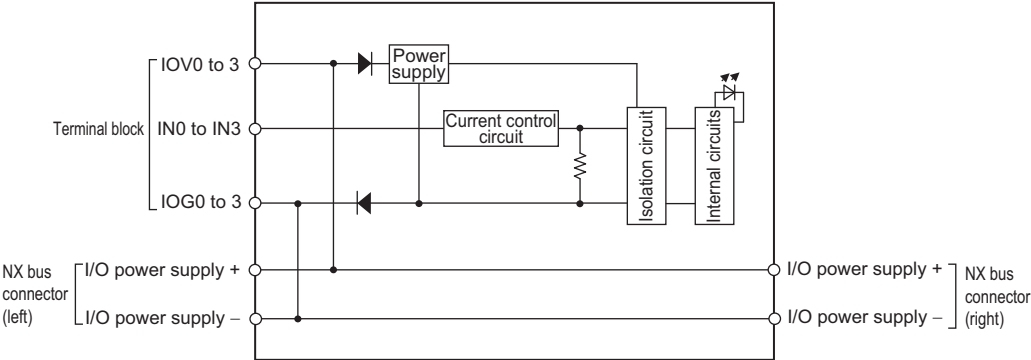
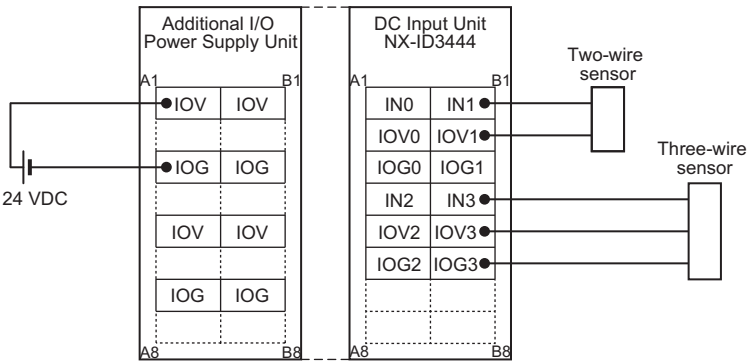
<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID3343
<b>Number of points</b>	4 points	<b>External connection terminals</b>	Screwless clamping terminal block (12 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>		<b>Internal I/O common</b>	NPN
		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
		<b>Input current</b>	3.5 mA typical (at 24 VDC), rated current
		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between IOV and each signal)
		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between IOV and each signal)
		<b>ON/OFF response time</b>	100 ns max./100 ns max.
		<b>Input filter time</b>	No filter, 1 μs, 2 μs, 4 μs, 8 μs (default), 16 μs, 32 μs, 64 μs, 128 μs, 256 μs
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Digital isolator isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.1 A/terminal max., IOG: 0.1 A/terminal max.
<b>NX Unit power consumption</b>	0.55 W max.	<b>Current consumption from I/O power supply</b>	30 mA max.
<b>Weight</b>	65 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.


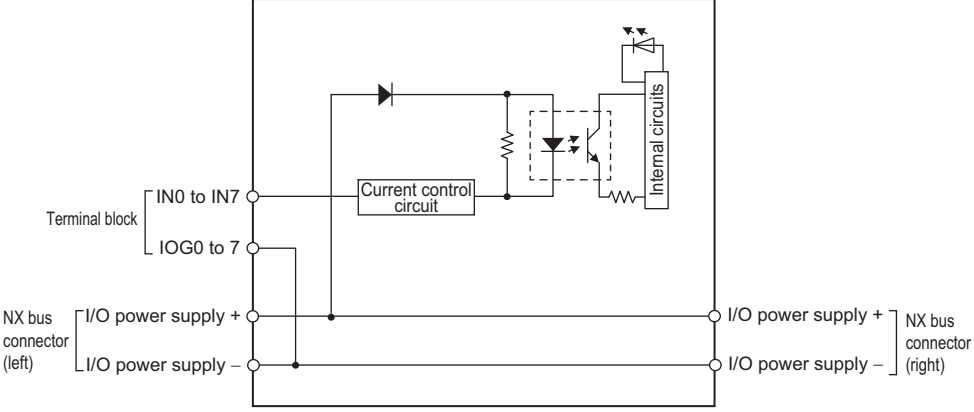
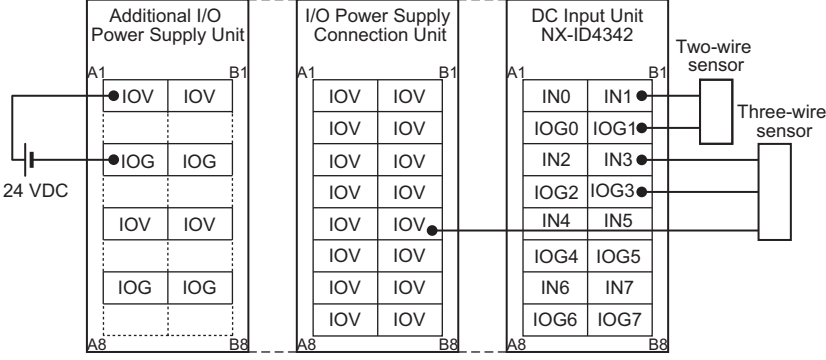
<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID3344
<b>Number of points</b>	4 points	<b>External connection terminals</b>	Screwless clamping terminal block (12 terminals)
<b>I/O refreshing method</b>	Input refreshing with input changed time		
<b>Indicators</b>		<b>Internal I/O common</b>	NPN
		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
		<b>Input current</b>	3.5 mA typical (at 24 VDC), rated current
		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between IOV and each signal)
		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between IOV and each signal)
		<b>ON/OFF response time</b>	100 ns max./100 ns max.
		<b>Input filter time</b>	No filter
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Digital isolator isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.1 A/terminal max., IOG: 0.1 A/terminal max.
<b>NX Unit power consumption</b>	0.55 W max.	<b>Current consumption from I/O power supply</b>	30 mA max.
<b>Weight</b>	65 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.

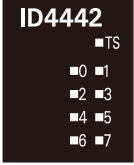
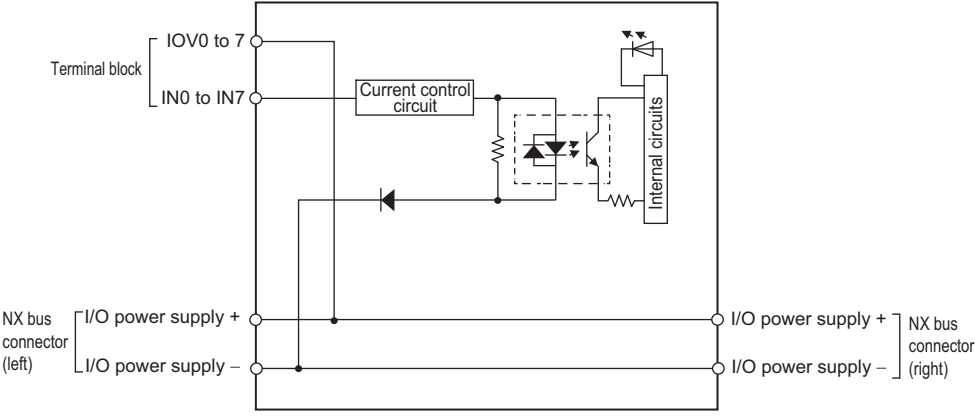
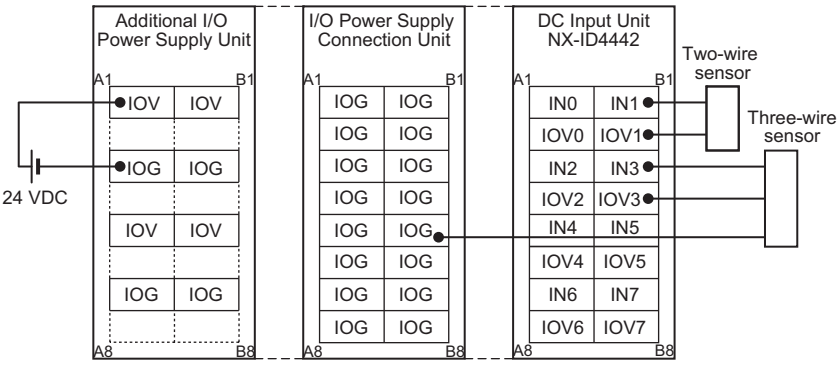
<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID3417
<b>Number of points</b>	4 points	<b>External connection terminals</b>	Screwless clamping terminal block (12 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	<p>TS indicator, input indicators</p> 	<b>Internal I/O common</b>	PNP
		<b>Rated input voltage</b>	12 to 24 VDC (9 to 28.8 VDC)
		<b>Input current</b>	6 mA typical (at 24 VDC), rated current
		<b>ON voltage/ON current</b>	9 VDC min./3 mA min. (between IOG and each signal)
		<b>OFF voltage/OFF current</b>	2 VDC max./1 mA max. (between IOG and each signal)
		<b>ON/OFF response time</b>	20 μs max./400 μs max.
		<b>Input filter time</b>	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
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Photocoupler isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.1 A/terminal max., IOG: 0.1 A/terminal max.
<b>NX Unit power consumption</b>	0.50 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>Weight</b>	65 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	<p>Installation orientation: Possible in 6 orientations.</p> <p>Restrictions: No restrictions</p>		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.




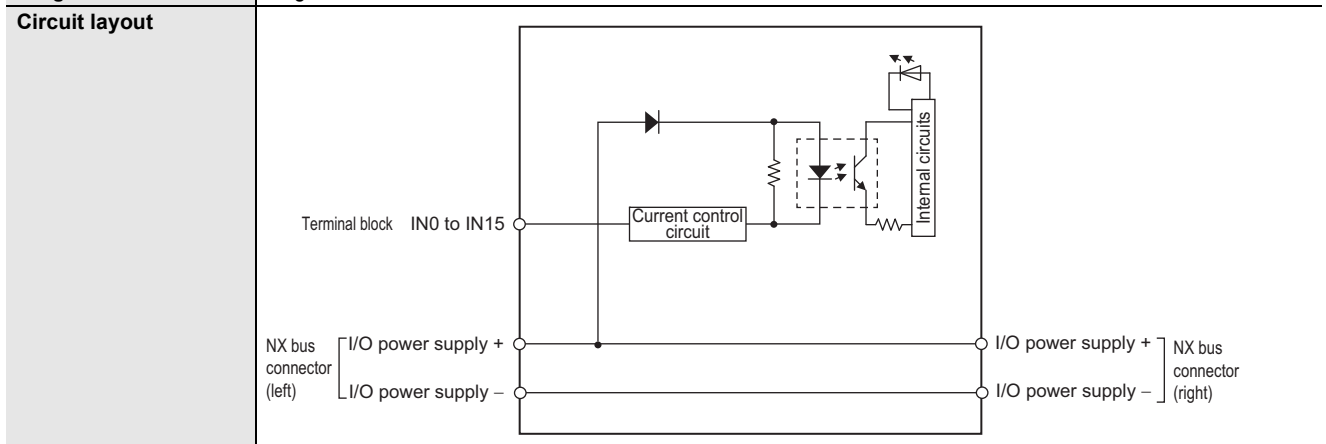
<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID3443
<b>Number of points</b>	4 points	<b>External connection terminals</b>	Screwless clamping terminal block (12 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>		<b>Internal I/O common</b>	PNP
		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
		<b>Input current</b>	3.5 mA typical (at 24 VDC), rated current
		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between IOG and each signal)
		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between IOG and each signal)
		<b>ON/OFF response time</b>	100 ns max./100 ns max.
		<b>Input filter time</b>	No filter, 1 μs, 2 μs, 4 μs, 8 μs (default), 16 μs, 32 μs, 64 μs, 128 μs, 256 μs
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Digital isolator isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.1 A/terminal max., IOG: 0.1 A/terminal max.
<b>NX Unit power consumption</b>	0.55 W max.	<b>Current consumption from I/O power supply</b>	30 mA max.
<b>Weight</b>	65 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.

<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID3444
<b>Number of points</b>	4 points	<b>External connection terminals</b>	Screwless clamping terminal block (12 terminals)
<b>I/O refreshing method</b>	Input refreshing with input changed time		
<b>Indicators</b>		<b>Internal I/O common</b>	PNP
		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
		<b>Input current</b>	3.5 mA typical (at 24 VDC), rated current
		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between IOG and each signal)
		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between IOG and each signal)
		<b>ON/OFF response time</b>	100 ns max./100 ns max.
		<b>Input filter time</b>	No filter
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Digital isolator isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.1 A/terminal max., IOG: 0.1 A/terminal max.
<b>NX Unit power consumption</b>	0.55 W max.	<b>Current consumption from I/O power supply</b>	30 mA max.
<b>Weight</b>	65 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.

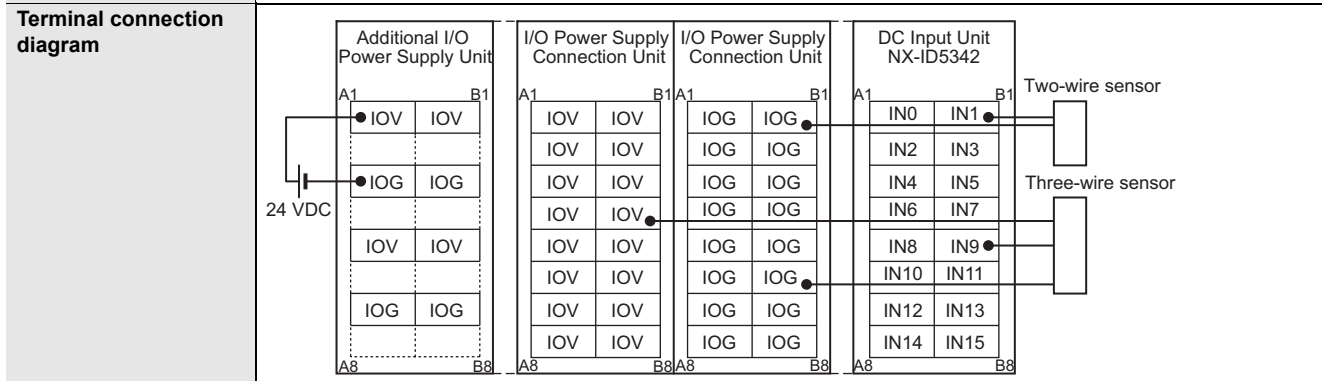
<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID4342
<b>Number of points</b>	8 points	<b>External connection terminals</b>	Screwless clamping terminal block (16 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>		<b>Internal I/O common</b>	NPN
		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
		<b>Input current</b>	3.5 mA typical (at 24 VDC), rated current
		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between IOV and each signal)
		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between IOV and each signal)
		<b>ON/OFF response time</b>	20 μs max./400 μs max.
		<b>Input filter time</b>	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
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Photocoupler isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOG: 0.1 A/terminal max.
<b>NX Unit power consumption</b>	0.50 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>Weight</b>	65 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.

<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID4442
<b>Number of points</b>	8 points	<b>External connection terminals</b>	Screwless clamping terminal block (16 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>		<b>Internal I/O common</b>	PNP
		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
		<b>Input current</b>	3.5 mA typical (at 24 VDC), rated current
		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between IOG and each signal)
		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between IOG and each signal)
		<b>ON/OFF response time</b>	20 μs max./400 μs max.
		<b>Input filter time</b>	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
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Photocoupler isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.1 A/terminal max.
<b>NX Unit power consumption</b>	0.50 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>Weight</b>	65 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.

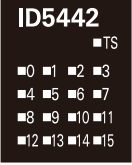
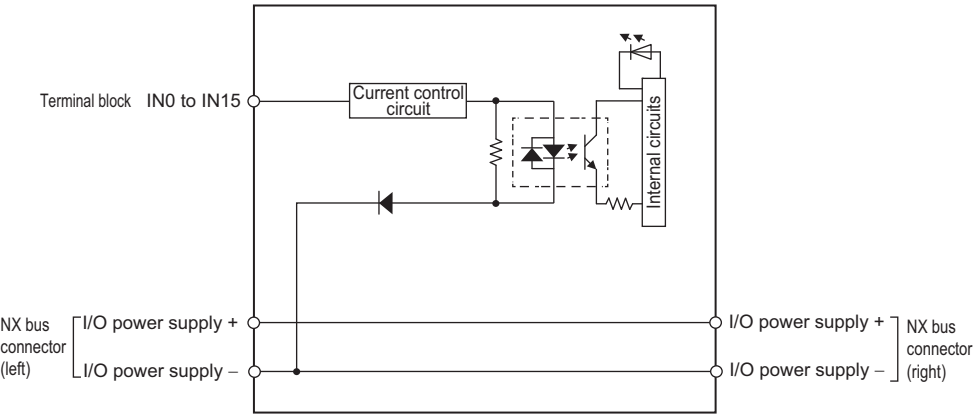
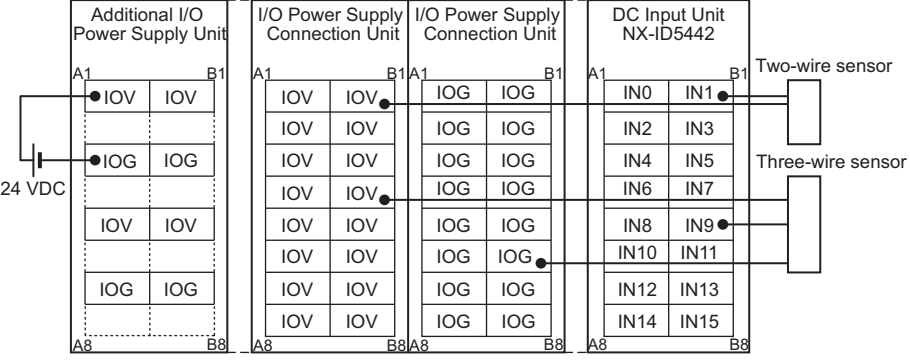
<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID5342
<b>Number of points</b>	16 points	<b>External connection terminals</b>	Screwless clamping terminal block (16 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>		<b>Internal I/O common</b>	NPN
		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
		<b>Input current</b>	2.5 mA typical (at 24 VDC), rated current
		<b>ON voltage/ON current</b>	15 VDC min./2 mA min. (between IOV and each signal)
		<b>OFF voltage/OFF current</b>	5 VDC max./0.5 mA max. (between IOV and each signal)
		<b>ON/OFF response time</b>	20 μs max./400 μs max.
		<b>Input filter time</b>	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
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Photocoupler isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.55 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>Weight</b>	65 g max.		



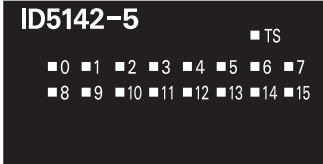
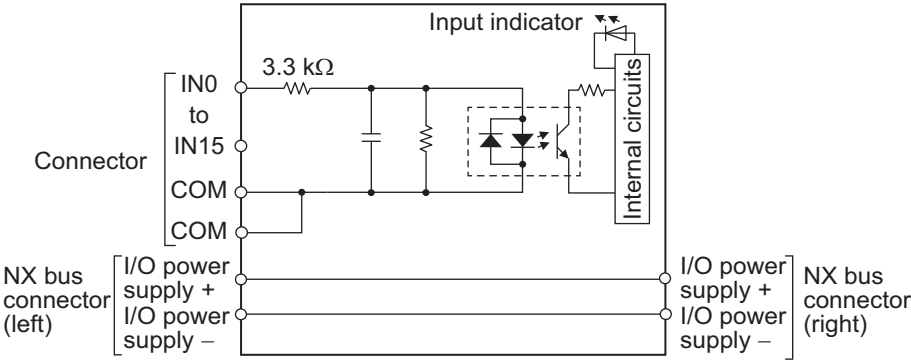
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions
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<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.
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<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID5442
<b>Number of points</b>	16 points	<b>External connection terminals</b>	Screwless clamping terminal block (16 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	<p>TS indicator, input indicators</p> 	<b>Internal I/O common</b>	PNP
		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
		<b>Input current</b>	2.5 mA typical (at 24 VDC), rated current
		<b>ON voltage/ON current</b>	15 VDC min./2 mA min. (between IOG and each signal)
		<b>OFF voltage/OFF current</b>	5 VDC max./0.5 mA max. (between IOG and each signal)
		<b>ON/OFF response time</b>	20 μs max./400 μs max.
		<b>Input filter time</b>	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
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Photocoupler isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.55 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>Weight</b>	65 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	<p>Installation orientation: Possible in 6 orientations.</p> <p>Restrictions: No restrictions</p>		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.

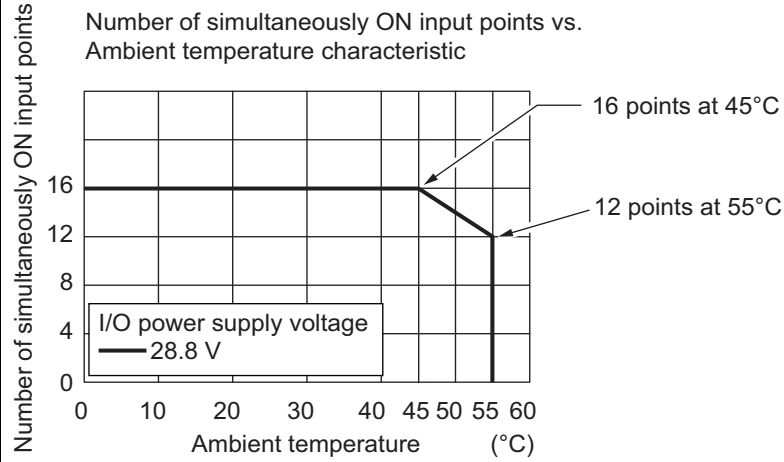
## DC Input Units (MIL Connector, 30 mm Width)

<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID5142-5
<b>Number of points</b>	16 points	<b>External connection terminals</b>	MIL connector (20 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>		<b>Internal I/O common</b>	For both NPN/PNP
		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
		<b>Input current</b>	7 mA typical (at 24 VDC)
		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between COM and each signal)
		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between COM and each signal)
		<b>ON/OFF response time</b>	20 μs max./400 μs max.
		<b>Input filter time</b>	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
<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Photocoupler isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from external source	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.55 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>Weight</b>	85 g max.		
<b>Circuit layout</b>			

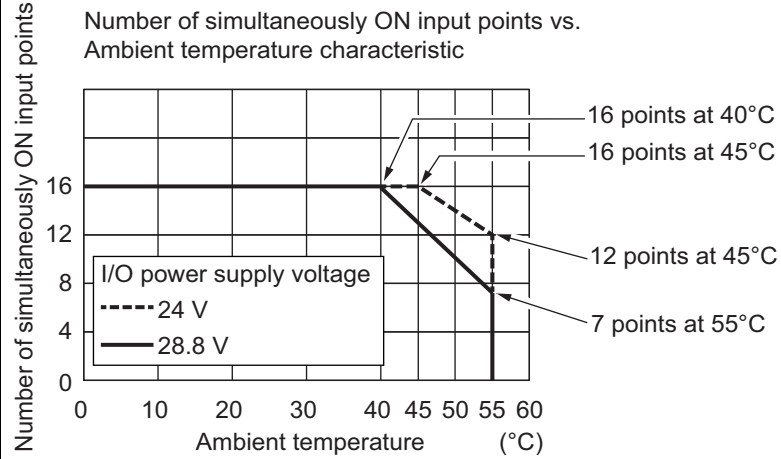
**Installation orientation and restrictions**

Installation orientation: Possible in 6 orientations.  
 Restrictions: As shown in the following.

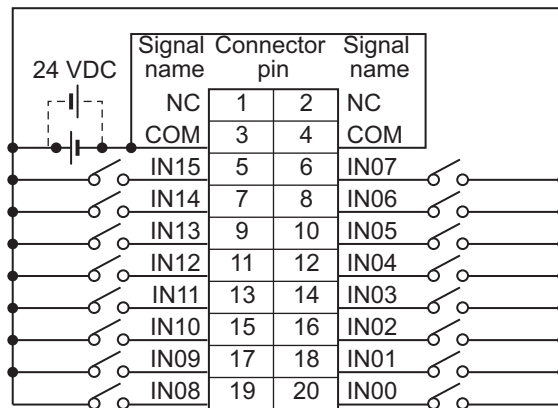
- For upright installation



- For any installation other than upright



**Terminal connection diagram**



- The polarity of the input power supply can be connected in either direction.
- Be sure to wire both pins 3 and 4 (COM), and set the same polarity for both pins.

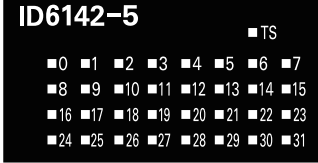
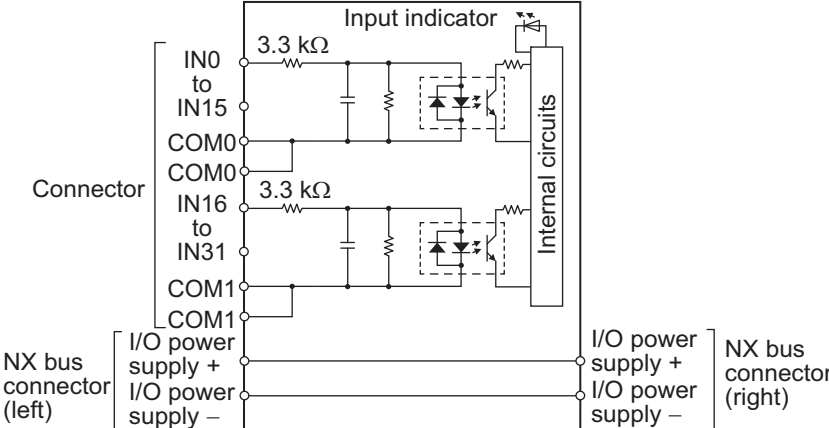
**Disconnection/Short-circuit detection**

Not supported.

**Protective function**

Not supported.



<b>Unit name</b>	DC Input Unit	<b>Model</b>	NX-ID6142-5
<b>Number of points</b>	32 points	<b>External connection terminals</b>	MIL connector (40 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	TS indicator, input indicators 	<b>Internal I/O common</b>	For both NPN/PNP
		<b>Rated input voltage</b>	24 VDC (19 to 28.8 VDC)
		<b>Input current</b>	4.1 mA typical (24 VDC)
		<b>ON voltage/ON current</b>	19 VDC min./3 mA min. (between COM and each signal)
		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between COM and each signal)
		<b>ON/OFF response time</b>	20 μs max./400 μs max.
		<b>Input filter time</b>	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
<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Photocoupler isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from external source	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.60 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>Weight</b>	90 g max.		
<b>Circuit layout</b>			

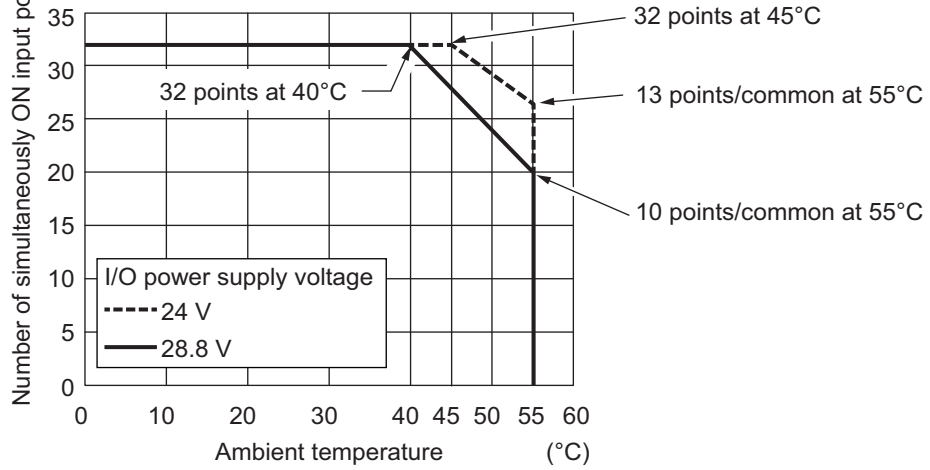
**Installation orientation and restrictions**

Installation orientation: Possible in 6 orientations.

Restrictions: As shown in the following.

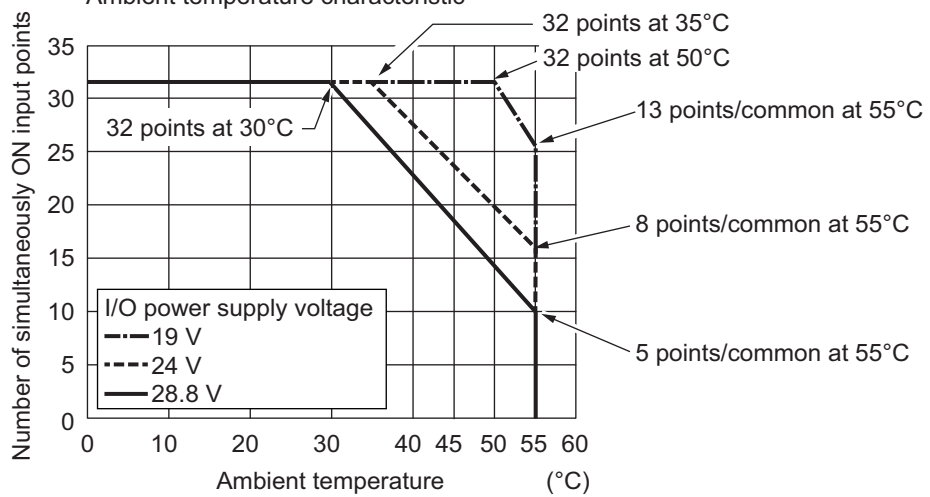
- For upright installation

Number of simultaneously ON input points vs. Ambient temperature characteristic

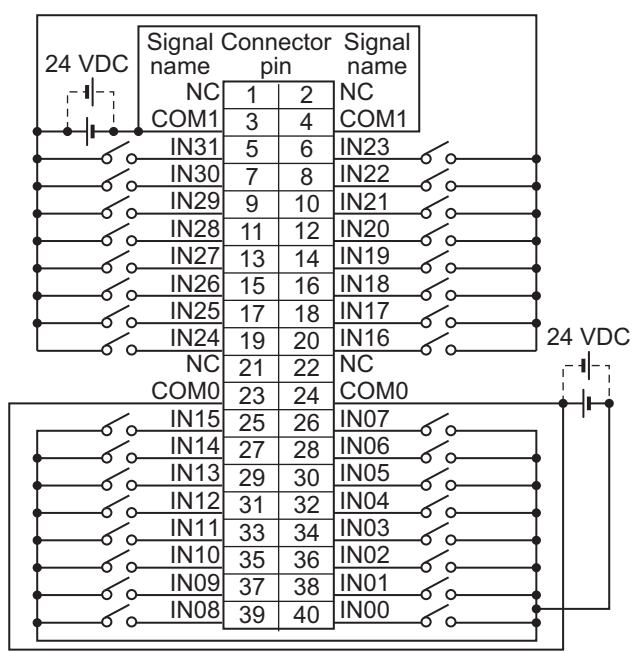


- For any installation other than upright

Number of simultaneously ON input points vs. Ambient temperature characteristic




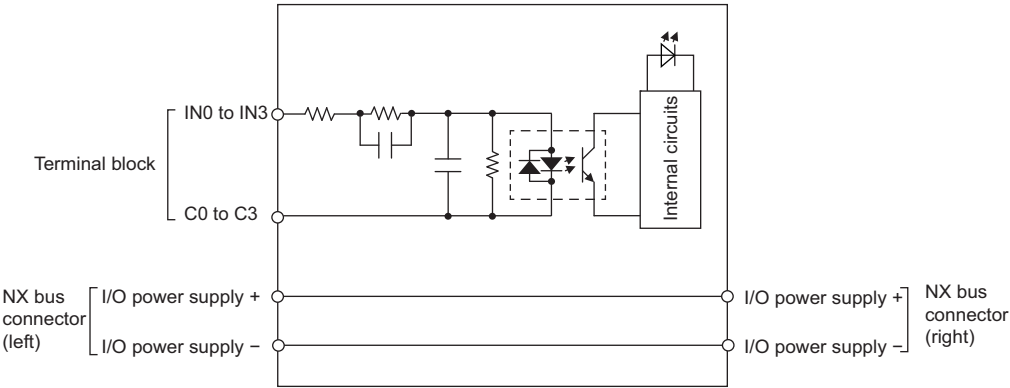
**Terminal connection diagram**



- The polarity of the input power supply can be connected in either direction.
- Be sure to wire both pins 23 and 24 (COM0), and set the same polarity for both pins.
- Be sure to wire both pins 3 and 4 (COM1), and set the same polarity for both pins.

<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.
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## AC Input Units (Screwless Clamping Terminal Block, 12 mm Width)

<b>Unit name</b>	AC Input Unit	<b>Model</b>	NX-IA3117
<b>Number of points</b>	4 points, independent contacts	<b>External connection terminals</b>	Screwless clamping terminal block (8 terminals)
<b>I/O refreshing method</b>	Free-Run refreshing		
<b>Indicators</b>	<p>TS indicator, input indicators</p> 	<b>Internal I/O common</b>	No polarity
		<b>Rated input voltage</b>	200 to 240 VAC, 50/60 Hz (170 to 264 VAC, ±3 Hz)
		<b>Input current</b>	9 mA typical (at 200 VAC, 50 Hz) 11 mA typical (at 200 VAC, 60 Hz)
		<b>ON voltage/ON current</b>	120 VAC min./4 mA min.
		<b>OFF voltage/OFF current</b>	40 VAC max./2 mA max.
		<b>ON/OFF response time</b>	10 ms max./40 ms max.
		<b>Input filter time</b>	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
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Photocoupler isolation
<b>Insulation resistance</b>	Between each AC input circuit: 20 MΩ min. (at 500 VDC)	<b>Dielectric strength</b>	Between each AC input circuit: 3700 VAC for 1 min at a leakage current of 5 mA max.
	Between the external terminals and the functional ground terminal: 20 MΩ min. (at 500 VDC)		Between the external terminals and functional ground terminal: 2300 VAC for 1 min at a leakage current of 5 mA max.
	Between the external terminals and internal circuits: 20 MΩ min. (at 500 VDC)		Between the external terminals and internal circuits: 2300 VAC for 1 min at a leakage current of 5 mA max.
	Between the internal circuit and the functional ground terminal: 20 MΩ min. (at 100 VDC)		Between the internal circuit and the functional ground terminal: 510 VAC for 1 min at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supplied from external source.	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>Weight</b>	0.50 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>NX Unit power consumption</b>	60 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	<p>Installation orientation: Possible in 6 orientations.</p> <p>Restrictions: No restrictions</p>		

<p><b>Terminal connection diagram</b></p>		
<p><b>Disconnection/ Short-circuit detection</b></p>	<p>Not supported.</p>	<p><b>Protective function</b> Not supported.</p>

## A-1-3 Digital Output Units

### Description of Items on the Data Sheet of the Transistor Output Unit

The meanings of the items on the data sheet of the Transistor Output Units are explained in the table below.


Item	Description
<b>Unit name</b>	The name of the Unit.
<b>Model</b>	The model of the Unit.
<b>Number of points</b>	The number of output points provided by the Unit.
<b>External connection terminals</b>	The type of terminal block and connector that is used for connecting the Unit. The number of terminals on the terminal block is also described when a screwless clamping terminal block is used.
<b>I/O refreshing method</b>	The I/O refreshing methods that are used by the Unit. Free-Run refreshing and synchronous I/O refreshing are available. The I/O refreshing methods that are used by the Unit. Free-Run refreshing, synchronous I/O refreshing and output refreshing with specified time stamp are available.
<b>Indicators</b>	The type of indicators on the Unit and the layout of those indicators.
<b>Internal I/O common</b>	The polarity of the output devices that are connected to the Unit. NPN connection and PNP connection are available.
<b>Rated voltage</b>	The rated output voltage of the Unit.
<b>Operating load voltage range</b>	The output load voltage range of the Unit.
<b>Maximum value of load current</b>	The maximum output load current of the Unit. The specifications for each output point and for the Unit are described. The specifications for each common are described depending on model.
<b>Maximum inrush current</b>	The maximum allowable inrush current of the Unit. Any inrush current from an external connection load must be kept to or below this value.
<b>Leakage current</b>	The leakage current when the output of the Unit is OFF.
<b>Residual voltage</b>	The residual voltage when the output of the Unit is ON.
<b>ON/OFF response time</b>	The delay time for which data in the internal circuit is reflected in the state of output elements of the Unit. It is described according to the ON/OFF sequence.
<b>Dimensions</b>	The dimensions of the Unit. They are described as W x H x D. The unit is "mm".
<b>Isolation method</b>	The isolation method of the output circuit and internal circuit of the Unit.
<b>Insulation resistance</b>	The insulation resistance between the output circuit and internal circuit of the Unit.
<b>Dielectric strength</b>	The dielectric strength between the output circuit and internal circuit of the Unit.
<b>I/O power supply method</b>	The method for supplying I/O power to the Unit. The supply method is determined for each Unit. The power is supplied from the NX bus or the external source.
<b>Current capacity of I/O power supply terminal</b>	The current capacity of the I/O power supply terminals (IOV/IOG) of the Unit. Do not exceed this value when supplying the I/O power to the connected external devices.
<b>NX Unit power consumption</b>	The power consumption of the NX Unit power supply of the Unit.
<b>Current consumption from I/O power supply</b>	The current consumption from I/O power supply of the Unit. The load current of any external connection load and current consumption of any connected external devices are not included.
<b>Weight</b>	The weight of the Unit.
<b>Circuit layout</b>	The output circuit layout of the Unit.
<b>Installation orientation and restrictions</b>	The installation orientation of the Slave Terminal including the Unit, and the details of restrictions on the specifications due to the installation orientation.
<b>Terminal connection diagram</b>	A diagram of the connection between the Unit and connected external devices. When an I/O Power Supply Connection Unit or a Shield Connection Unit is required to be connected to the connected external devices, the description for such is included.
<b>Disconnection/Short-circuit detection</b>	The function of the Unit to detect a disconnection/short-circuit.
<b>Protective function</b>	The protective function that the Unit has.

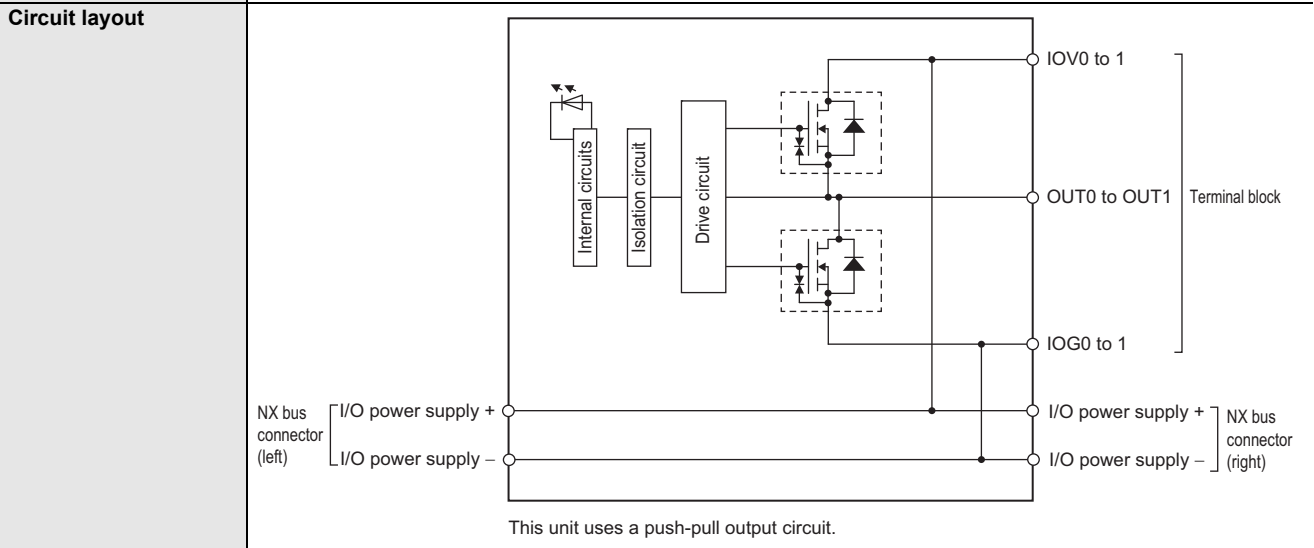
## Description of Items on the Data Sheet of the Relay Output Unit

The meanings of the items on the data sheet of the Relay Output Unit are explained in the table below.

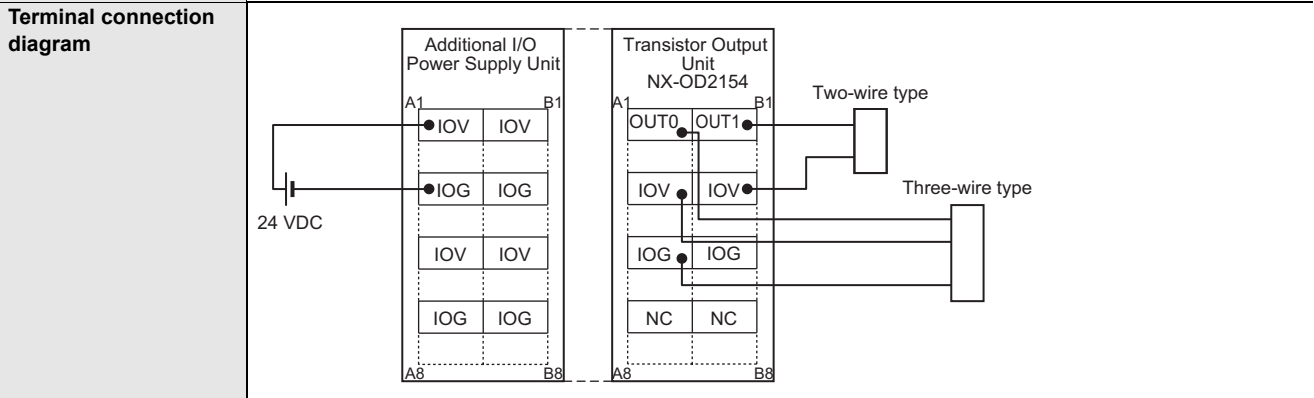
Item	Description
<b>Unit name</b>	The name of the Unit.
<b>Model</b>	The model of the Unit.
<b>Number of points</b>	The number of output points provided by the Unit.
<b>External connection terminals</b>	The type of terminal block and connector that is used for connecting the Unit. The number of terminals on the terminal block is also described when a screwless clamping terminal block is used.
<b>I/O refreshing method</b>	The I/O refreshing methods that are used by the Unit. Free-Run refreshing and synchronous I/O refreshing are available.
<b>Indicators</b>	The type of indicators on the Unit and the layout of those indicators.
<b>Relay type</b>	The type of relay that is connected to the Unit. There are N.O. and N.O. + N.C..
<b>Maximum switching capacity</b>	The maximum value of switchable current of the connected relay.
<b>Minimum switching capacity</b>	The minimum value of switchable current of the connected relay.
<b>Relay service life</b>	The service life of the connected relay.
<b>ON/OFF response time</b>	The delay time for which data in the internal circuit is reflected in the state of output elements of the Unit. It is described according to the ON/OFF sequence.
<b>Dimensions</b>	The dimensions of the Unit. They are described as W x H x D. The unit is "mm".
<b>Isolation method</b>	The isolation method of the output circuit and internal circuit of the Unit.
<b>Insulation resistance</b>	The insulation resistance between the output circuit and internal circuit of the Unit.
<b>Dielectric strength</b>	The dielectric strength between the output circuit and internal circuit of the Unit.
<b>Vibration resistance</b>	The vibration-resistance specifications of the Unit. Some are different from the general specifications.
<b>Shock resistance</b>	These are the shock-resistance specifications of the Unit. Some are different from the general specifications.
<b>I/O power supply method</b>	The method for supplying I/O power to the Unit. The supply method is determined for each Unit. The power is supplied from the NX bus or the external source.
<b>Current capacity of I/O power supply terminal</b>	The current capacity of the I/O power supply terminals (IOV/IOG) of the Unit. Do not exceed this value when supplying the I/O power to the connected external devices.
<b>NX Unit power consumption</b>	The power consumption of the NX Unit power supply of the Unit.
<b>Current consumption from I/O power supply</b>	The current consumption from I/O power supply of the Unit. The load current of any external connection load and current consumption of any connected external devices are not included.
<b>Weight</b>	The weight of the Unit.
<b>Circuit layout</b>	The output circuit layout of the Unit.
<b>Installation orientation and restrictions</b>	The installation orientation of the Slave Terminal including the Unit, and the details of restrictions on the specifications due to the installation orientation.
<b>Terminal connection diagram</b>	A diagram of the connection between the Unit and connected external devices. When an I/O Power Supply Connection Unit or a Shield Connection Unit is required to be connected to the connected external devices, the description for such is included.
<b>Disconnection/Short-circuit detection</b>	The function of the Unit to detect a disconnection/short-circuit.
<b>Protective function</b>	The protective function that the Unit has.

## Transistor Output Units (Screwless Clamping Terminal Block, 12 mm Width)

<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD2154
<b>Number of points</b>	2 points	<b>External connection terminals</b>	Screwless clamping terminal block (8 terminals)
<b>I/O refreshing method</b>	Output refreshing with specified time stamp		
<b>Indicators</b>	TS indicator, output indicator  	<b>Internal I/O common</b>	NPN
		<b>Rated voltage</b>	24 VDC
		<b>Operating load voltage range</b>	15 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 1 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	300 ns max./300 ns max.
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Digital isolator isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.5 A/terminal max., IOG: 0.5 A/terminal max.
<b>NX Unit power consumption</b>	0.50 W max.	<b>Current consumption from I/O power supply</b>	30 mA max.
<b>Weight</b>	70 g max.		

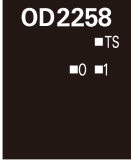
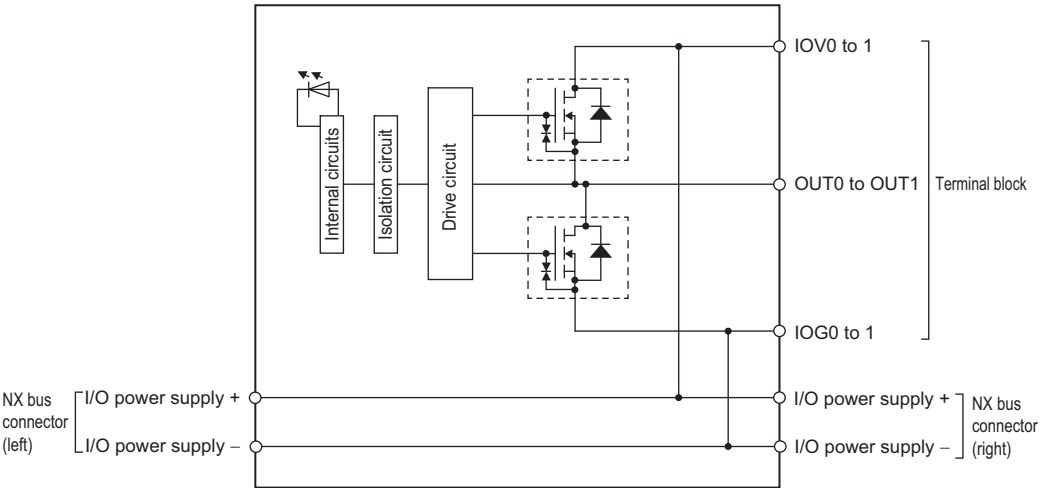
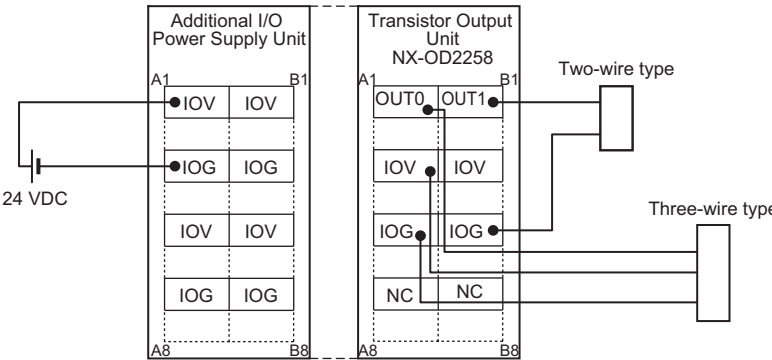



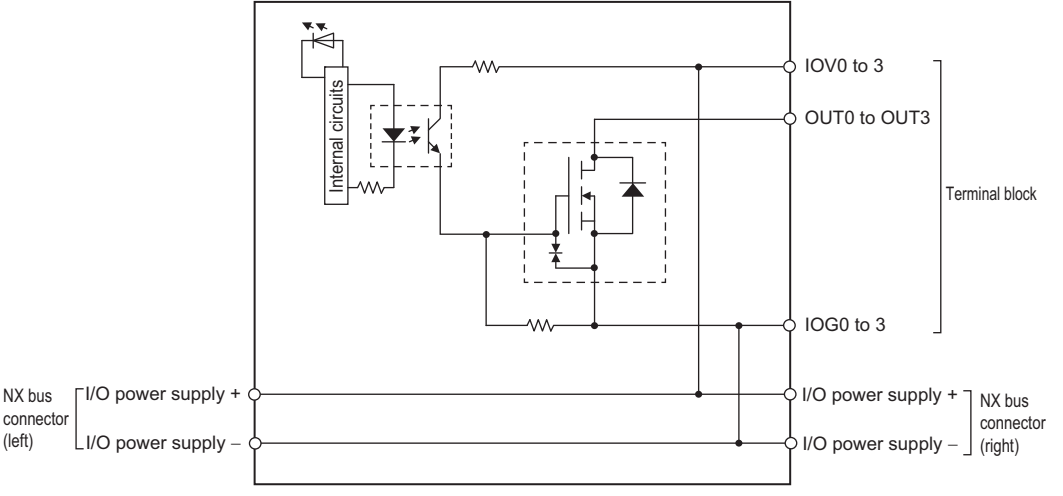
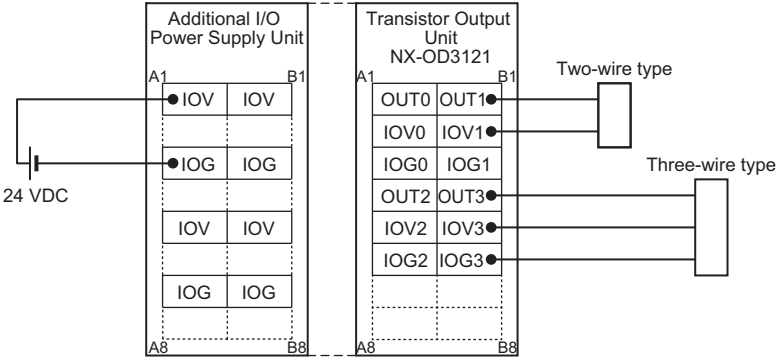
**Installation orientation and restrictions**  
 Installation orientation: Possible in 6 orientations.  
 Restrictions: No restrictions


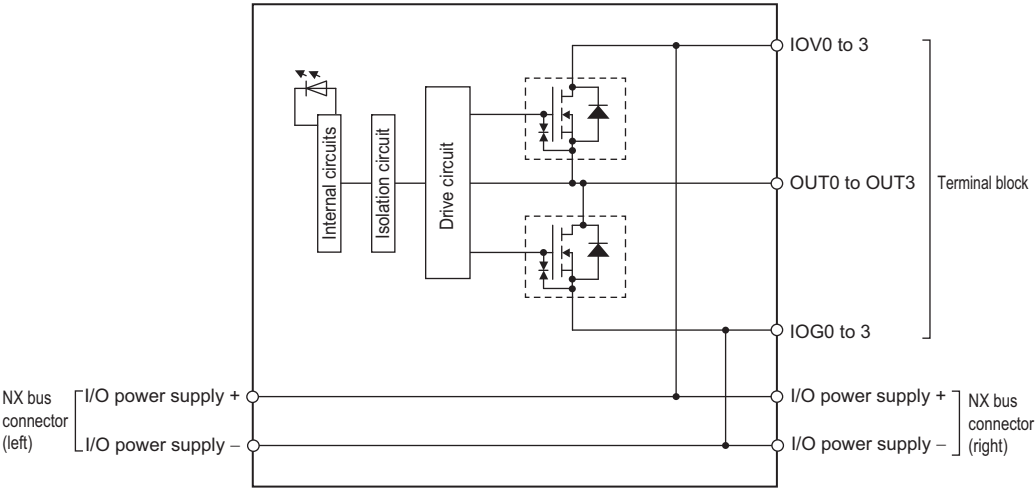
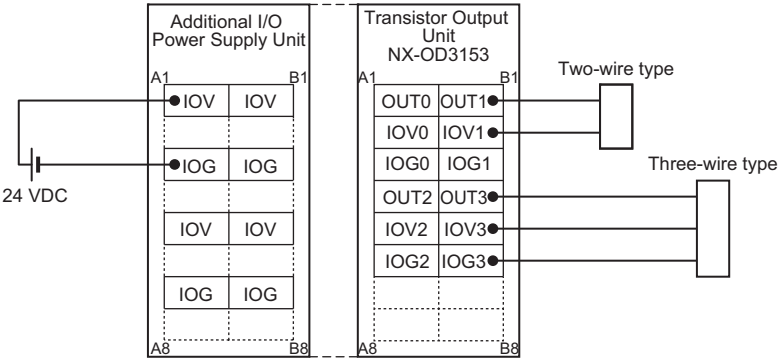



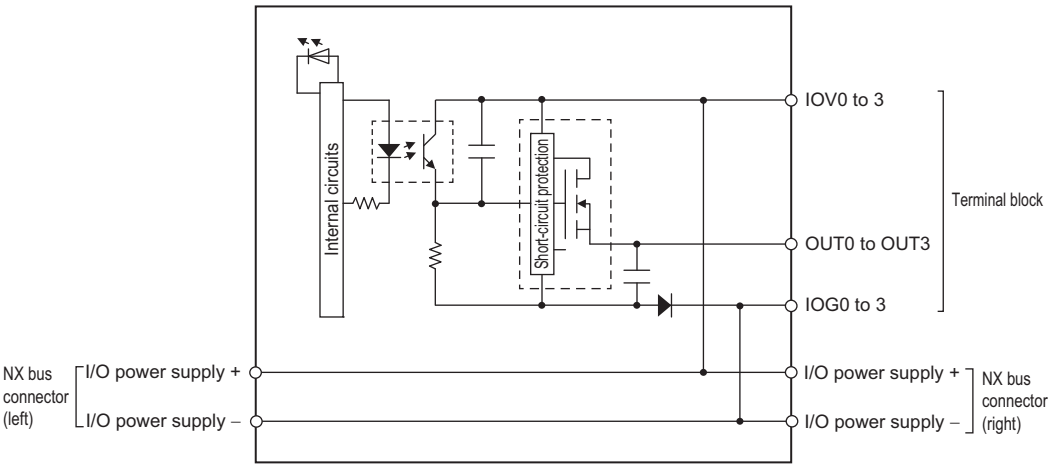
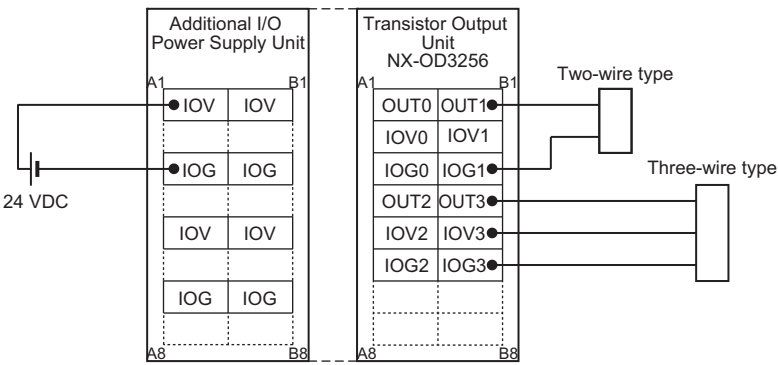



<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.
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<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD2258
<b>Number of points</b>	2 points	<b>External connection terminals</b>	Screwless clamping terminal block (8 terminals)
<b>I/O refreshing method</b>	Output refreshing with specified time stamp		
<b>Indicators</b>	 <p>OD2258 ■ TS ■ 0 ■ 1</p>	<b>Internal I/O common</b>	PNP
		<b>Rated voltage</b>	24 VDC
		<b>Operating load voltage range</b>	15 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 1 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	300 ns max./300 ns max.
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Digital isolator isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.5 A/terminal max., IOG: 0.5 A/terminal max.
<b>NX Unit power consumption</b>	0.50 W max.	<b>Current consumption from I/O power supply</b>	40 mA max.
<b>Weight</b>	70 g max.		
<b>Circuit layout</b>	 <p>This unit uses a push-pull output circuit.</p>		
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	With load short-circuit protection.

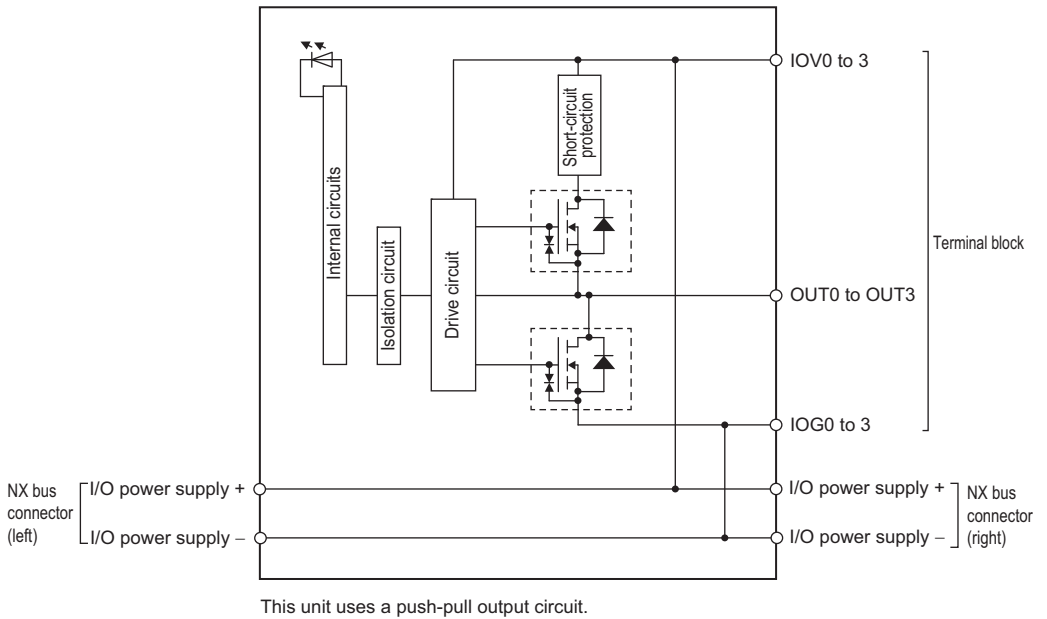
<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD3121
<b>Number of points</b>	4 points	<b>External connection terminals</b>	Screwless clamping terminal block (12 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	 <p>OD3121          ■ TS          ■ 0 ■ 1          ■ 2 ■ 3</p>	<b>Internal I/O common</b>	NPN
		<b>Rated voltage</b>	12 to 24 VDC
		<b>Operating load voltage range</b>	10.2 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 2 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	0.1 ms max./0.8 ms max.
		<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.5 A/terminal max., IOG: 0.5 A/terminal max.
<b>NX Unit power consumption</b>	0.55 W max.	<b>Current consumption from I/O power supply</b>	10 mA max.
<b>Weight</b>	70 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.

<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD3153
<b>Number of points</b>	4 points	<b>External connection terminals</b>	Screwless clamping terminal block (12 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	TS indicator, output indicator  	<b>Internal I/O common</b>	NPN
		<b>Rated voltage</b>	24 VDC
		<b>Operating load voltage range</b>	15 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 2 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	300 ns max./300 ns max.
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Digital isolator isolation
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.5 A/terminal max., IOG: 0.5 A/terminal max.
<b>NX Unit power consumption</b>	0.50 W max.	<b>Current consumption from I/O power supply</b>	30 mA max.
<b>Weight</b>	70 g max.		
<b>Circuit layout</b>	 <p style="text-align: center;">This unit uses a push-pull output circuit.</p>		
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.

<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD3256
<b>Number of points</b>	4 points	<b>External connection terminals</b>	Screwless clamping terminal block (12 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	 <p>OD3256          ■ TS          ■ 0 ■ 1          ■ 2 ■ 3</p>	<b>Internal I/O common</b>	PNP
		<b>Rated voltage</b>	24 VDC
		<b>Operating load voltage range</b>	15 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 2 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	0.5 ms max./1.0 ms max.
		<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.5 A/terminal max., IOG: 0.5 A/terminal max.
<b>NX Unit power consumption</b>	0.55 W max.	<b>Current consumption from I/O power supply</b>	20 mA max.
<b>Weight</b>	70 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	With load short-circuit protection.

<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD3257
<b>Number of points</b>	4 points	<b>External connection terminals</b>	Screwless clamping terminal block (12 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>		<b>Internal I/O common</b>	PNP
		<b>Rated voltage</b>	24 VDC
		<b>Operating load voltage range</b>	15 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 2 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	300 ns max./300 ns max.
		<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.5 A/terminal max., IOG: 0.5 A/terminal max.
<b>NX Unit power consumption</b>	0.50 W max.	<b>Current consumption from I/O power supply</b>	40 mA max.
<b>Weight</b>	70 g max.		

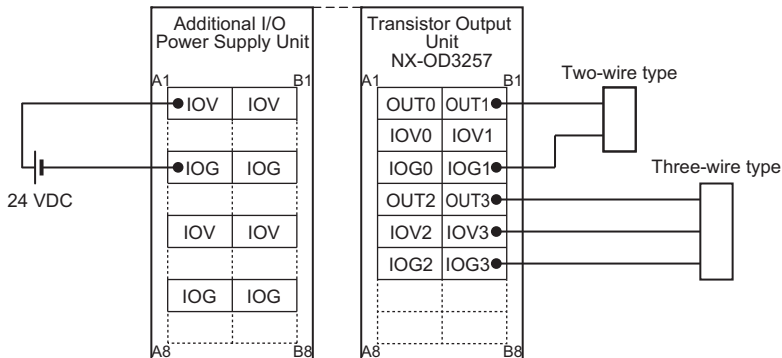
**Circuit layout**




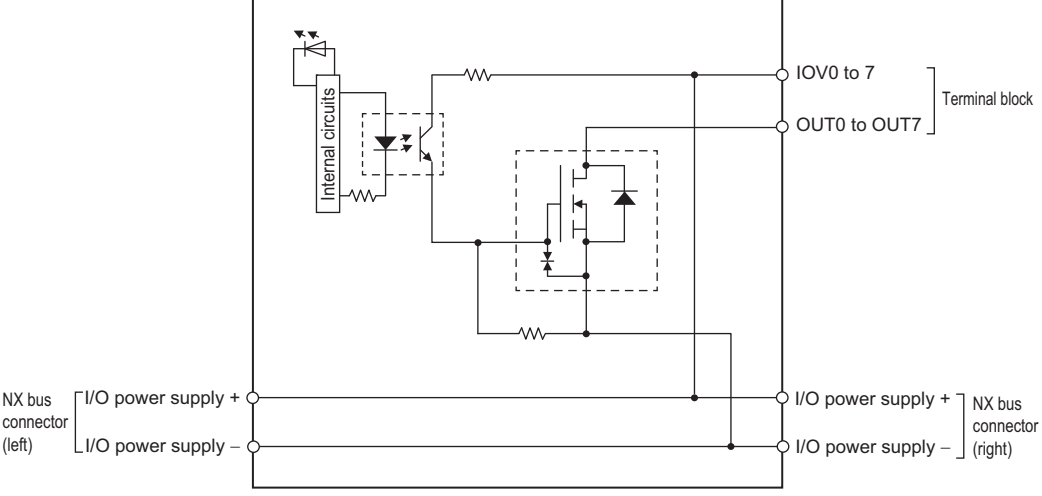
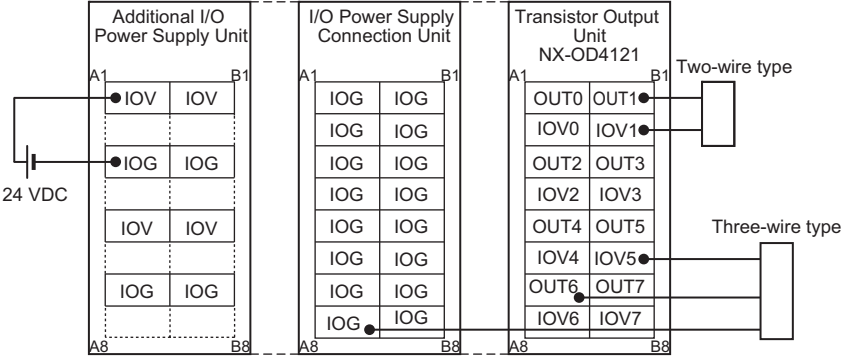
**Installation orientation and restrictions**

Installation orientation: Possible in 6 orientations.  
Restrictions: No restrictions


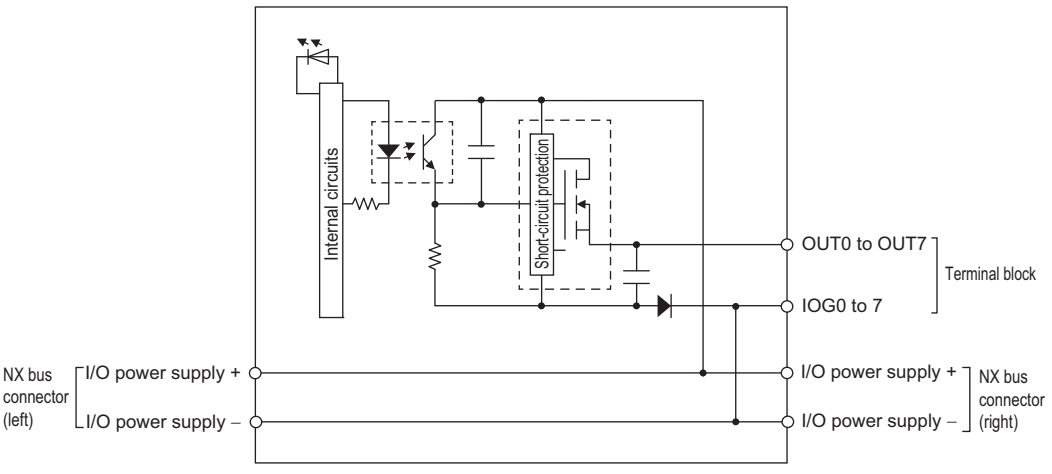
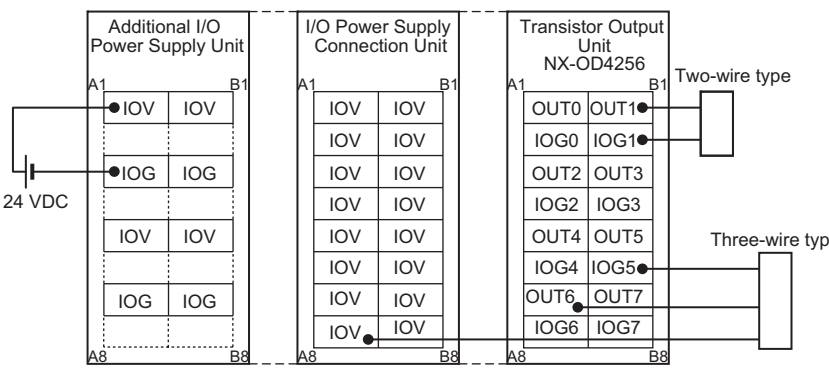
**Terminal connection diagram**


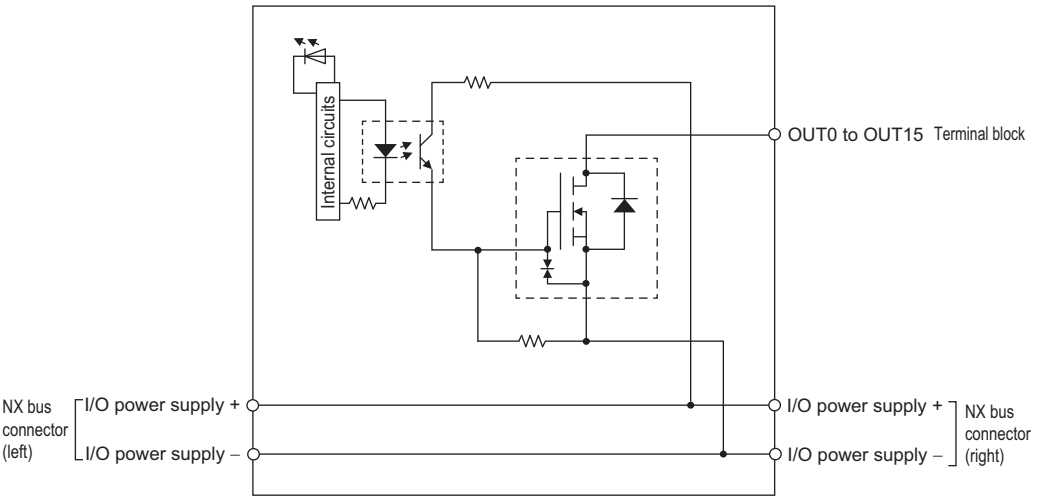
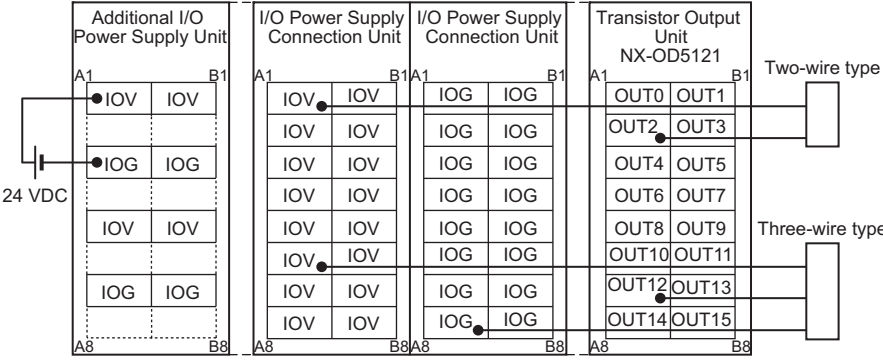


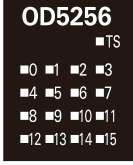
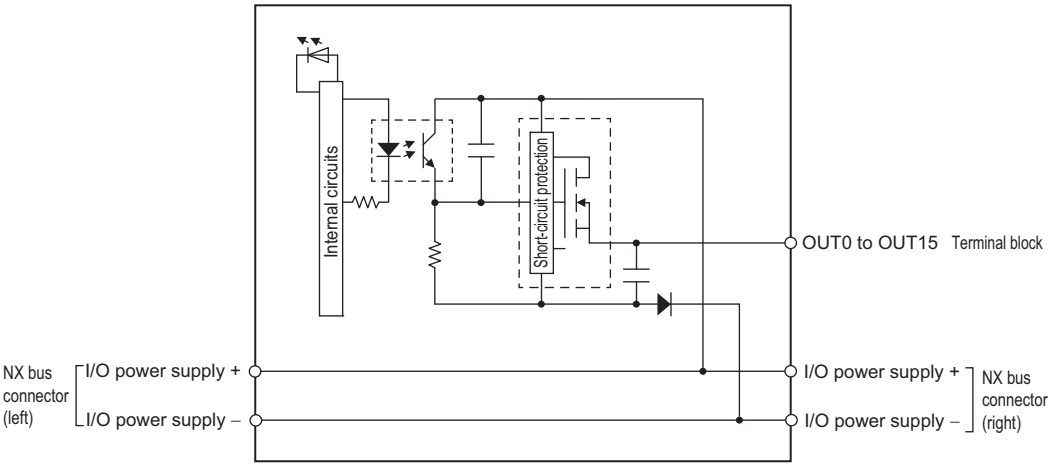
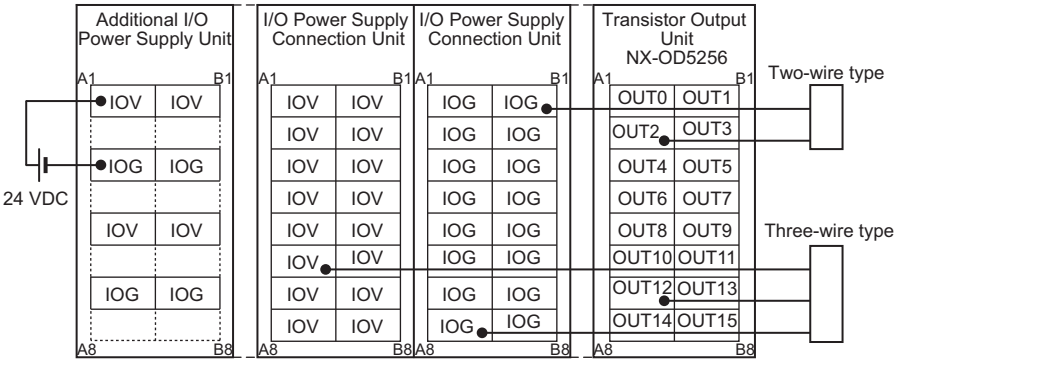
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	With load short-circuit protection.
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<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD4121
<b>Number of points</b>	8 points	<b>External connection terminals</b>	Screwless clamping terminal block (16 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	<p>TS indicator, output indicator</p> 	<b>Internal I/O common</b>	NPN
		<b>Rated voltage</b>	12 to 24 VDC
		<b>Operating load voltage range</b>	10.2 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 4 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	0.1 ms max./0.8 ms max.
		<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOV: 0.5 A/terminal max.
<b>NX Unit power consumption</b>	0.55 W max.	<b>Current consumption from I/O power supply</b>	10 mA max.
<b>Weight</b>	70 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	<p>Installation orientation: Possible in 6 orientations.                  Restrictions: No restrictions</p>		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.

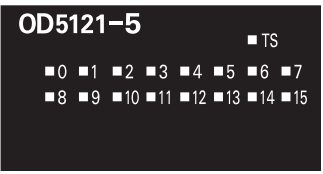
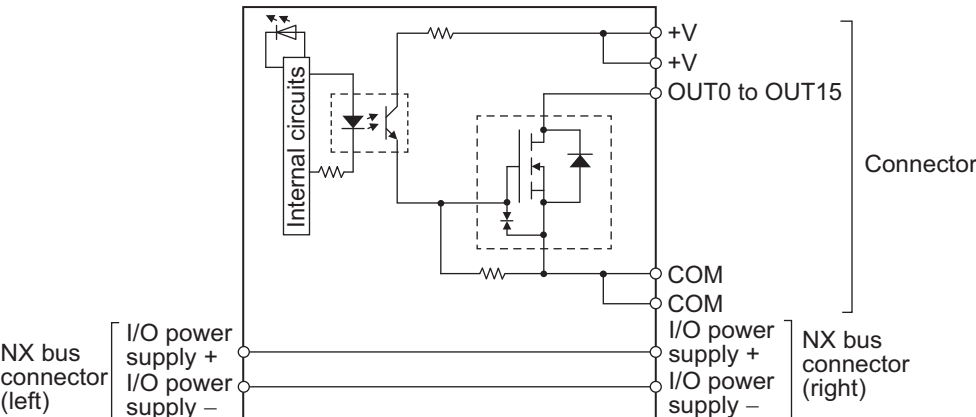
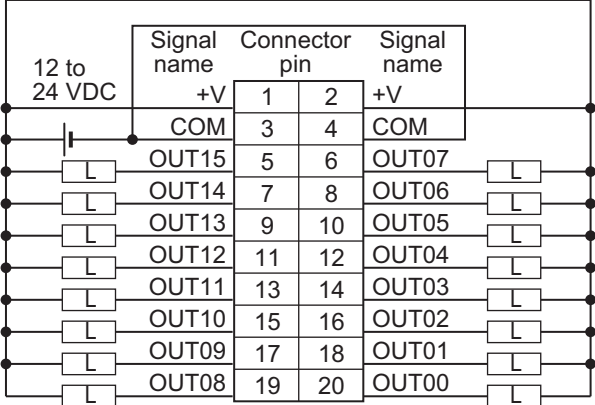


<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD4256
<b>Number of points</b>	8 points	<b>External connection terminals</b>	Screwless clamping terminal block (16 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>		<b>Internal I/O common</b>	PNP
		<b>Rated voltage</b>	24 VDC
		<b>Operating load voltage range</b>	15 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 4 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	0.5 ms max./1.0 ms max.
		<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	IOG: 0.5 A/terminal max.
<b>NX Unit power consumption</b>	0.65 W max.	<b>Current consumption from I/O power supply</b>	30 mA max.
<b>Weight</b>	70 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	With load short-circuit protection.

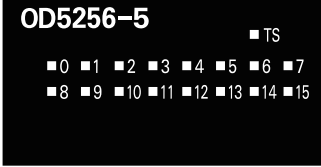
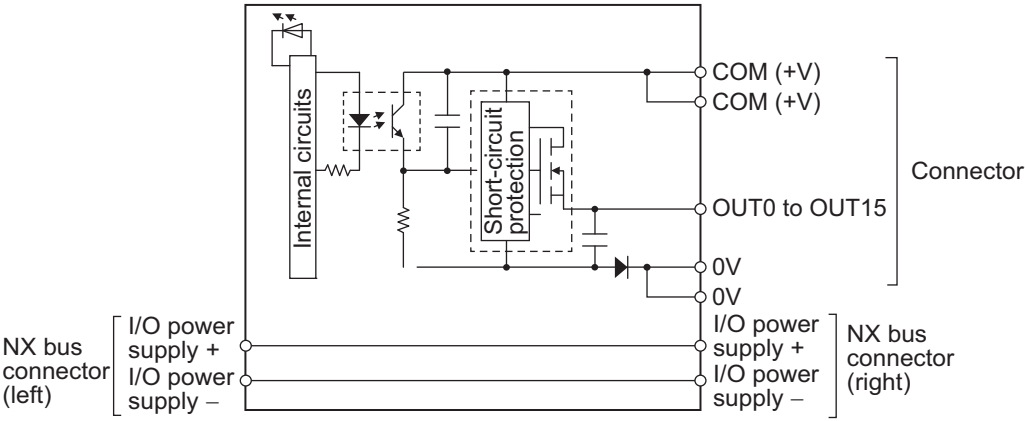
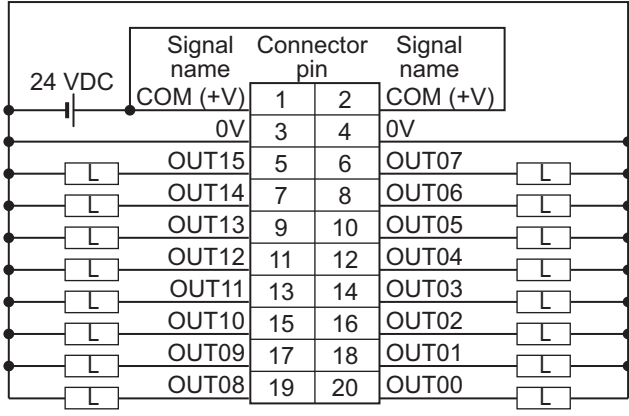
<b>Unit name</b>	Transistor Output Unit		<b>Model</b>	NX-OD5121
<b>Number of points</b>	16 points		<b>External connection terminals</b>	Screwless clamping terminal block (16 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing			
<b>Indicators</b>	TS indicator, output indicator		<b>Internal I/O common</b>	NPN
			<b>Rated voltage</b>	12 to 24 VDC
			<b>Operating load voltage range</b>	10.2 to 28.8 VDC
			<b>Maximum value of load current</b>	0.5 A/point, 4 A/NX Unit
			<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
			<b>Leakage current</b>	0.1 mA max.
			<b>Residual voltage</b>	1.5 V max.
			<b>ON/OFF response time</b>	0.1 ms max./0.8 ms max.
			<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)		<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus		<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.65 W max.		<b>Current consumption from I/O power supply</b>	20 mA max.
<b>Weight</b>	70 g max.			
<b>Circuit layout</b>				
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions			
<b>Terminal connection diagram</b>				
<b>Disconnection/Short-circuit detection</b>	Not supported.		<b>Protective function</b>	Not supported.

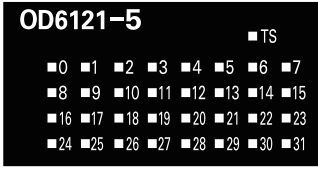
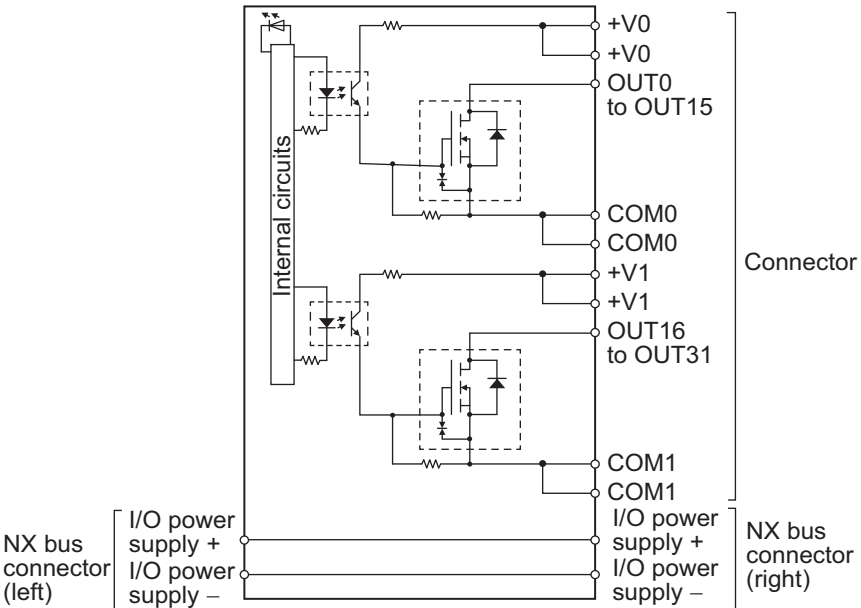
<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD5256
<b>Number of points</b>	16 points	<b>External connection terminals</b>	Screwless clamping terminal block (16 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	TS indicator, output indicator  	<b>Internal I/O common</b>	PNP
		<b>Rated voltage</b>	24 VDC
		<b>Operating load voltage range</b>	15 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 4 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	0.5 ms max./1.0 ms max.
		<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from the NX bus	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.70 W max.	<b>Current consumption from I/O power supply</b>	40 mA max.
<b>Weight</b>	70 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	With load short-circuit protection.

## Transistor Output Units (MIL Connector, 30 mm Width)

<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD5121-5
<b>Number of points</b>	16 points	<b>External connection terminals</b>	MIL connector (20 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	 <p><b>OD5121-5</b> ■ TS</p> <p>■ 0 ■ 1 ■ 2 ■ 3 ■ 4 ■ 5 ■ 6 ■ 7</p> <p>■ 8 ■ 9 ■ 10 ■ 11 ■ 12 ■ 13 ■ 14 ■ 15</p>	<b>Internal I/O common</b>	NPN
		<b>Rated voltage</b>	12 to 24 VDC
		<b>Operating load voltage range</b>	10.2 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 2 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	0.1 ms max./0.8 ms max.
		<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from external source	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.60 W max.	<b>Current consumption from I/O power supply</b>	30 mA max.
<b>Weight</b>	80 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>	 <ul style="list-style-type: none"> <li>• Be sure to wire both pins 3 and 4 (COM).</li> <li>• Be sure to wire both pins 1 and 2 (+V).</li> </ul>		

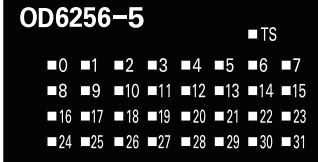
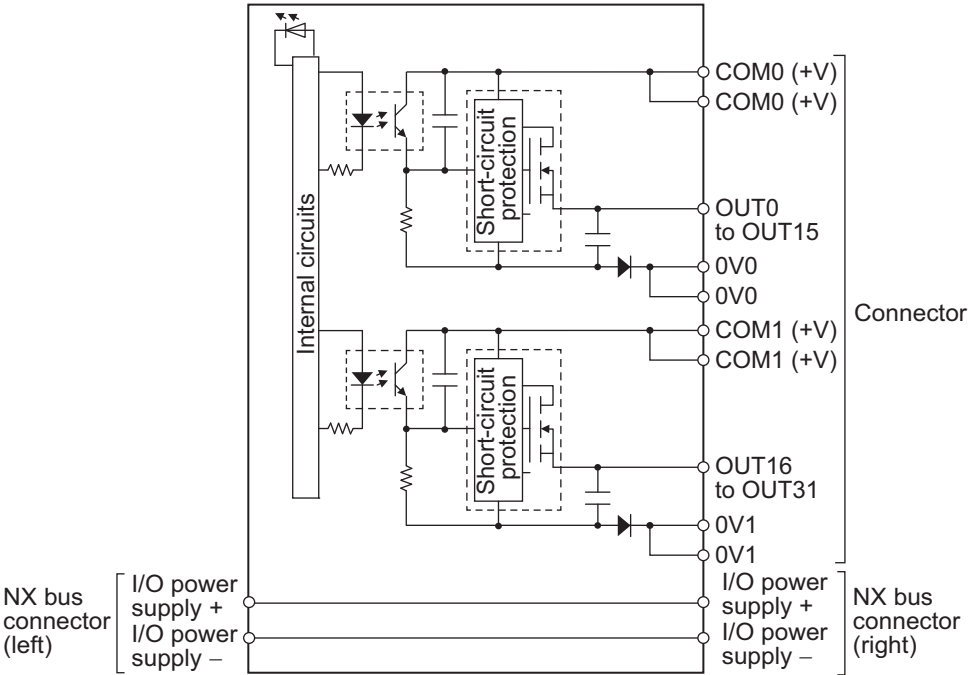
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.
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<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD5256-5
<b>Number of points</b>	16 points	<b>External connection terminals</b>	MIL connector (20 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	 <p>TS indicator, output indicator</p>	<b>Internal I/O common</b>	PNP
		<b>Rated voltage</b>	24 VDC
		<b>Operating load voltage range</b>	20.4 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 2 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	0.5 ms max./1.0 ms max.
		<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supplied from external source.	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.70 W max.	<b>Current consumption from I/O power supply</b>	40 mA max.
<b>Weight</b>	85 g max.		
<b>Circuit layout</b>			
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>	 <ul style="list-style-type: none"> <li>• Be sure to wire both pins 1 and 2 (COM (+V)).</li> <li>• Be sure to wire both pins 3 and 4 (0V).</li> </ul>		
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	With load short-circuit protection.

<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD6121-5
<b>Number of points</b>	32 points	<b>External connection terminals</b>	MIL connector (40 terminals)
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing		
<b>Indicators</b>	<p>TS indicator, output indicator</p>  <p><b>OD6121-5</b></p> <p>■ TS</p> <p>■0 ■1 ■2 ■3 ■4 ■5 ■6 ■7</p> <p>■8 ■9 ■10 ■11 ■12 ■13 ■14 ■15</p> <p>■16 ■17 ■18 ■19 ■20 ■21 ■22 ■23</p> <p>■24 ■25 ■26 ■27 ■28 ■29 ■30 ■31</p>	<b>Internal I/O common</b>	NPN
		<b>Rated voltage</b>	12 to 24 VDC
		<b>Operating load voltage range</b>	10.2 to 28.8 VDC
		<b>Maximum value of load current</b>	0.5 A/point, 2 A/common, 4 A/NX Unit
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.
		<b>Leakage current</b>	0.1 mA max.
		<b>Residual voltage</b>	1.5 V max.
		<b>ON/OFF response time</b>	0.1 ms max./0.8 ms max.
		<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)
<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from external source	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.80 W max.	<b>Current consumption from I/O power supply</b>	50 mA max.
<b>Weight</b>	90 g max.		
<b>Circuit layout</b>	 <p>Internal circuits</p> <p>NX bus connector (left) [ I/O power supply + I/O power supply - ]</p> <p>Connector [ +V0 +V0 OUT0 to OUT15 COM0 COM0 +V1 +V1 OUT16 to OUT31 COM1 COM1 I/O power supply + I/O power supply - ]</p> <p>NX bus connector (right)</p>		
<b>Installation orientation and restrictions</b>	<p>Installation orientation: Possible in 6 orientations.</p> <p>Restrictions: No restrictions</p>		

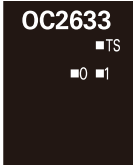
<p><b>Terminal connection diagram</b></p>				<ul style="list-style-type: none"> <li>• Be sure to wire both pins 21 and 22 (+V0).</li> <li>• Be sure to wire both pins 23 and 24 (COM0).</li> <li>• Be sure to wire both pins 1 and 2 (+V1).</li> <li>• Be sure to wire both pins 3 and 4 (COM1).</li> </ul>
<p><b>Disconnection/Short-circuit detection</b></p>	<p>Not supported.</p>	<p><b>Protective function</b></p>	<p>Not supported.</p>	

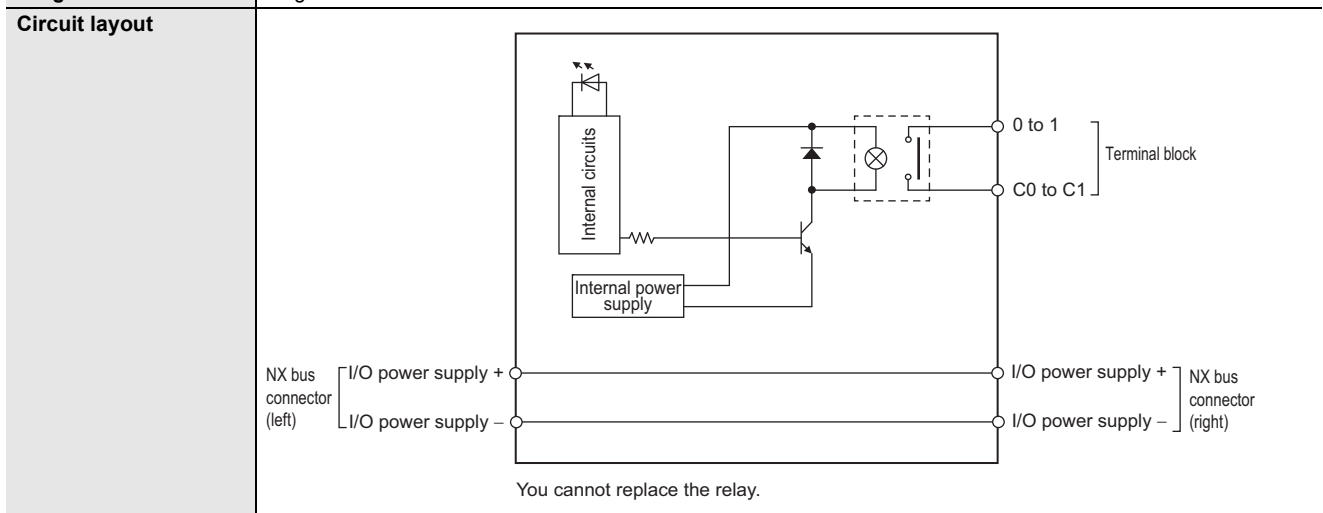


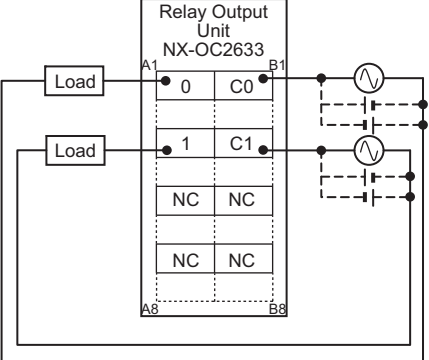
<b>Unit name</b>	Transistor Output Unit	<b>Model</b>	NX-OD6256-5		
<b>Number of points</b>	32 points	<b>External connection terminals</b>	MIL connector (40 terminals)		
<b>I/O refreshing method</b>	Switching Synchronous I/O refreshing and Free-Run refreshing				
<b>Indicators</b>	<p>TS indicator, output indicator</p>  <p><b>OD6256-5</b></p> <p>■ TS</p> <p>■0 ■1 ■2 ■3 ■4 ■5 ■6 ■7</p> <p>■8 ■9 ■10 ■11 ■12 ■13 ■14 ■15</p> <p>■16 ■17 ■18 ■19 ■20 ■21 ■22 ■23</p> <p>■24 ■25 ■26 ■27 ■28 ■29 ■30 ■31</p>	<b>Internal I/O common</b>	PNP		
		<b>Rated voltage</b>	24 VDC		
		<b>Operating load voltage range</b>	20.4 to 28.8 VDC		
		<b>Maximum value of load current</b>	0.5 A/point, 2 A/common, 4 A/NX Unit		
		<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.		
		<b>Leakage current</b>	0.1 mA max.		
		<b>Residual voltage</b>	1.5 V max.		
		<b>ON/OFF response time</b>	0.5 ms max./1.0 ms max.		
		<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Photocoupler isolation
		<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
<b>I/O power supply method</b>	Supply from external source	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals		
<b>NX Unit power consumption</b>	1.00 W max.	<b>Current consumption from I/O power supply</b>	80 mA max.		
<b>Weight</b>	95 g max.				
<b>Circuit layout</b>	 <p>The diagram illustrates the internal circuitry of the NX-OD6256-5 unit. It shows two channels of output drivers. Each channel includes a PNP transistor, a resistor, and a diode for short-circuit protection. The outputs are connected to a MIL connector. The left connector provides I/O power supply (+ and -), and the right connector provides COM0 (+V), OUT0 to OUT15, 0V0, COM1 (+V), OUT16 to OUT31, and 0V1. The internal circuits are protected by photocouplers.</p>				
<b>Installation orientation and restrictions</b>	<p>Installation orientation: Possible in 6 orientations.</p> <p>Restrictions: No restrictions</p>				

<p><b>Terminal connection diagram</b></p>			<ul style="list-style-type: none"> <li>• Be sure to wire both pins 21 and 22 (COM0 (+V)).</li> <li>• Be sure to wire both pins 1 and 2 (COM1 (+V)).</li> <li>• Be sure to wire both pins 23 and 24 (0V0).</li> <li>• Be sure to wire both pins 3 and 4 (0V1).</li> </ul>
<p><b>Disconnection/Short-circuit detection</b></p>	<p>Not supported.</p>	<p><b>Protective function</b></p>	<p>With load short-circuit protection.</p>

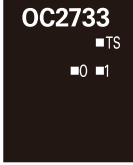
## Relay Output Units (Screwless Clamping Terminal Block, 12 mm Width)

<b>Unit name</b>	Relay Output Unit	<b>Model</b>	NX-OC2633
<b>Number of points</b>	2 points, independent contacts	<b>External connection terminals</b>	Screwless clamping terminal block (8 terminals)
<b>I/O refreshing method</b>	Free-Run refreshing		
<b>Indicators</b>	TS indicator, output indicator  	<b>Relay type</b>	N.O. contact
		<b>Maximum switching capacity</b>	250 VAC/2 A (cosΦ = 1), 250 VAC/2 A (cosΦ = 0.4), 24 VDC/2 A, 4 A/NX Unit
		<b>Minimum switching capacity</b>	5 VDC, 1 mA
<b>Relay service life</b>	Electrical: 100,000 operations *1 Mechanical: 20,000,000 operations	<b>ON/OFF response time</b>	15 ms max./15 ms max.
<b>Dimensions</b>	12 (W) x 100 (H) x 71 (D)	<b>Isolation method</b>	Relay isolation
<b>Insulation resistance</b>	Between A1/B1 terminals and A3/B3 terminals: 20 MΩ min. (at 500 VDC) Between the external terminals and the functional ground terminal: 20 MΩ min. (at 500 VDC) Between the external terminals and internal circuits: 20 MΩ min. (at 500 VDC) Between the internal circuit and the functional ground terminal: 20 MΩ min. (at 100 VDC)	<b>Dielectric strength</b>	Between A1/B1 terminals and A3/B3 terminals: 2300 VAC for 1 min at a leakage current of 5 mA max. Between the external terminals and the functional ground terminal: 2300 VAC for 1 min at a leakage current of 5 mA max. Between the external terminals and internal circuits: 2300 VAC for 1 min at a leakage current of 5 mA max. Between the internal circuit and the functional ground terminal: 510 VAC for 1 min at a leakage current of 5 mA max.
<b>Vibration resistance</b>	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 <sup>2</sup> 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)	<b>Shock resistance</b>	100 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions
<b>I/O power supply method</b>	Supplied from external source.	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.80 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>Weight</b>	65 g max.		



<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
<b>Terminal connection diagram</b>			
<b>Disconnection/Short-circuit detection</b>	Not supported.	<b>Protective function</b>	Not supported.

\*1. Electrical service life will vary depending on the current value. Refer to *Precautions when Using the Relay Output Units* on page 7-21 for details.

<b>Unit name</b>	Relay Output Unit	<b>Model</b>	NX-OC2733
<b>Number of points</b>	2 points, independent contacts	<b>External connection terminals</b>	Screwless clamping terminal block (8 terminals)
<b>I/O refreshing method</b>	Free-Run refreshing		
<b>Indicators</b>	TS indicator, output indicator  	<b>Relay type</b>	N.O. + N.C. contact
		<b>Maximum switching capacity</b>	250 VAC/2 A (cosΦ = 1), 250 VAC/2 A (cosΦ = 0.4), 24 VDC/2 A, 4 A/NX Unit
		<b>Minimum switching capacity</b>	5 VDC, 10 mA
<b>Relay service life</b>	Electrical: 100,000 operations* <sup>1</sup> Mechanical: 20,000,000 operations	<b>ON/OFF response time</b>	15 ms max./15 ms max.
<b>Dimensions</b>	12 (W) × 100 (H) × 71 (D)	<b>Isolation method</b>	Relay isolation
<b>Insulation resistance</b>	Between A1/3, B1/3 terminals and A5/7, B5/7 terminals: 20 MΩ min. (at 500 VDC) Between the external terminals and functional ground terminal: 20 MΩ min. (at 500 VDC) Between the external terminals and internal circuits: 20 MΩ min. (at 500 VDC) Between the internal circuit and the functional ground terminal: 20 MΩ min. (at 100 VDC)	<b>Dielectric strength</b>	Between A1/3, B1/3 terminals and A5/7, B5/7 terminals: 2300 VAC for 1 min at a leakage current of 5 mA max. Between the external terminals and the functional ground terminal: 2300 VAC for 1 min at a leakage current of 5 mA max. Between the external terminals and internal circuits: 2300 VAC for 1 min at a leakage current of 5 mA max. Between the internal circuit and the functional ground terminal: 510 VAC for 1 min at a leakage current of 5 mA max.
		<b>Vibration resistance</b>	10 to 55 Hz with amplitude of 0.5 mm
<b>I/O power supply method</b>	Supply from external source	<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals
<b>NX Unit power consumption</b>	0.95 W max.	<b>Current consumption from I/O power supply</b>	No consumption
<b>Weight</b>	70 g max.		
<b>Circuit layout</b>	<p style="text-align: center;">NO0 and NO1 are normally open contacts, and NC0 and NC1 are normally close contacts. You cannot replace the relay.</p>		
<b>Installation orientation and restrictions</b>	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		

<p><b>Terminal connection diagram</b></p>			
<p><b>Disconnection/Short-circuit detection</b></p>	<p>Not supported.</p>	<p><b>Protective function</b></p>	<p>Not supported.</p>

\*1. Electrical service life will vary depending on the current value. Refer to *Relay Service Life* on page 7-21 for details.

## A-1-4 Digital Mixed I/O Units

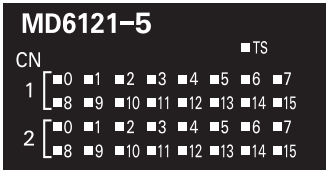
### Description of Items on the Data Sheet of the DC Input/Transistor Output Units

Item		Description
<b>Unit name</b>		The name of the Unit.
<b>Model</b>		The model of the Unit.
<b>Number of points</b>		The number of input and output points provided by the Unit.
<b>External connection terminals</b>		The type of terminal block and connector that is used for connecting the Unit.
<b>I/O refreshing method</b>		The I/O refreshing methods that are used by the Unit. Free-Run refreshing and synchronous I/O refreshing are available.
<b>Output section (CN1)</b>	<b>Internal I/O common</b>	The polarity of the output devices that are connected to the Unit. NPN connection and PNP connection are available.
	<b>Rated voltage</b>	The rated output voltage of the Unit.
	<b>Operating load voltage range</b>	The output load voltage range of the Unit.
	<b>Maximum value of load current</b>	The maximum output load current of the Unit. The specifications for each output point and for the Unit are described.
	<b>Maximum inrush current</b>	The maximum allowable inrush current of the Unit. Any inrush current from an external connection load must be kept to or below this value.
	<b>Leakage current</b>	The leakage current when the output of the Unit is OFF.
	<b>Residual voltage</b>	The residual voltage when the output of the Unit is ON.
	<b>ON/OFF response time</b>	The delay time for which data in the internal circuit is reflected in the state of output elements of the Unit. It is described according to the ON/OFF sequence.
<b>Input section (CN2)</b>	<b>Internal I/O common</b>	The polarity of the input devices that are connected to the Unit. NPN connection and PNP connection are available.
	<b>Rated input voltage</b>	The rated input voltage and range of the Unit.
	<b>Input current</b>	The input current at the rated voltage of the Unit.
	<b>ON voltage/ON current</b>	The input voltage in which the Unit input turns ON, and corresponding input current.
	<b>OFF voltage/OFF current</b>	The input voltage in which the Unit input turns OFF, and corresponding input current.
	<b>ON/OFF response time</b>	The delay time for which the status change of the input terminals reaches the internal circuit of the Unit. The input filter time below is not included. It is described according to the ON/OFF sequence.
	<b>Input filter time</b>	The filter time when the status of the internal circuit is read as the data to the internal of the Unit. It is same for both ON/OFF. The filter time to be set by the Support Software is described.
<b>Indicators</b>		The type of indicators on the Unit and the layout of those indicators.
<b>Dimensions</b>		The dimensions of the Unit. They are described as W x H x D. The unit is "mm".
<b>Isolation method</b>		The isolation method of the I/O circuits and internal circuit of the Unit.
<b>Insulation resistance</b>		The insulation resistance between the I/O circuits and internal circuit of the Unit.
<b>Dielectric strength</b>		The dielectric strength between the I/O circuits and internal circuit of the Unit.
<b>I/O power supply method</b>		The method for supplying I/O power to the Unit. The supply method is determined for each Unit. The power is supplied from the NX bus or the external source.
<b>Current capacity of I/O power supply terminal</b>		The current capacity of the I/O power supply terminals (IOV/IOG) of the Unit. Do not exceed this value when supplying the I/O power to the connected external devices.
<b>NX Unit power consumption</b>		The power consumption of the NX Unit power supply of the Unit.
<b>Current consumption from I/O power supply</b>		The current consumption from I/O power supply of the Unit. The load current of any external connection load, input current, and current consumption of any connected external devices are not included.
<b>Weight</b>		The weight of the Unit.
<b>Circuit layout</b>		The circuit layout of the I/O circuits of the Unit.
<b>Installation orientation and restrictions</b>		The installation orientation of the Slave Terminal including the Unit, and the details of restrictions on the specifications due to the installation orientation.

Item	Description
<b>Terminal connection diagram</b>	A diagram of the connection between the Unit and connected external devices. When an I/O Power Supply Connection Unit or a Shield Connection Unit is required to be connected to the connected external devices, the description for such is included.
<b>Disconnection/Short-circuit detection</b>	The function of the Unit to detect a disconnection/short-circuit.
<b>Protective function</b>	The protective function that the Unit has.

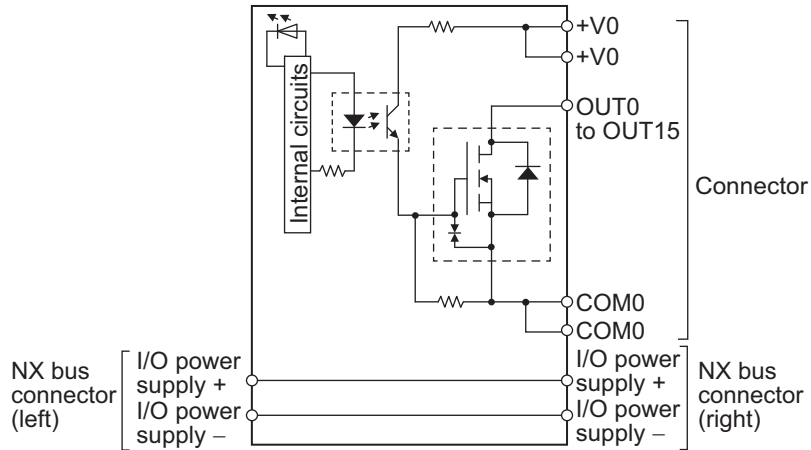


## DC Input/Transistor Output Units (MIL Connector, 30 mm Width)

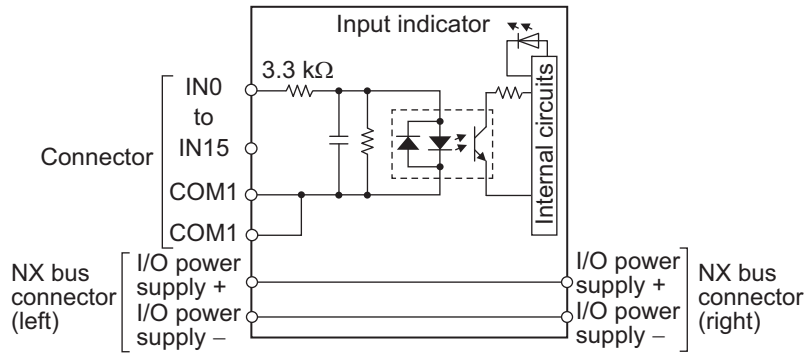
<b>Unit name</b>		DC Input/Transistor Output Unit	<b>Model</b>	NX-MD6121-5	
<b>Number of points</b>		16 inputs/16 outputs	<b>External connection terminals</b>	2 MIL connectors (20 terminals)	
<b>I/O refreshing method</b>		Switching Synchronous I/O refreshing and Free-Run refreshing			
<b>Output section (CN1)</b>	<b>Internal I/O common</b>	NPN	<b>Input section (CN2)</b>	<b>Internal I/O common</b>	For both NPN/PNP
	<b>Rated voltage</b>	12 to 24 VDC		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
	<b>Operating load voltage range</b>	10.2 to 28.8 VDC		<b>Input current</b>	7 mA typical (at 24 VDC)
	<b>Maximum value of load current</b>	0.5 A/point, 2 A/NX Unit		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between COM and each signal)
	<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between COM and each signal)
	<b>Leakage current</b>	0.1 mA max.		<b>ON/OFF response time</b>	20 μs max./400 μs max.
	<b>Residual voltage</b>	1.5 V max.		<b>Input filter time</b>	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
	<b>ON/OFF response time</b>	0.1 ms max./0.8 ms max.			
<b>Indicators</b>		TS indicator, I/O indicators	<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)	
 <p><b>MD6121-5</b>      ■ TS</p> <p>CN1</p> <p>1 [ 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</p> <p>2 [ 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</p>		<b>Isolation method</b>	Photocoupler isolation		
		<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)		
		<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.		
		<b>I/O power supply method</b>	Supply from external source		
		<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals		
		<b>NX Unit power consumption</b>	0.70 W max.		
		<b>Current consumption from I/O power supply</b>	30 mA max.		
		<b>Weight</b>	105 g max.		

Circuit layout

CN1 (left) output circuit



CN2 (right) input circuit



**Installation orientation and restrictions**

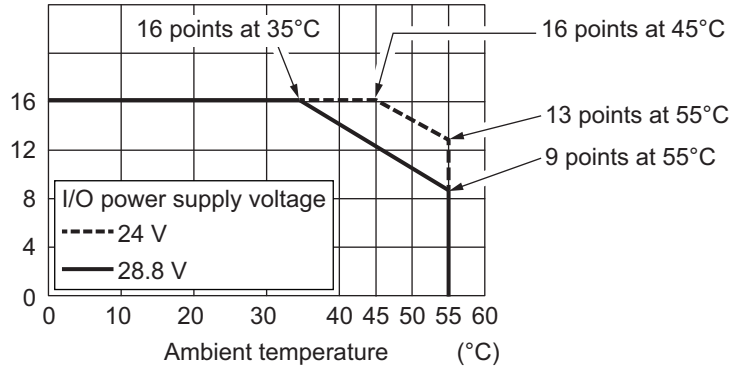
Installation orientation: Possible in 6 orientations.

Restrictions: As shown in the following.

- For upright installation

Number of simultaneously ON input points

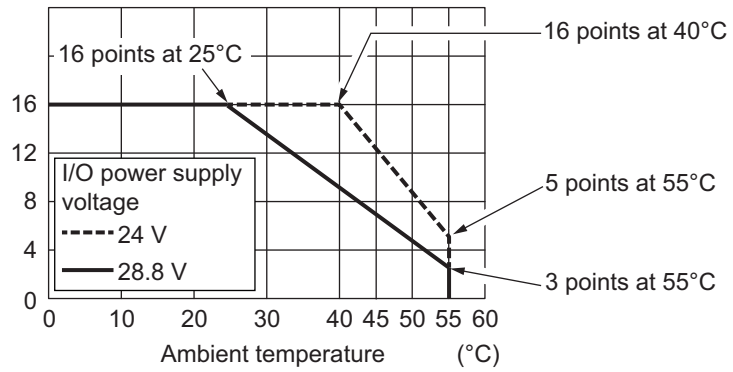
Number of simultaneously ON input points vs. Ambient temperature characteristic



- For any installation other than upright

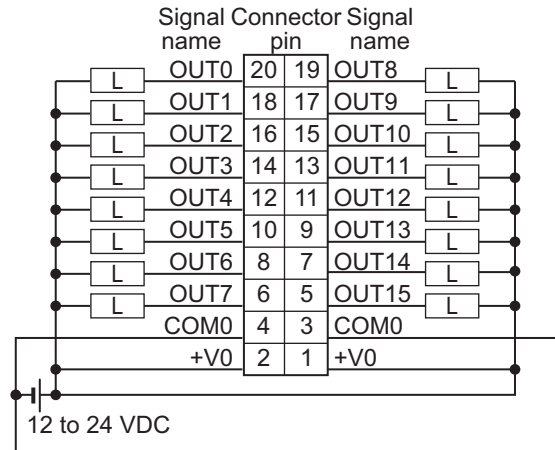
Number of simultaneously ON input points

Number of simultaneously ON input points vs. Ambient temperature characteristic



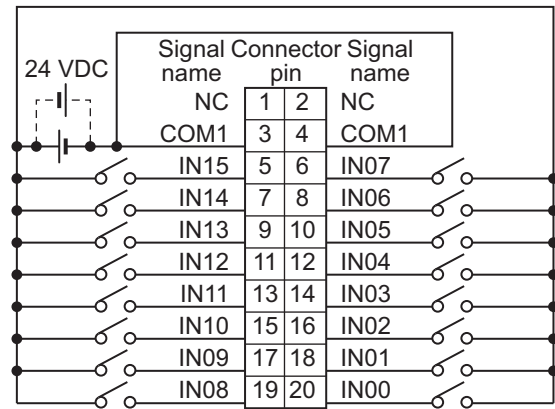
**Terminal connection diagram**

CN1 (left) output terminal



- Be sure to wire both pins 3 and 4 (COM0) of CN1.
- Be sure to wire both pins 1 and 2 (+V0) of CN1.

CN2 (right) input terminal



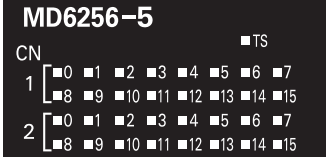
- The polarity of the input power supply of CN2 can be connected in either direction.
- Be sure to wire both pins 3 and 4 (COM1) of CN2, and set the same polarity for both pins.

**Disconnection/Short-circuit detection**

Not supported.

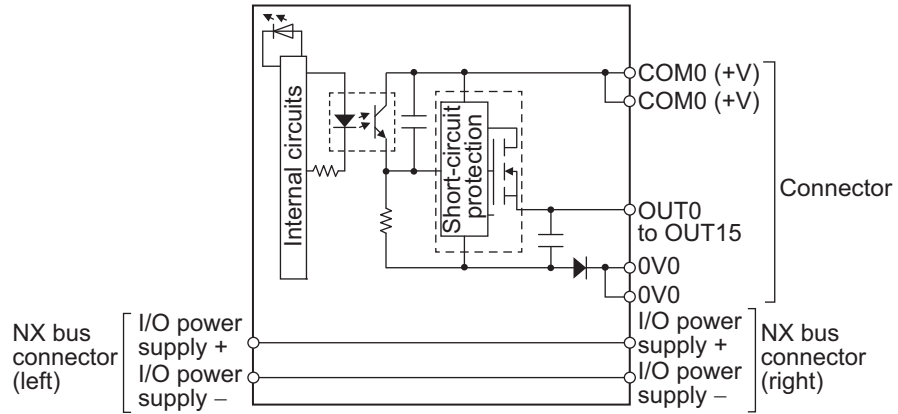
**Protective function**

Not supported.

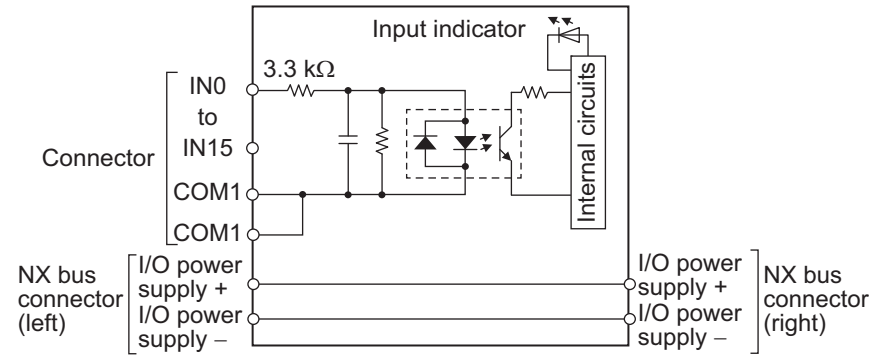
<b>Unit name</b>		DC Input/Transistor Output Unit	<b>Model</b>	NX-MD6256-5	
<b>Number of points</b>		16 inputs/16 outputs	<b>External connection terminals</b>	2 MIL connectors (20 terminals)	
<b>I/O refreshing method</b>		Switching Synchronous I/O refreshing and Free-Run refreshing			
<b>Output section (CN1)</b>	<b>Internal I/O common</b>	PNP	<b>Input section (CN2)</b>	<b>Internal I/O common</b>	For both NPN/PNP
	<b>Rated voltage</b>	24 VDC		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
	<b>Operating load voltage range</b>	20.4 to 28.8 VDC		<b>Input current</b>	7 mA typical (at 24 VDC)
	<b>Maximum value of load current</b>	0.5 A/point, 2 A/NX Unit		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between COM and each signal)
	<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between COM and each signal)
	<b>Leakage current</b>	0.1 mA max.		<b>ON/OFF response time</b>	20 μs max./400 μs max.
	<b>Residual voltage</b>	1.5 V max.		<b>Input filter time</b>	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
	<b>ON/OFF response time</b>	0.5 ms max./1.0 ms max.			
<b>Indicators</b>		TS indicator, I/O indicators	<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)	
		 <p><b>MD6256-5</b></p> <p>■ TS</p> <p>CN</p> <p>1 [ 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</p> <p>2 [ 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</p>	<b>Isolation method</b>	Photocoupler isolation	
			<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	
			<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.	
			<b>I/O power supply method</b>	Supply from external source	
			<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals	
			<b>NX Unit power consumption</b>	0.75 W max.	
			<b>Current consumption from I/O power supply</b>	40 mA max.	
			<b>Weight</b>	110 g max.	

Circuit layout

CN1 (left) output circuit



CN2 (right) input circuit



**Installation orientation and restrictions**

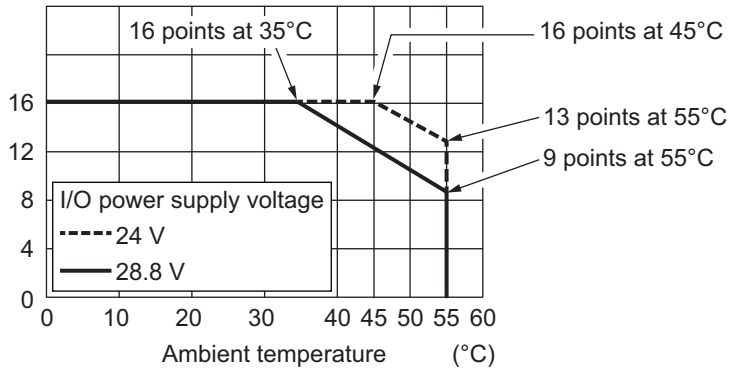
Installation orientation: Possible in 6 orientations.

Restrictions: As shown in the following.

- For upright installation

Number of simultaneously ON input points

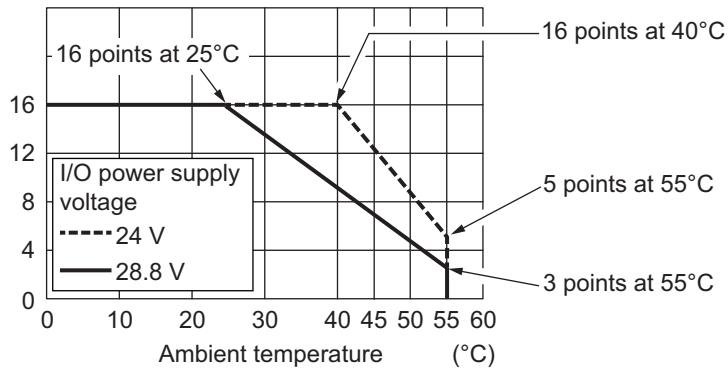
Number of simultaneously ON input points vs. Ambient temperature characteristic



- For any installation other than upright

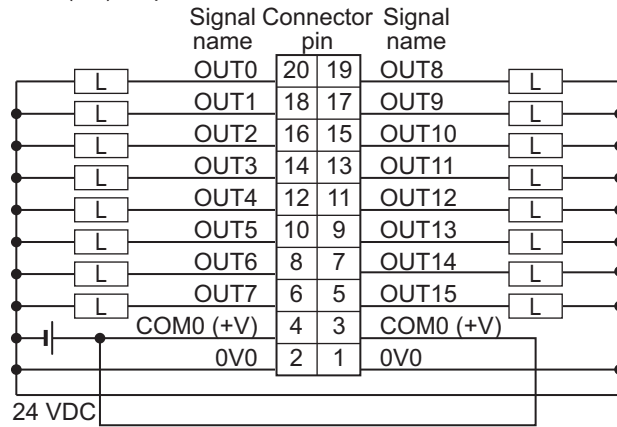
Number of simultaneously ON input points

Number of simultaneously ON input points vs. Ambient temperature characteristic



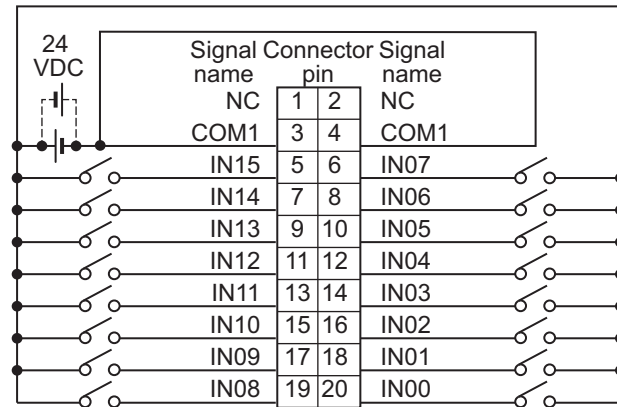
**Terminal connection diagram**

CN1 (left) output terminal



- Be sure to wire both pins 3 and 4 (COM0 (+V)) of CN1.
- Be sure to wire both pins 1 and 2 (0V0) of CN1.

CN2 (right) input terminal



- The polarity of the input power supply of CN2 can be connected in either direction.
- Be sure to wire both pins 3 and 4 (COM1) of CN2, and set the same polarity for both pins.

**Disconnection/Short-circuit detection**

Not supported.

**Protective function**

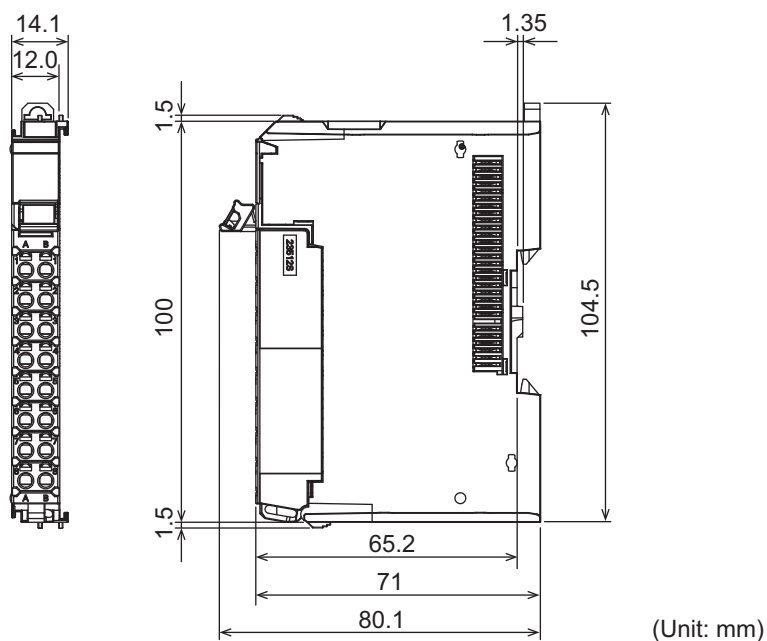
With load short-circuit protection.



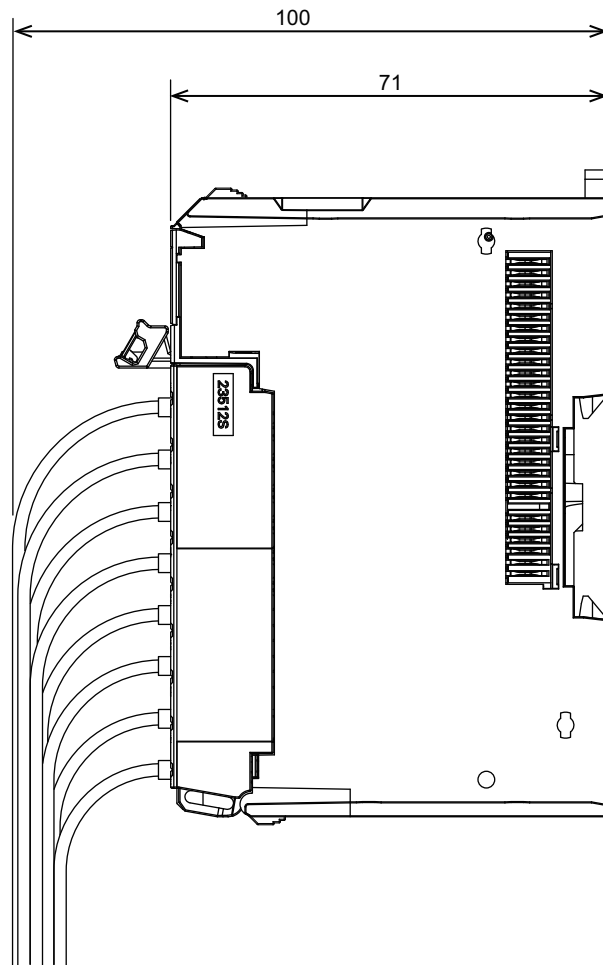
# A-2 Dimensions

## A-2-1 Screwless Clamping Terminal Block Type

### 12 mm Width



## Installation Height

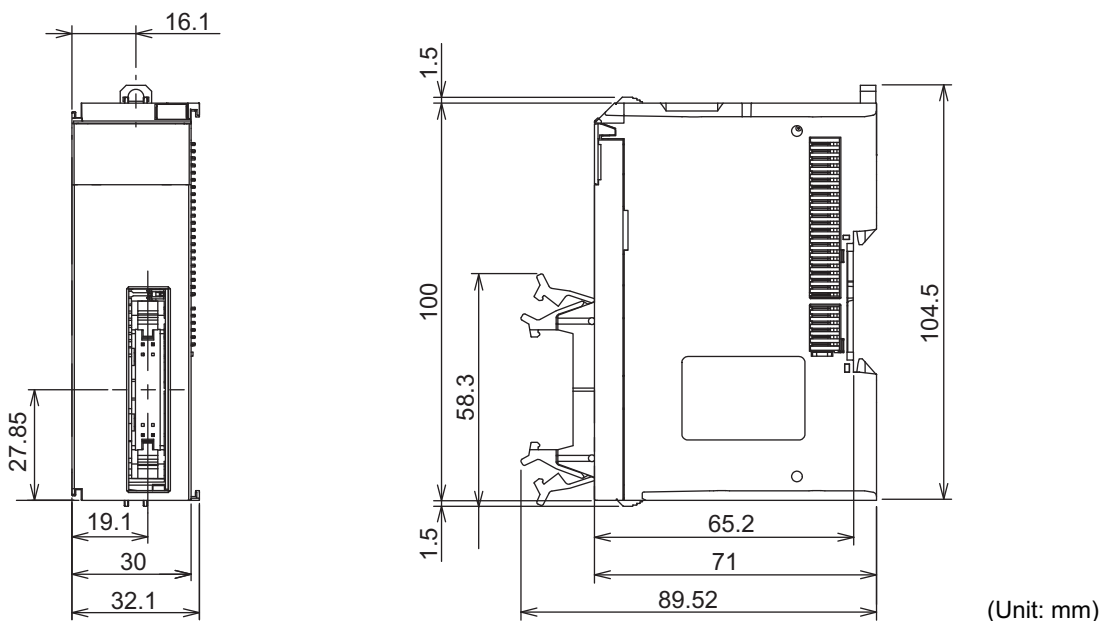


(Unit: mm)

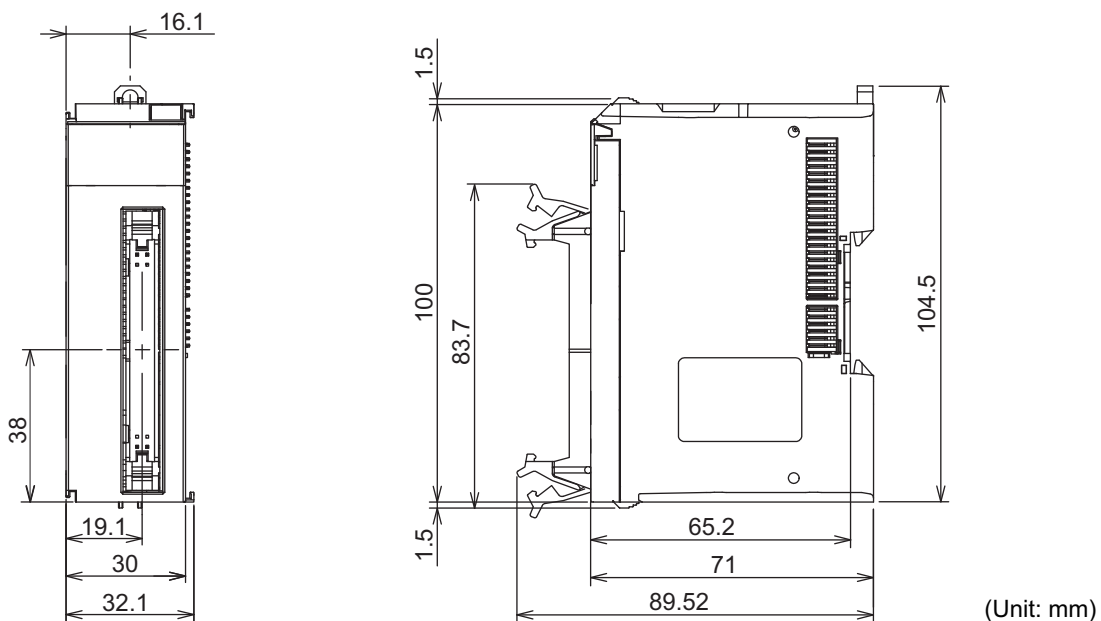
**A-2-2 Connector Types**

**30 mm Width**

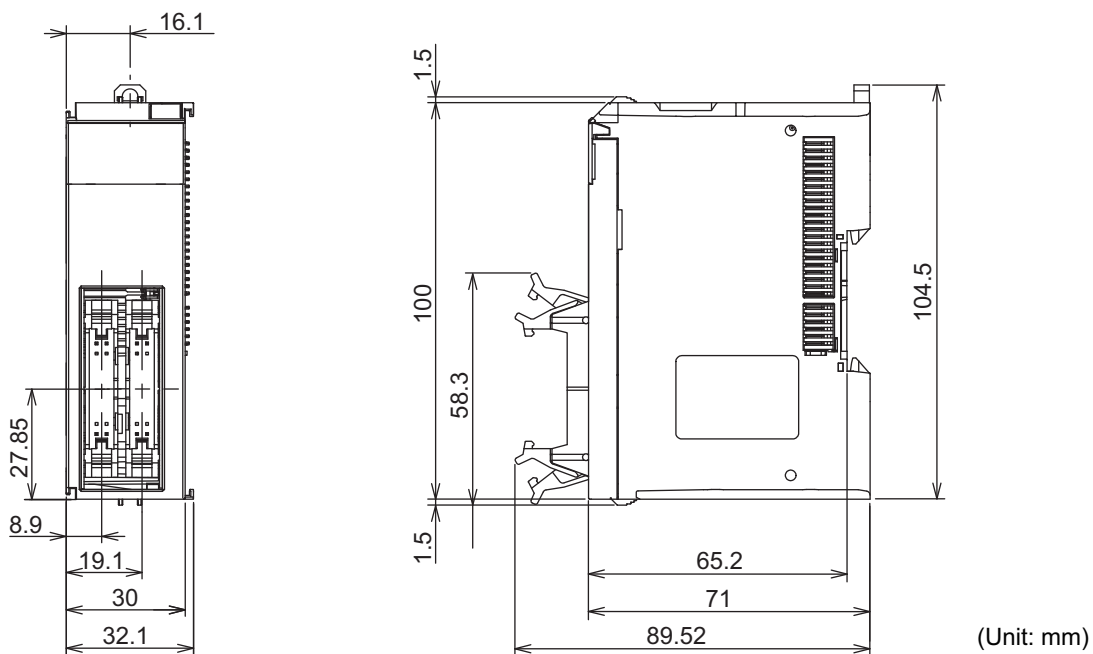
- Units with MIL Connectors (1 Connector with 20 terminals)



- Units with MIL Connectors (1 Connector with 40 terminals)



● Units with MIL Connectors (2 Connectors with 20 terminals)



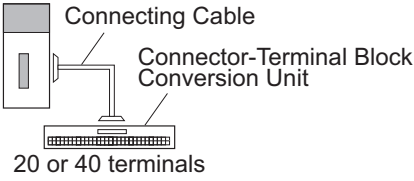
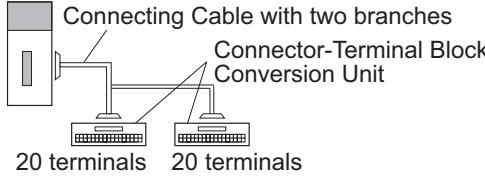
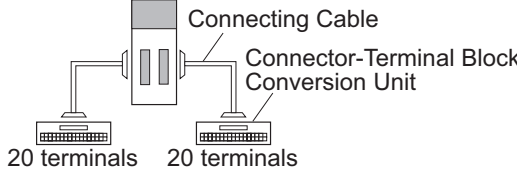
# A-3 Connecting Connector-Terminal Block Conversion Units and I/O Relay Terminals

**A**

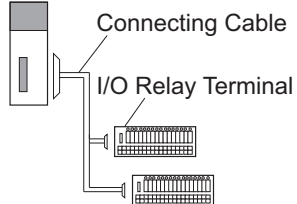
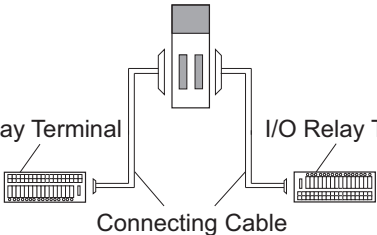
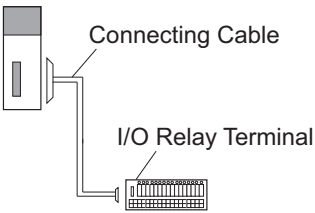
## A-3-1 Patterns for Combining Connector-Terminal Block Conversion Units and I/O Relay Terminals

The following patterns can be used to connect Digital I/O Units with connectors to OMRON Connector-Terminal Block Conversion Units and I/O Relay Terminals using OMRON Connecting Cables.

### Connection Patterns for Connector-Terminal Block Conversion Units

Pattern	Configuration	Number of connectors	Branching
A	 <p>Connecting Cable Connector-Terminal Block Conversion Unit 20 or 40 terminals</p>	1	None
B	 <p>Connecting Cable with two branches Connector-Terminal Block Conversion Unit 20 terminals 20 terminals</p>		2 branches
C	 <p>Connecting Cable Connector-Terminal Block Conversion Unit 20 terminals 20 terminals</p>	2	None

## Connection Patterns for I/O Relay Terminals

Pattern	Configuration
A	 <p>Diagram A shows a vertical terminal block on the left. A connecting cable extends from its bottom and branches to connect to two horizontal I/O Relay Terminal blocks stacked vertically on the right.</p>
E	 <p>Diagram E shows a central vertical terminal block at the top. Two horizontal I/O Relay Terminal blocks are positioned below it, one on the left and one on the right. Connecting cables connect the bottom of the central terminal block to the top of each I/O Relay Terminal block.</p>
F	 <p>Diagram F shows a vertical terminal block on the left. A connecting cable extends from its bottom and connects to a single horizontal I/O Relay Terminal block on the right.</p>

## A-3-2 Combinations of Connections

Combinations of OMRON Connecting Cables with Connector-Terminal Block Conversion Units and I/O Relay Terminals are shown below.

### Connections to Connector-Terminal Block Conversion Units

Unit	I/O capacity	Number of connectors	Polarity	Connection pattern	Number of branches	Connecting Cable	Connector-Terminal Block Conversion Unit	Common terminal	Connection diagram
NX-ID5142-5	16 inputs	1 MIL connector	NPN/PNP	A	None	XW2Z-□□□X	XW2D-20G6	None	P. A-68
				A	None	XW2Z-□□□X	XW2B-20G5	None	---
				A	None	XW2Z-□□□X	XW2B-20G4	None	---
NX-ID6142-5	32 inputs	1 MIL connector	NPN/PNP	A	None	XW2Z-□□□K	XW2D-40G6	None	P. A-69
				A	None	XW2Z-□□□K	XW2D-40G6-RM *1	None	
				A	None	XW2Z-□□□K	XW2B-40G5	None	---
				A	None	XW2Z-□□□K	XW2B-40G4	None	---
				B	2	XW2Z-□□□N	XW2D-20G6 (2 Units)	None	---
				B	2	XW2Z-□□□N	XW2B-20G5 (2 Units)	None	---
				B	2	XW2Z-□□□N	XW2B-20G4 (2 Units)	None	---
				B	2	XW2Z-□□□N	XW2C-20G6-IO16 (2 Units)	Yes	P. A-69
				B	2	XW2Z-□□□N	XW2C-20G5-IN16 (2 Units) *2	Yes	---
				B	2	XW2Z-□□□N	XW2E-20G5-IN16 (2 Units) *2	Yes	---
				B	2	XW2Z-□□□N	XW2F-20G7-IN16 (2 Units) *2	Yes	---
				B	2	XW2Z-□□□N	XW2N-20G8-IN16 (2 Units) *2	Yes	---
NX-OD5121-5	16 outputs	1 MIL connector	NPN	A	None	XW2Z-□□□X	XW2D-20G6	None	P. A-70
				A	None	XW2Z-□□□X	XW2B-20G5	None	---
				A	None	XW2Z-□□□X	XW2B-20G4	None	---
NX-OD5256-5	16 outputs	1 MIL connector	PNP	A	None	XW2Z-□□□X	XW2D-20G6	None	P. A-70
				A	None	XW2Z-□□□X	XW2B-20G5	None	---
				A	None	XW2Z-□□□X	XW2B-20G4	None	---
NX-OD6121-5	32 outputs	1 MIL connector	NPN	A	None	XW2Z-□□□K	XW2D-40G6	None	P. A-71
				A	None	XW2Z-□□□K	XW2B-40G5	None	
				A	None	XW2Z-□□□K	XW2B-40G4	None	---
				B	2	XW2Z-□□□N	XW2D-20G6 (2 Units)	None	---
				B	2	XW2Z-□□□N	XW2B-20G5 (2 Units)	None	---
				B	2	XW2Z-□□□N	XW2B-20G4 (2 Units)	None	---
				B	2	XW2Z-□□□N	XW2C-20G6-IO16 (2 Units)	Yes	P. A-71
B	2	XW2Z-□□□N	XW2F-20G7-OUT16 (2 Units)	Yes	---				

\*1. Bleeder resistor (5.6 kΩ) is built in.

\*2. The inputs are NPN. For PNP inputs, reverse the polarity of the external power supply connections to the power supply terminals on the Connector-Terminal Block Conversion Unit.

Unit	I/O capacity	Number of connectors	Polarity	Connection pattern	Number of branches	Connecting Cable	Connector-Terminal Block Conversion Unit	Common terminal	Connection diagram
NX-OD6256-5	32 outputs	1 MIL connector	PNP	A	None	XW2Z-□□□K	XW2D-40G6	None	P. A-72
				A	None	XW2Z-□□□K	XW2B-40G5	None	---
				A	None	XW2Z-□□□K	XW2B-40G4	None	---
				B	2	XW2Z-□□□N	XW2D-20G6 (2 Units)	None	---
				B	2	XW2Z-□□□N	XW2B-20G5 (2 Units)	None	---
				B	2	XW2Z-□□□N	XW2B-20G4 (2 Units)	None	---
				B	2	XW2Z-□□□N	XW2C-20G6-IO16 (2 Units)	Yes	P. A-72
NX-MD6121-5	16 inputs	1 MIL connector	NPN/PNP	C	None	XW2Z-□□□X	XW2D-20G6	None	P. A-73
				C	None	XW2Z-□□□X	XW2B-20G5	None	---
				C	None	XW2Z-□□□X	XW2B-20G4	None	---
	16 outputs	1 MIL connector	NPN	C	None	XW2Z-□□□X	XW2D-20G6	None	P. A-73
				C	None	XW2Z-□□□X	XW2B-20G5	None	---
				C	None	XW2Z-□□□X	XW2B-20G4	None	---
NX-MD6256-5	16 inputs	1 MIL connector	NPN/PNP	C	None	XW2Z-□□□X	XW2D-20G6	None	P. A-73
				C	None	XW2Z-□□□X	XW2B-20G5	None	---
				C	None	XW2Z-□□□X	XW2B-20G4	None	---
	16 outputs	1 MIL connector	PNP	C	None	XW2Z-□□□X	XW2D-20G6	None	P. A-73
				C	None	XW2Z-□□□X	XW2B-20G5	None	---
				C	None	XW2Z-□□□X	XW2B-20G4	None	---



## Connections to I/O Relay Terminals

Unit	I/O capacity	Number of connectors	Polarity	Connection pattern	Number of branches	Connecting Cable	I/O Relay Terminal	Connection diagram
NX-ID5142-5	16 inputs	1 MIL connector	NPN	F	None	G79-O□C	G7TC-ID16	P. A-74
				F	None	G79-O□C	G7TC-IA16	
NX-ID6142-5	32 inputs	1 MIL connector	NPN	A	2	G79-O□-□-D1	G7TC-ID16	
				A	2	G79-O□-□-D1	G7TC-IA16	
NX-OD5121-5	16 outputs	1 MIL connector	NPN	F	None	G79-O□C	G7TC-OC08	P. A-78
				F	None	G79-O□C	G70D-SOC08	P. A-76
				F	None	G79-O□C	G70R-SOC08	P. A-77
				F	None	G79-O□C	G7TC-OC16	P. A-78
				F	None	G79-O□C	G70D-SOC16	P. A-76
				F	None	G79-O□C	G70D-VSOC16	P. A-75
				F	None	G79-O□C	G70D-FOM16	---
				F	None	G79-O□C	G70A-ZOC16-3	---
NX-OD5256-5	16 outputs	1 MIL connector	PNP	F	None	G79-I□C	G7TC-OC16-1	P. A-78
				F	None	G79-O□C	G70D-SOC16-1	P. A-77
				F	None	G79-O□C	G70D-FOM16-1	---
				F	None	G79-O□C	G70A-ZOC16-4	---
NX-OD6121-5	32 outputs	1 MIL connector	NPN	A	2	G79-O□-□-D1	G7TC-OC16	P. A-78
				A	2	G79-O□-□-D1	G7TC-OC08	
				A	2	G79-O□-□-D1	G70D-SOC16	P. A-76
				A	2	G79-O□-□-D1	G70D-FOM16	---
				A	2	G79-O□-□-D1	G70D-VSOC16	P. A-75
				A	2	G79-O□-□-D1	G70D-VFOM16	---
				A	2	G79-O□-□-D1	G70A-ZOC16-3 and Relay	P. A-79
				A	2	G79-O□-□-D1	G70R-SOC08	P. A-77
NX-OD6256-5	32 outputs	1 MIL connector	PNP	A	2	G79-I□-□-D1	G7TC-OC16-1	P. A-78
				A	2	G79-O□-□-D1	G70D-SOC16-1	P. A-77
				A	2	G79-O□-□-D1	G70D-FOM16-1	---
				A	2	G79-O□-□-D1	G70A-ZOC16-4 and Relay	---
NX-MD6121-5	16 inputs	1 MIL connector	NPN	E	None	G79-O□C	G7TC-ID16	P. A-74
				E	None	G79-O□C	G7TC-IA16	
	16 outputs	1 MIL connector	NPN	E	None	G79-O□C	G7TC-OC16	P. A-78
				E	None	G79-O□C	G7TC-OC08	
				E	None	G79-O□C	G70D-SOC16	P. A-76
				E	None	G79-O□C	G70D-FOM16	---
				E	None	G79-O□C	G70D-VSOC16	P. A-75
				E	None	G79-O□C	G70D-VFOM16	---
				E	None	G79-O□C	G70A-ZOC16-3 and Relay	P. A-79
NX-MD6256-5	16 outputs	1 MIL connector	PNP	E	None	G79-O□C	G7TC-OC16-1	P. A-78
				E	None	G79-I□C	G70D-SOC16-1	P. A-77
				E	None	G79-I□C	G70D-FOM16-1	---
				E	None	G79-I□C	G70A-ZOC16-4 and Relay	---

### A-3-3 Connector-Terminal Block Conversion Unit Connection Diagrams

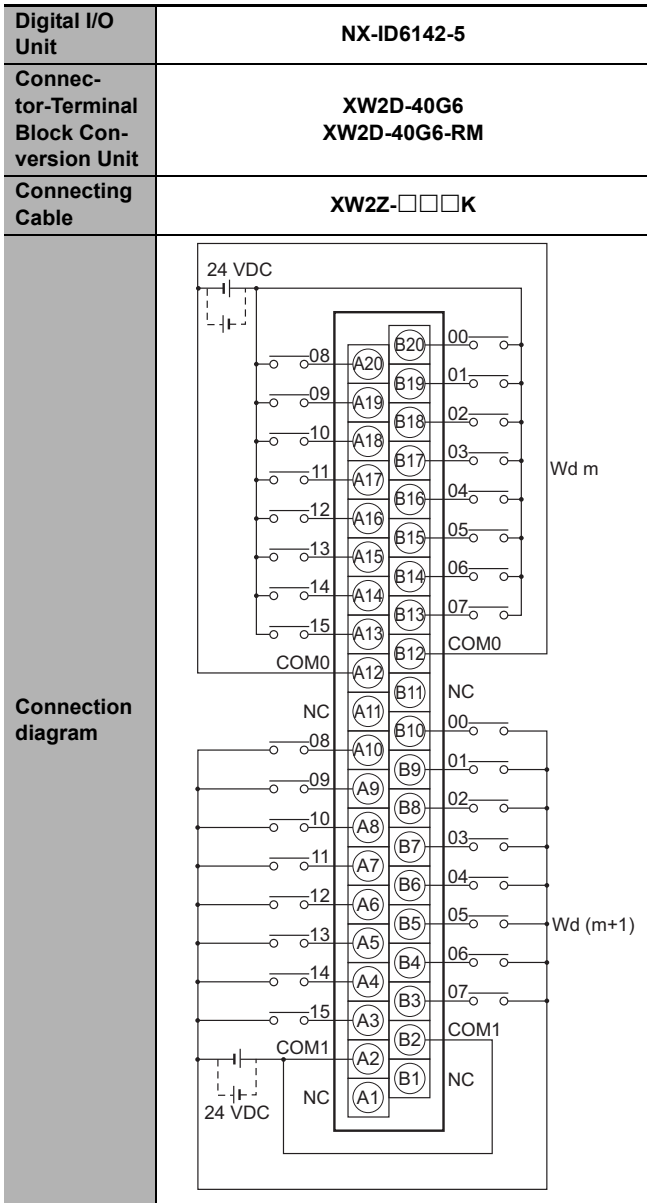
The applicable terminals on the Connector-Terminal Block Conversion Unit and external connection diagrams are provided below for Digital I/O Unit connections to Connector-Terminal Block Conversion Units.

In the connection diagrams here, 1 word consists of 16 points of the I/O terminals and the first word is called Wd m.

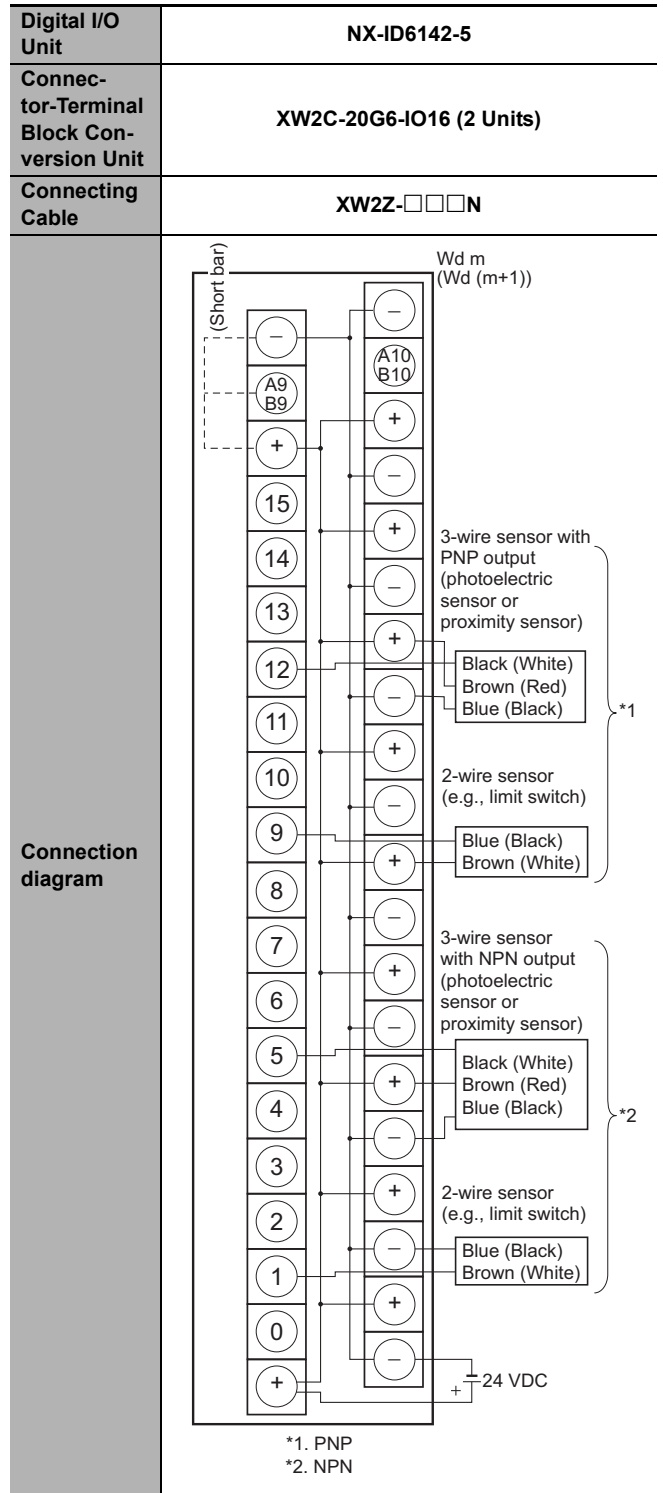
## Inputs

<b>Digital I/O Unit</b>	<b>NX-ID5142-5</b>
<b>Connector-Terminal Block Conversion Unit</b>	<b>XW2D-20G6</b>
<b>Connecting Cable</b>	<b>XW2Z-□□□X</b>
<b>Connection diagram</b>	<p>The diagram shows a terminal block with two columns of terminals labeled A1 through A10 and B1 through B10. To the left of the terminals, there are 8 terminals numbered 08 through 15. Terminal 08 is connected to a 24VDC power source. Terminal 09 is connected to terminal A10. Terminal 10 is connected to terminal A9. Terminal 11 is connected to terminal A8. Terminal 12 is connected to terminal A7. Terminal 13 is connected to terminal A6. Terminal 14 is connected to terminal A5. Terminal 15 is connected to terminal A4. Below the A terminals, there are terminals labeled COM and NC. To the right of the B terminals, there are terminals numbered 00 through 07, a terminal labeled COM, and a terminal labeled NC. The COM terminals on both sides are internally connected.</p>

Note 1. The COM terminals are internally connected inside the Unit, but they must all be wired.



- Note 1. The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction provided that the same polarity is used for the commons.
2. Both COM0 and COM1 have two pins each. They are internally connected inside the Unit, but they must all be wired.



- Note 1. Connect the A9/B9 terminal and the ⊕ terminal for NPN.  
Connect the A9/B9 terminal and the ⊖ terminal for PNP.  
(Use the enclosed short bar.)
2. The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.

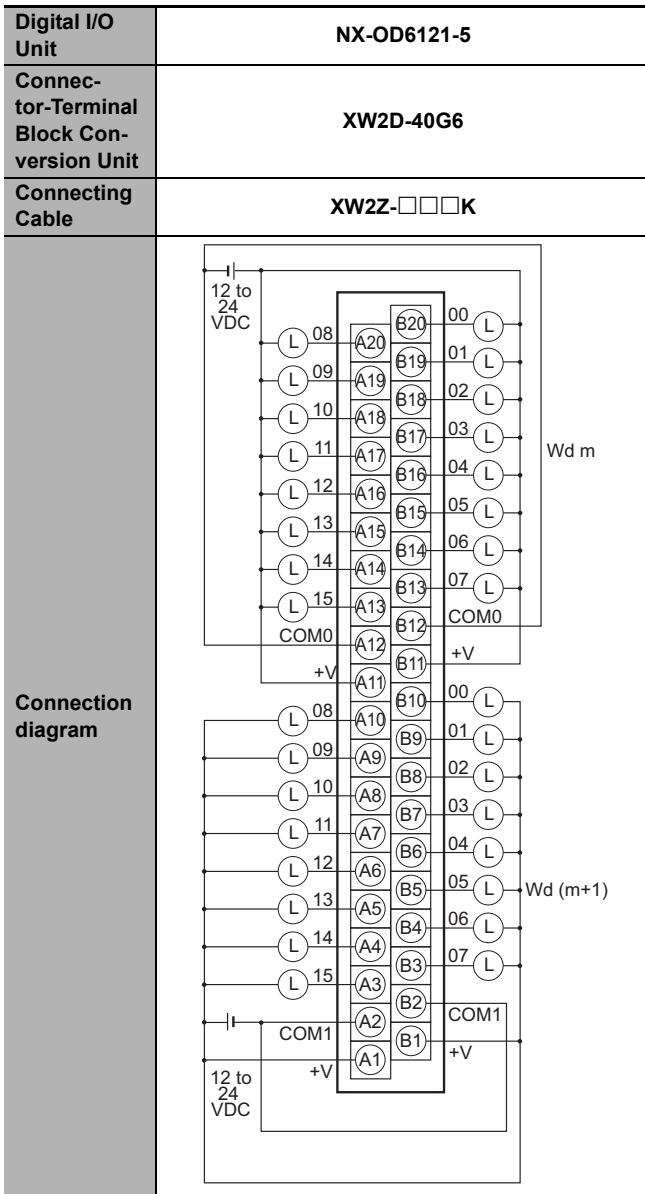
## Outputs

<b>Digital I/O Unit</b>	<b>NX-OD5121-5</b>
<b>Connector-Terminal Block Conversion Unit</b>	<b>XW2D-20G6</b>
<b>Connecting Cable</b>	<b>XW2Z-□□□X</b>
<b>Connection diagram</b>	

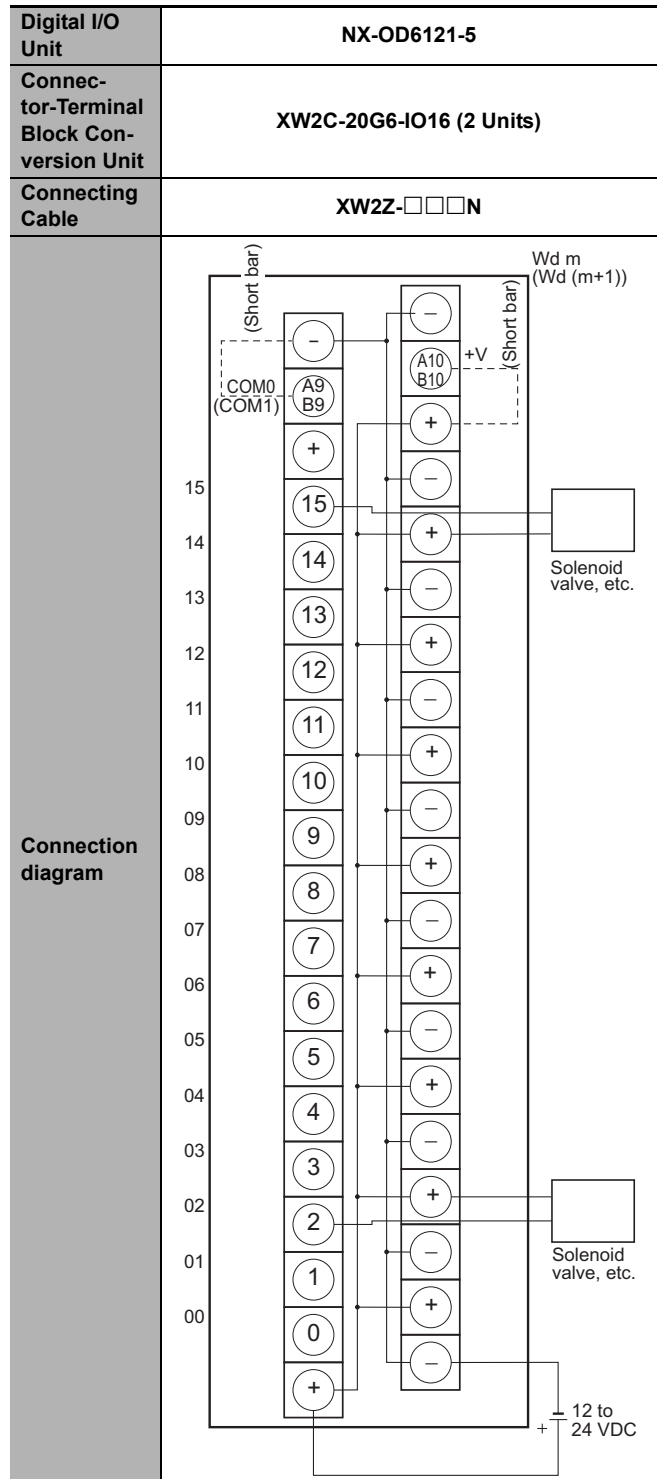
Note The COM terminals and +V terminals are internally connected inside the Unit, but they must all be wired.

<b>Digital I/O Unit</b>	<b>NX-OD5256-5</b>
<b>Connector-Terminal Block Conversion Unit</b>	<b>XW2D-20G6</b>
<b>Connecting Cable</b>	<b>XW2Z-□□□X</b>
<b>Connection diagram</b>	

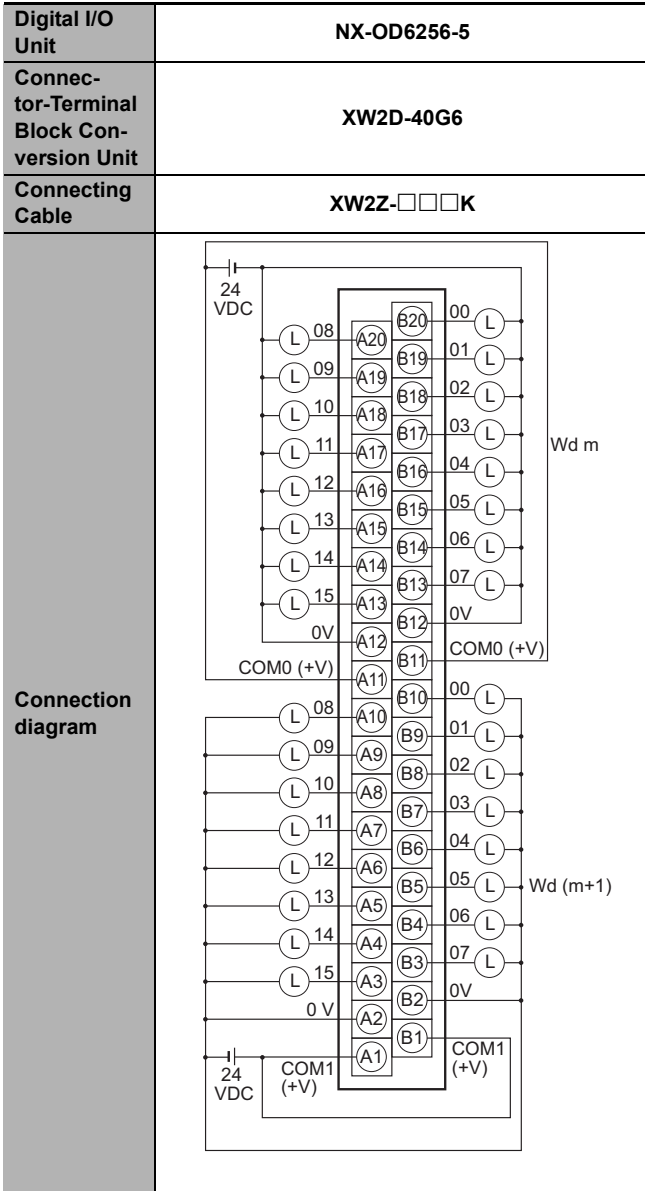
Note The 0 V terminals and COM (+V) terminals are internally connected inside the Unit, but they must all be wired.



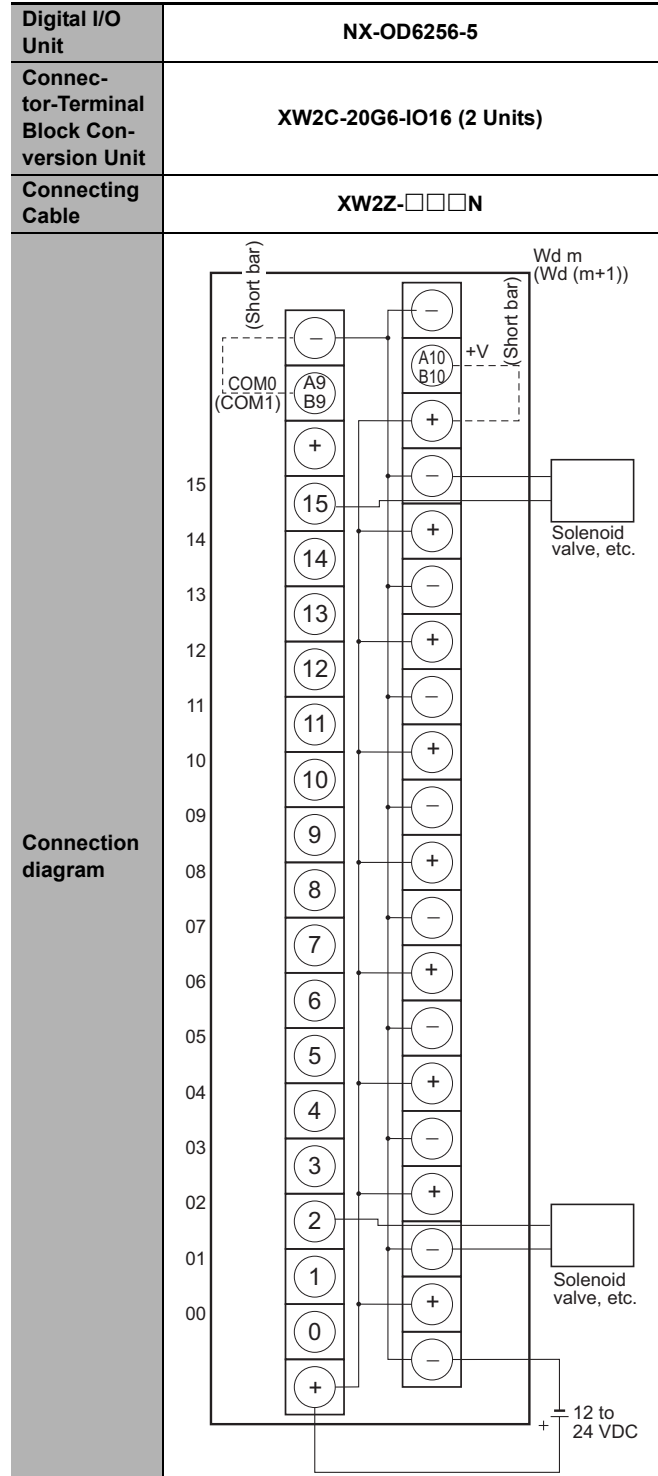
Note The +V terminals and COM terminals are internally connected inside the Unit, but they must all be wired.



- Note 1. Connect the A9/B9 terminal and the ⊖ terminal.  
 Connect the A10/B10 terminal and the ⊕ terminal.  
 (Use the enclosed short bar.)
2. The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.

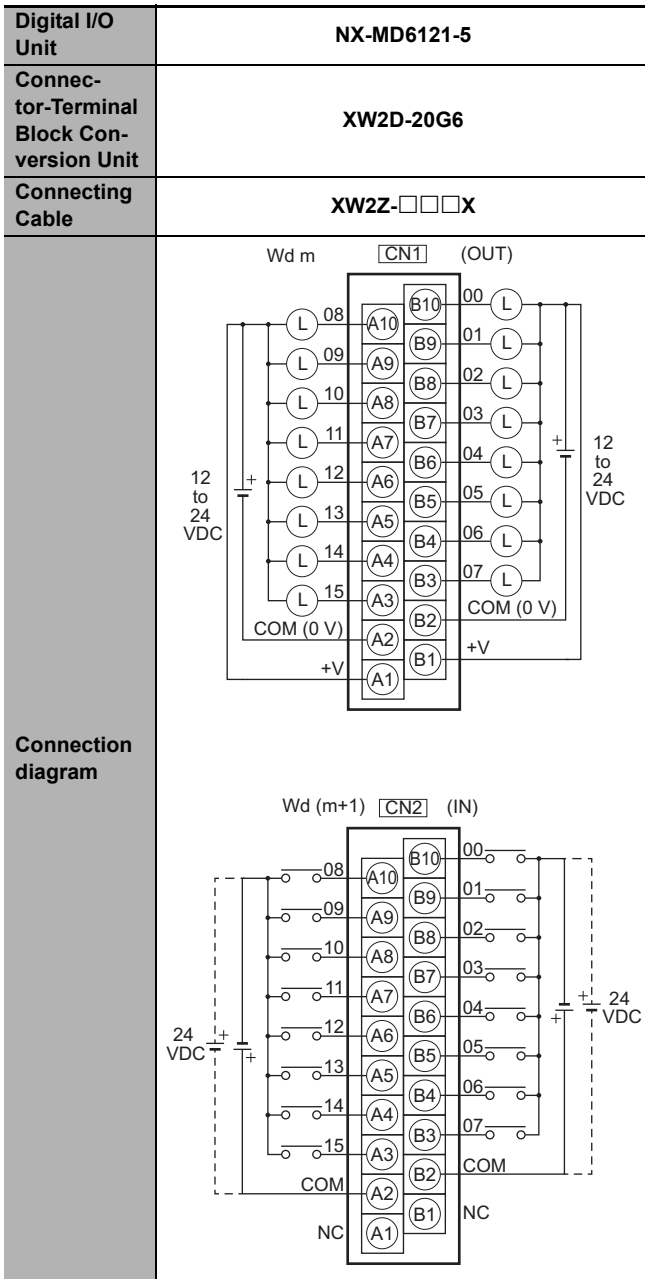


Note The COM (+V) terminals and 0 V terminals are internally connected inside the Unit, but they must all be wired.

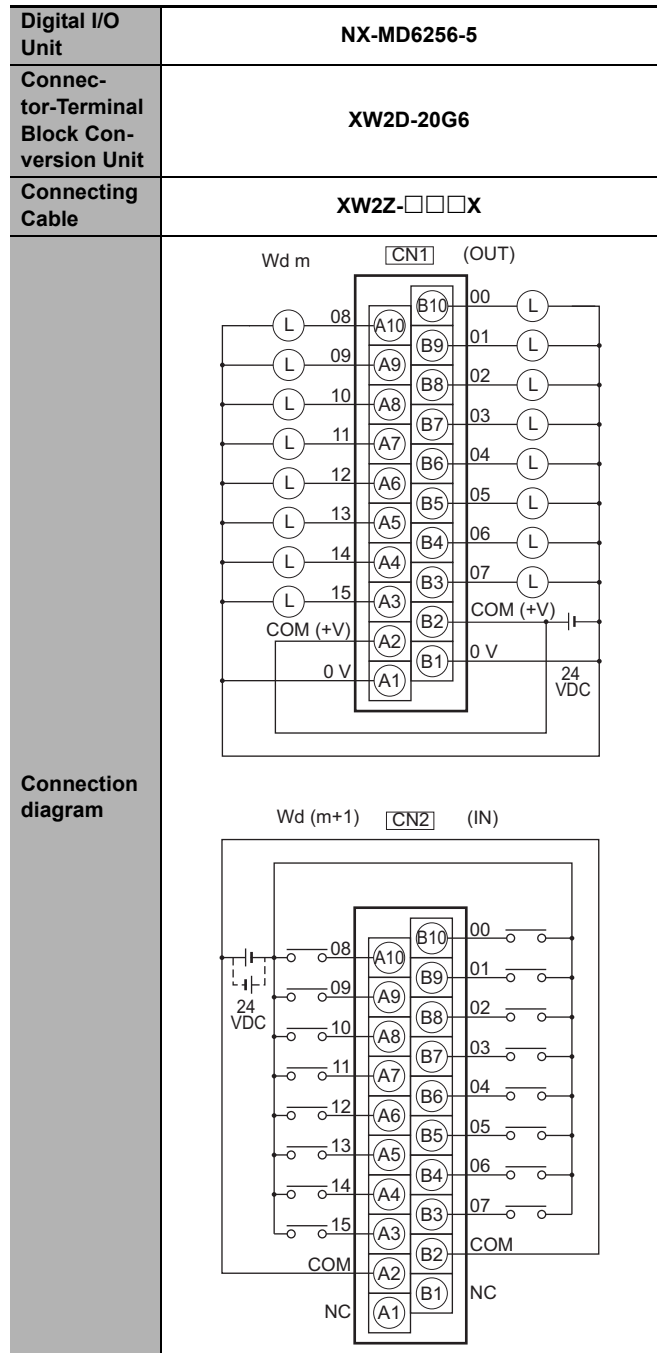


- Note 1. Connect the A9/B9 terminal and the ⊖ terminal.  
 Connect the A10/B10 terminal and the ⊕ terminal.  
 (Use the enclosed short bar.)
2. The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.

## Inputs and Outputs



- Note 1. The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction.
2. The COM terminals and +V terminals are internally connected inside the Unit, but they must all be wired.



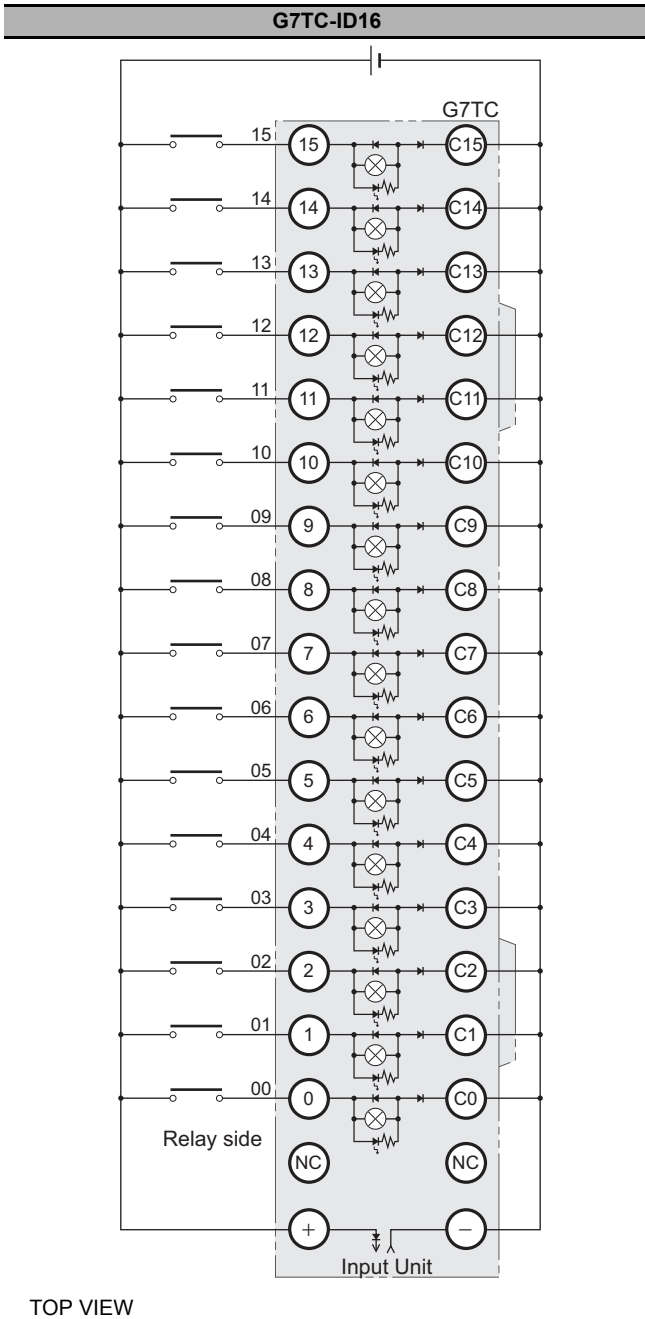
- Note 1. The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction.
2. The COM terminals and 0 V terminals are internally connected inside the Unit, but they must all be wired.

## A-3-4 Connection Diagrams for I/O Relay Terminals

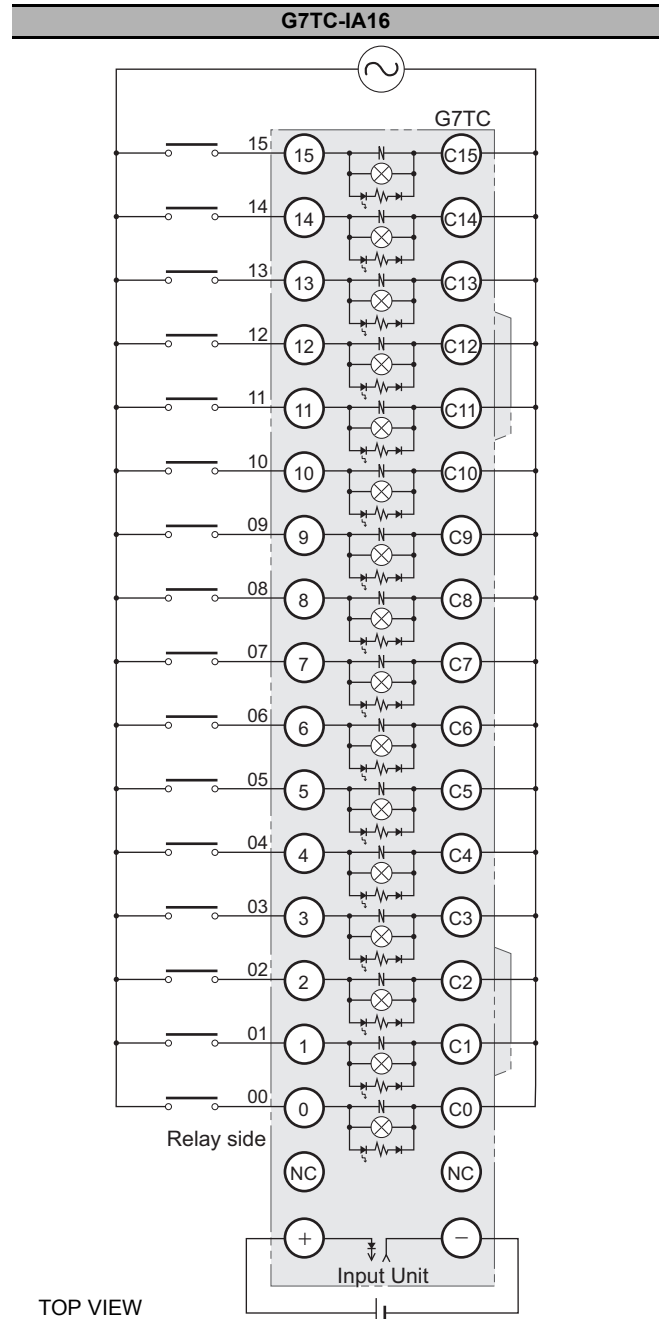
Connection examples and internal connection diagrams for I/O Relay Terminals connected to Digital I/O Units are shown below.

### Inputs

#### ● G7TC I/O Relay Terminals



- Note 1. Inputs to the Input Units and I/O Relay Terminals use isolated contacts. "00" to "15" are the input bit numbers for the Input Unit and the I/O Relay Terminal.
2. Use the G78-04 short bar to short to the common terminal.

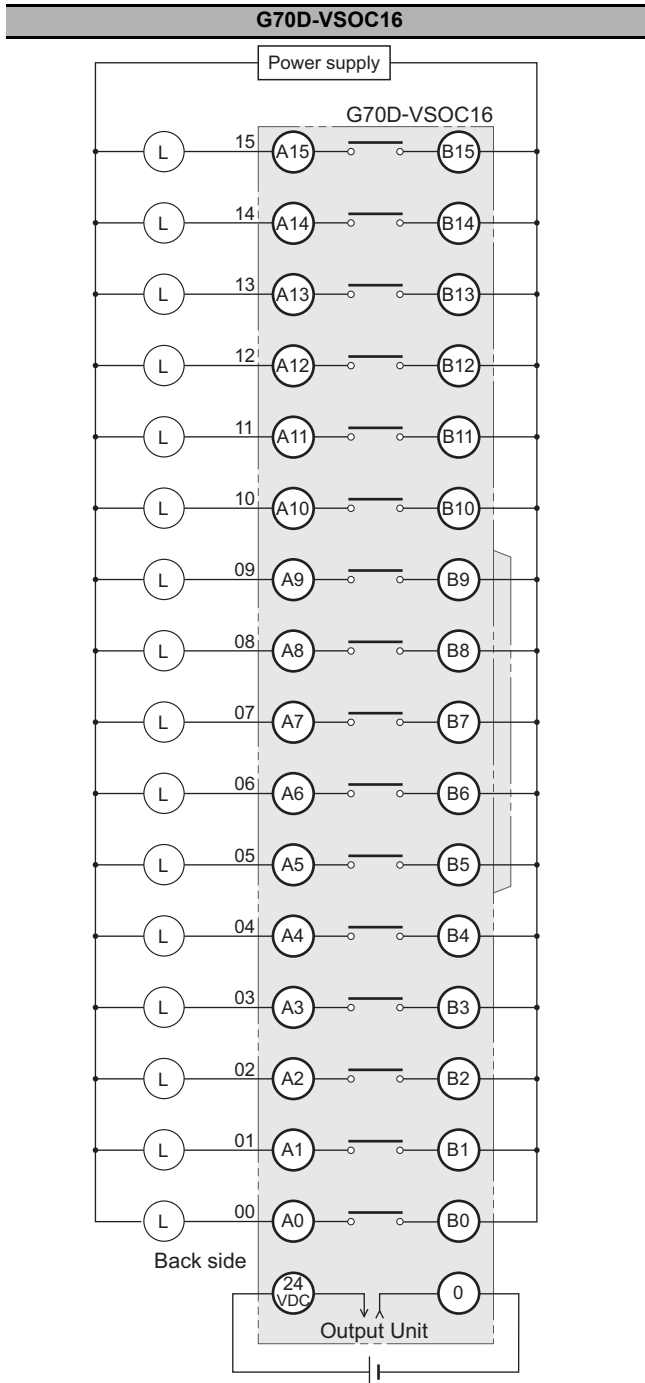


- Note 1. Inputs to the Input Units and I/O Relay Terminals use isolated contacts. "00" to "15" are the input bit numbers for the Input Unit and the I/O Relay Terminal.
2. Use the G78-04 short bar to short to the common terminal.



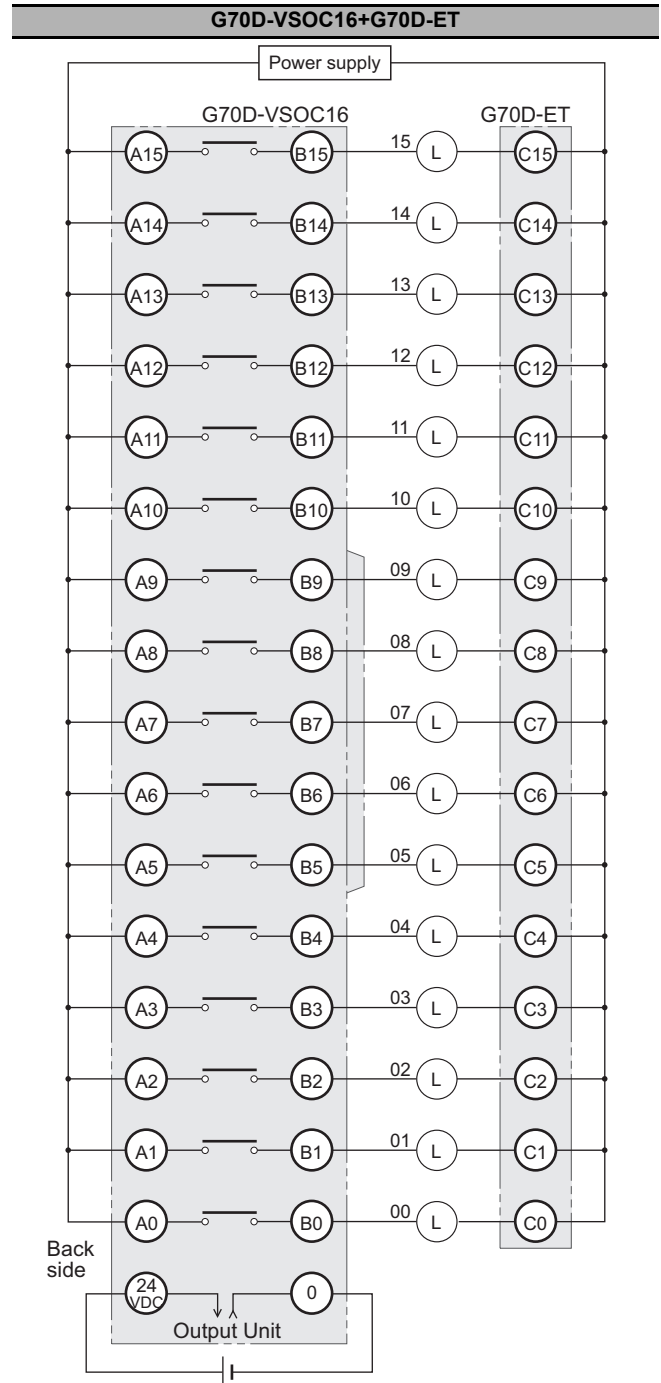
## Outputs

### ● G70D-V Relay Terminals



TOP VIEW

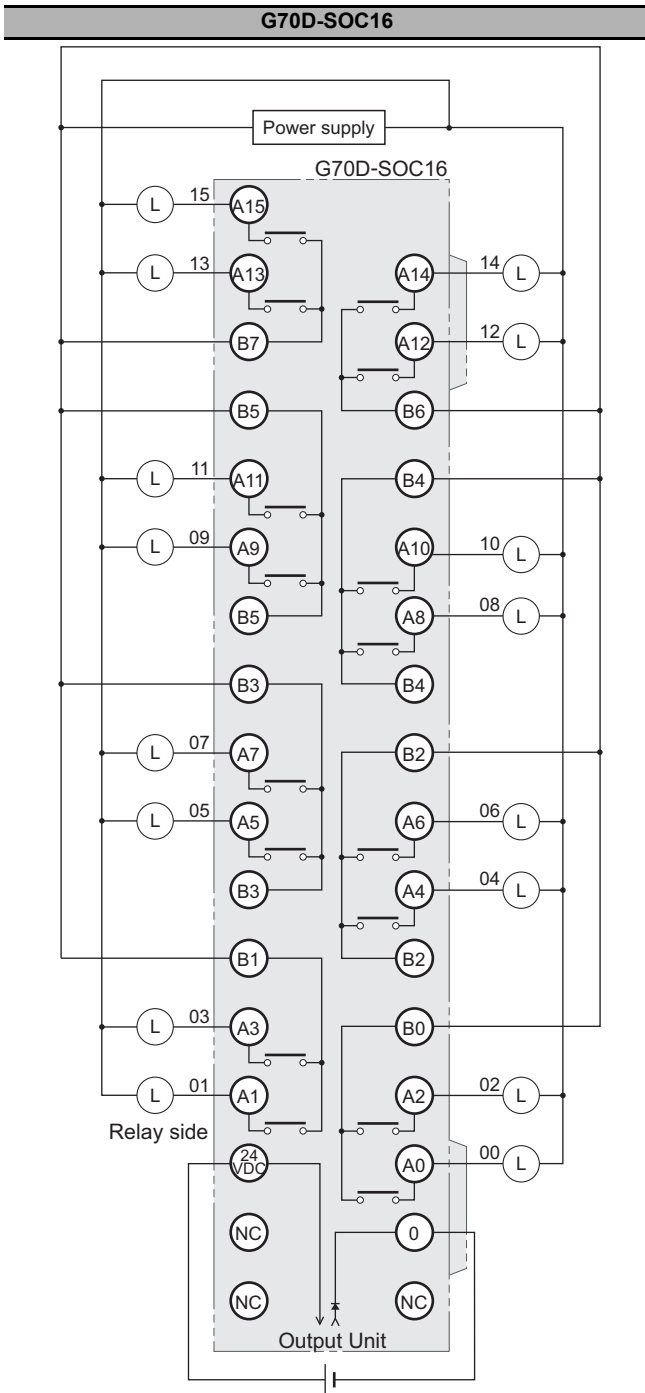
- Note 1. All outputs are independent.  
They are also isolated from the Output Unit and I/O Relay Terminal.  
“00” to “15” are the output numbers for the Output Unit and the I/O Relay Terminal.
- Use the G6D-4-SB short bar to short to the common terminal.



TOP VIEW

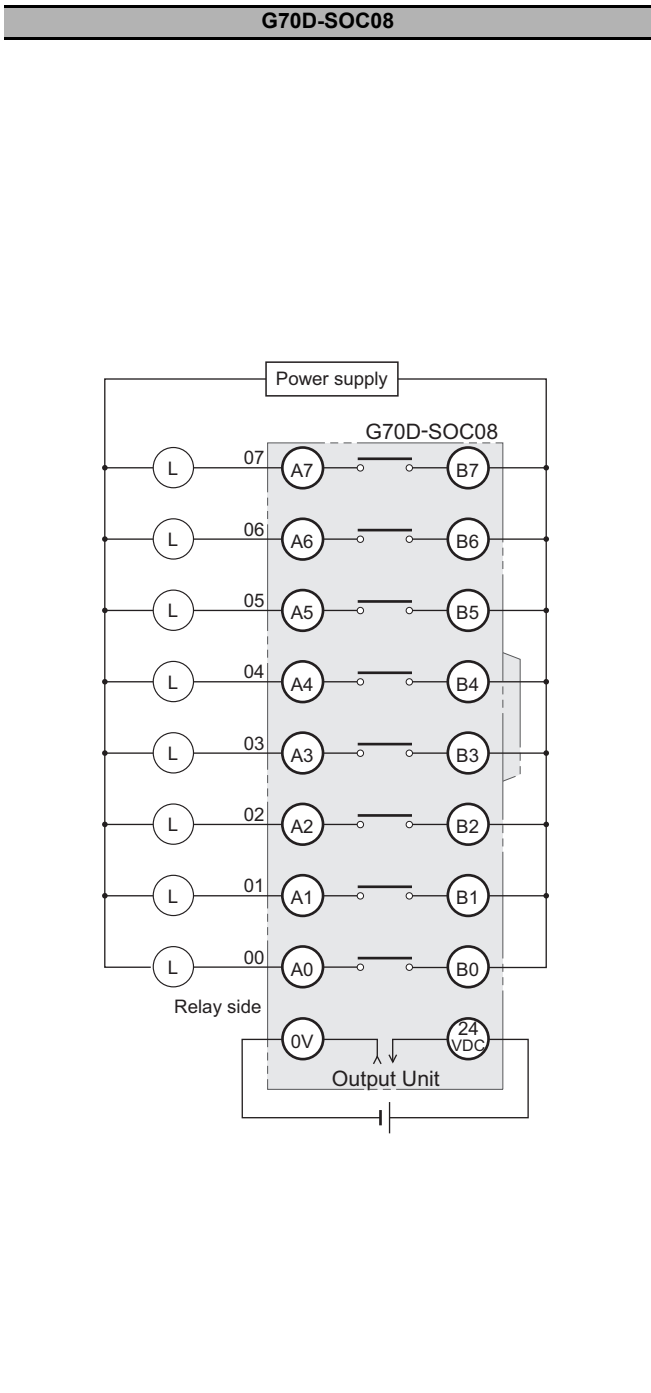
- Note 1. All outputs are independent.  
They are also isolated from the Output Unit and I/O Relay Terminal.  
“00” to “15” are the output numbers for the Output Unit and the I/O Relay Terminal.
- Use the G6D-4-SB short bar to short to the common terminal.

● G70D Relay Terminals



TOP VIEW

Note 1. Every two outputs share a common. The current supplied is 3 A per common. They are also isolated from the Output Unit and I/O Relay Terminal. "00" to "15" are the output numbers for the Output Unit and the I/O Relay Terminal.



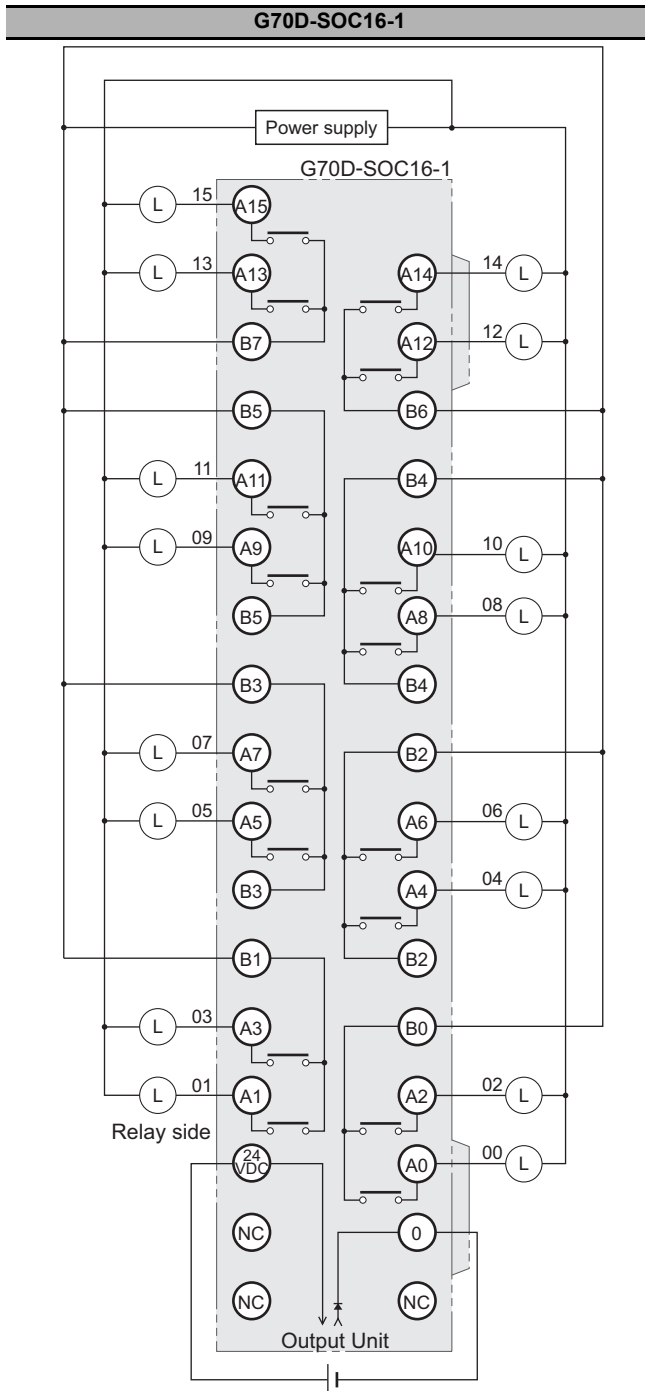
TOP VIEW

Note 1. All outputs are independent. They are also isolated from the Output Unit and I/O Relay Terminal. "00" to "07" are the output numbers for the Output Unit and the I/O Relay Terminal.

2. Use the G6D-4-SB short bar to short to the common terminal.

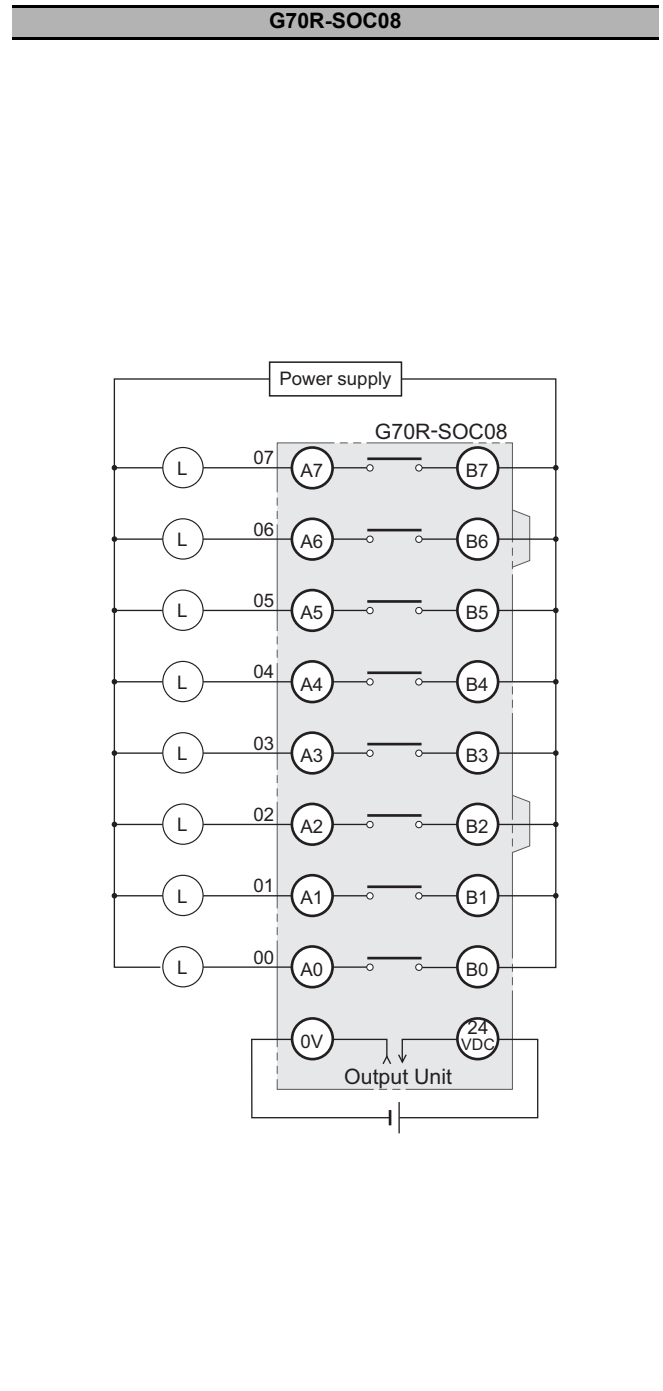
● G70D Relay Terminals

● G70R Relay Terminals



TOP VIEW

Note 1. Every two outputs share a common. The current supplied is 3 A per common. They are also isolated from the Output Unit and I/O Relay Terminal. "00" to "15" are the output numbers for the Output Unit and the I/O Relay Terminal.

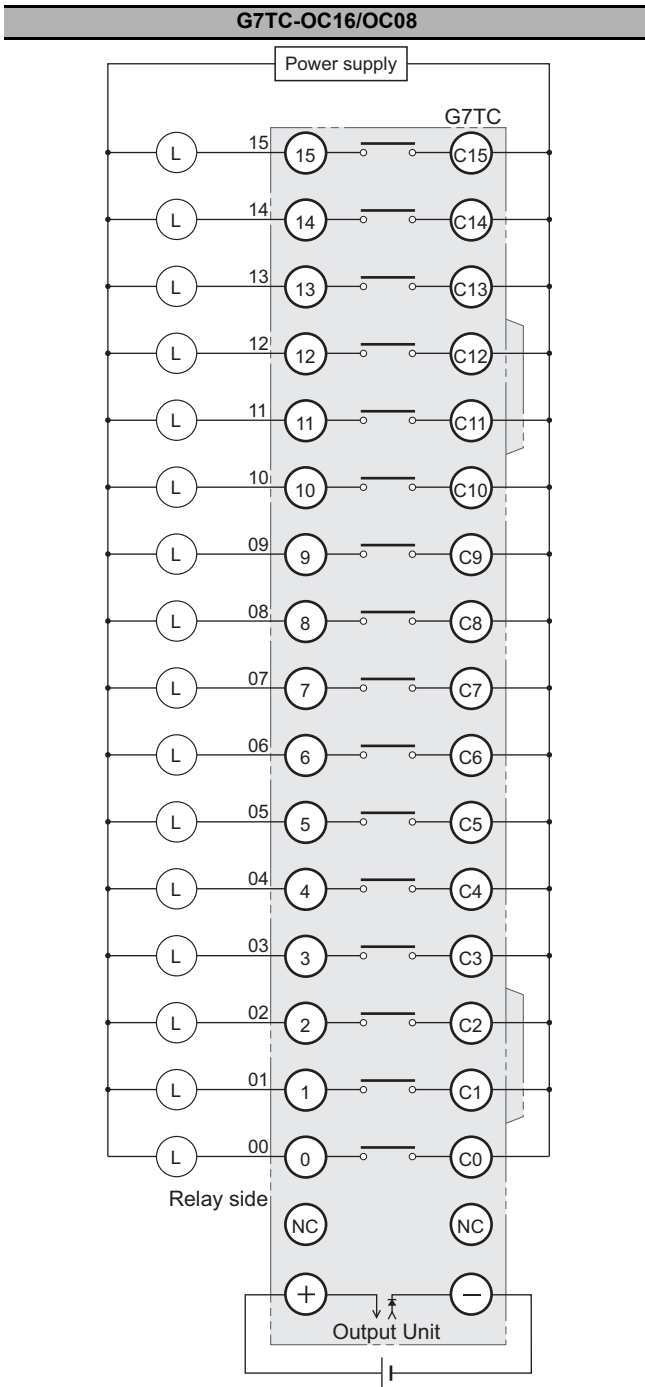


TOP VIEW

Note 1. All outputs are independent. They are also isolated from the Output Unit and I/O Relay Terminal. "00" to "07" are the output numbers for the Output Unit and the I/O Relay Terminal.

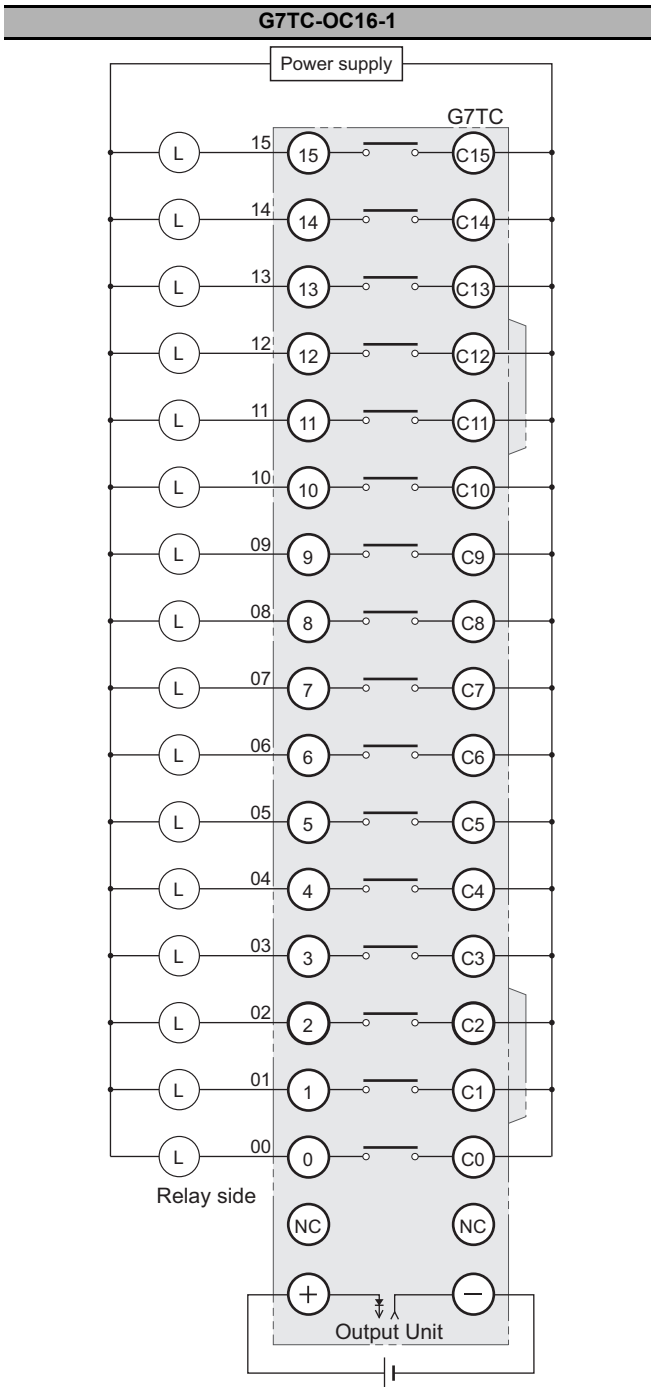
2. Use the G6D-4-SB short bar to short to the common terminal.

● G7TC I/O Relay Terminals



TOP VIEW

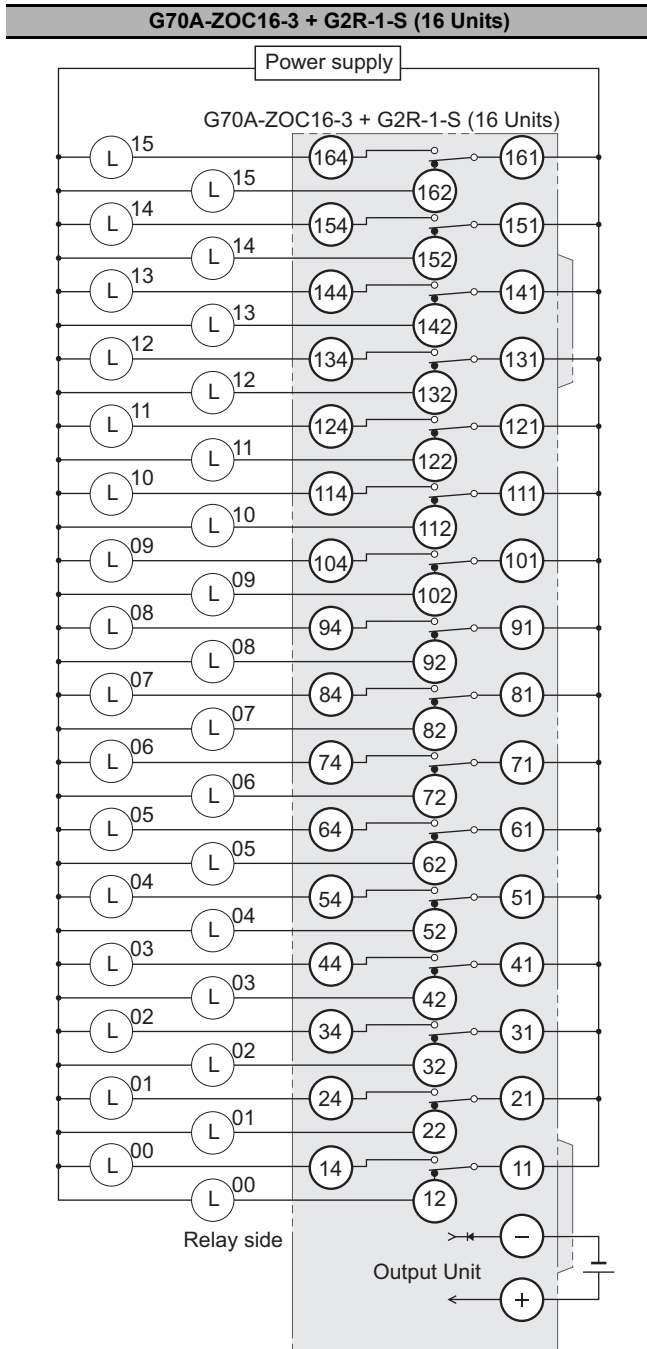
- Note 1. All outputs are independent.  
They are also isolated from the Output Unit and I/O Relay Terminal.  
“00” to “15” are the output numbers for the Output Unit and the I/O Relay Terminal.
- The G7TC-OC08 has only 8 outputs and therefore does not have 8 to 15 and C8 to C15.
  - Use the G78-04 short bar to short to the common terminal.



TOP VIEW

- Note 1. All outputs are independent.  
They are also isolated from the Output Unit and I/O Relay Terminal.  
“00” to “15” are the output numbers for the Output Unit and the I/O Relay Terminal.
- Use the G78-04 short bar to short to the common terminal.

● **G70A-ZOC16**  
**Relay Terminal Socket**



TOP VIEW

- Note 1. The above diagram is an example with the G2R-1-S (N) mounted to the G70A-ZOC16-3.
2. All outputs are independent. They are also isolated from the Output Unit and I/O Relay Terminal.
- “00” to “15” are the output numbers for the Output Unit and the I/O Relay Terminal.

## A-4 EMC Directive Measures for Relay Outputs

### ● Conformance to EC Directives

The NX-series I/O Units conform to the Common Emission Standards (EN 61131-2) of the EMC Directives. However, when incorporating in the system, noise generated by relay output switching may not satisfy these Standards.

In such a case, appropriate countermeasures must be provided externally to the Output Unit, such as by connecting a contact protection circuit. Countermeasures taken to satisfy the standards vary depending on the devices on the load side, wiring, configuration of machines, etc.

### ● Countermeasures

- Countermeasures are not required: the switching frequency of the entire system incorporating the Output Unit is less than 5 times per minute
- Countermeasures are required: the switching frequency of the entire system incorporating the Output Unit is more than 5 times per minute

Refer to EN 61131-2 for details.

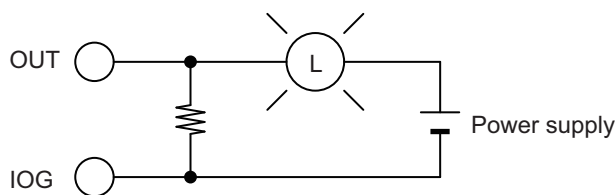
### ● Countermeasure Example

The following measures must be taken.

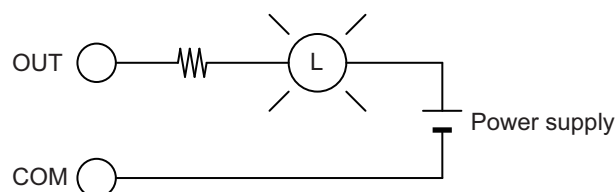
Use the measures to reduce the noises that are occurred.

- When switching an inductive load, connect a contact protection circuit in parallel with the load or contact. (Refer to *Inductive Load* on page 7-22.)
- When switching a load with a high inrush current such as an incandescent lamp, use either of the following methods to reduce the inrush current.

<Method 1. Draw about 1/3 of the current consumed by the load.>



<Method 2. Mount a limiting resistor.>



# A-5 List of NX Objects

This section describes the NX objects of the Digital I/O Units.

## A-5-1 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 allocation	Data attribute

- 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-5-2 Digital Input Units

### Unit Information Objects

This object gives the 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	7	7	–	USINT	RO	Not possible	–
	02	Model	*1	–	–	ARRAY [0..11] OF BYTE	RO	Not possible	–
	03	Device Type	*2	–	–	UDINT	RO	Not possible	–
	04	Product Code	*3	–	–	UDINT	RO	Not possible	–
	05	Vendor Code	00000001 hex *4	–	–	UDINT	RO	Not possible	–
	06	Unit Version	*5	–	–	UDINT	RO	Not possible	–
	07	Serial Number	*6	00000000 to FFFFFFFF hex	–	UDINT	RO	Not possible	–
1001	–	Production Info	–	–	–	–	–	–	–
	00	Number of Entries	2	2	–	USINT	RO	Not possible	–
	01	Lot Number	*7	00000000 to FFFFFFFF hex	–	UDINT	RO	Not possible	–
	02	Hardware Version	*8	–	–	ARRAY [0..19] OF BYTE	RO	Not possible	–

\*1. The product models are assigned in ascending order from the lowest number of array elements. Any remainder elements are filled with spaces.

\*2. The device types are assigned for each product Unit type.  
Bits 0 to 31: Device type

\*3. The product codes are assigned for each product model.  
Bits 0 to 31: Product code

\*4. OMRON vendor code

\*5. Bits 24 to 31: Integer part of the Unit version.  
Bits 16 to 23: Fractional part of the Unit version.  
Bits 0 to 15: Reserved  
(Example) For Ver.1.0, 0100□□□□ hex

\*6. A unique serial number is assigned for each product unit.  
Bits 0 to 31: Serial number

\*7. The year, month, and day of production are assigned to the "lot number".  
Bits 24 to 31: Date of production  
Bits 16 to 23: Month of production  
Bits 8 to 15: Year of production  
Bits 0 to 7: Reserved

\*8. The hardware version is assigned in ascending order from the earliest number of array elements. Any remainder elements are filled 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-series Instructions Reference Manual* (Cat. No. W502-E1-07 or later) 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	–	Bit Input	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Bit 00	FALSE	TRUE or FALSE	–	BOOL	RO	Possible	–
	02	Input Bit 01	FALSE	TRUE or FALSE	–	BOOL	RO	Possible	–
	03	Input Bit 02	FALSE	TRUE or FALSE	–	BOOL	RO	Possible	–
	04	Input Bit 03	FALSE	TRUE or FALSE	–	BOOL	RO	Possible	–

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID3317/ID3343/ID3417/ID3443/ ID3344/ID3444/IA3117	4	4 (fixed)
Other models	0	0 (fixed)

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6001	–	BYTE Input	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Bit 8 bits	00 hex	00 to FF hex *2	–	BYTE	RO	Possible	–

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID4342/ID4442	1	1 (fixed)
Other models	0	0 (fixed)

\*2. Detailed data for Input Bit 8 bits are as follows.

- Bit 0: Input Bit 00
- Bit 1: Input Bit 01
- .
- .
- .
- Bit 7: Input Bit 07

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6002	–	Word Input	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Bit 16 bits	0000 hex	0000 to FFFF hex *2	–	WORD	RO	Possible	–

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID5142-5/ID5342/ID5442	1	1 (fixed)
Other models	0	0 (fixed)

\*2. Detailed data for Input Bit 16 bits are as follows.

- Bit 0: Input Bit 00
- Bit 1: Input Bit 01
- .
- .
- .
- Bit 15: Input Bit 15

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6003	–	DWORD Input	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Bit 32 bits	00000000 hex	00000000 to FFFFFFFF hex*2	–	DWORD	RO	Possible	–

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID6142-5	1	1 (fixed)
Other models	0	0 (fixed)

\*2. Detailed data for Input Bit 32 bits are as follows.

- Bit 0: Input Bit 00
- Bit 1: Input Bit 01
- .
- .
- .
- Bit 31: Input Bit 31

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6010	–	Time Stamp	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Bit 00 Time Stamp	0	0 to +18446744073709551615	ns	ULINT	RO	Possible	–
	02	Input Bit 01 Time Stamp				ULINT	RO	Possible	–
	03	Input Bit 02 Time Stamp				ULINT	RO	Possible	–
	04	Input Bit 03 Time Stamp				ULINT	RO	Possible	–
ULINT						RO	Possible	–	

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID3344/ID3444	4	4 (fixed)
Other models	0	0 (fixed)

## 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
5000	–	Input Filter Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Filter Value Setting	3	0 to 11 *2	–	USINT	RW	Not possible	Y
	02	Input Filter Mode Setting	0	0/1 *3	–	USINT	RW	Not possible	Y

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID3317/ID3417/ID4342/ID4442/ID5142-5/ID5342/ID5442/ID6142-5/IA3117	2	2 (fixed)
Other models	0	0 (fixed)

\*2. The meaning of the set values for Input Filter Value Setting is as follows.

Set value	Meaning
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 ms

\*3. The meaning of the set values for Input Filter Mode Setting is as follows.

Set value	Meaning
0	Enable ON Filter and OFF Filter
1	Enable Only OFF Filter

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5001	–	Input Filter Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Filter Value Setting	4	0 to 9 *2	–	USINT	RW	Not possible	Y
	02	Input Filter Mode Setting	0	0/1 *3	–	USINT	RW	Not possible	Y

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID3343/ID3443	2	2 (fixed)
Other models	0	0 (fixed)

\*2. The meaning of the set values for Input Filter Value Setting is as follows.

Set value	Meaning
0	No Filter
1	1 μs
2	2 μs
3	4 μs
4	8 μs
5	16 μs
6	32 μs
7	64 μs
8	128 μs
9	256 μs

\*3. The meaning of the set values for Input Filter Mode Setting is as follows.

Set value	Meaning
0	Enable ON Filter and OFF Filter
1	Enable Only OFF Filter

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5005	–	Time Stamp (Trigger Setting)	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Bit 00 Trigger Setting	FALSE	TRUE or FALSE *2	–	BOOL	RW	Not possible	Y
	02	Input Bit 01 Trigger Setting	FALSE		–	BOOL	RW	Not possible	Y
	03	Input Bit 02 Trigger Setting	FALSE		–	BOOL	RW	Not possible	Y
	04	Input Bit 03 Trigger Setting	FALSE		–	BOOL	RW	Not possible	Y

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID3344/ID3444	4	4 (fixed)
Other models	0	0 (fixed)

\*2. The meaning of the set values for Input Bit  Trigger Setting is as follows.

Set value	Meaning
FALSE	Rising Edge
TRUE	Falling Edge

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5006	–	Time Stamp (Mode Setting)	–	–	–	–	–	–	–
	00	Number of Entries	–	*1	–	USINT	RO	Not possible	–
	01	Input Bit 00 Mode Setting	FALSE	TRUE or FALSE *2	–	BOOL	RW	Not possible	Y
	02	Input Bit 01 Mode Setting	FALSE		–	BOOL	RW	Not possible	Y
	03	Input Bit 02 Mode Setting	FALSE		–	BOOL	RW	Not possible	Y
	04	Input Bit 03 Mode Setting	FALSE		–	BOOL	RW	Not possible	Y

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID3344/ID3444	4	4 (fixed)
Other models	0	0 (fixed)

\*2. The meaning of the set values for Input Bit  Mode Setting is as follows.

Set value	Meaning
FALSE	Continuous (Last changed time)
TRUE	One-shot (First changed time)

## A-5-3 Digital Output Units

### Unit Information Objects

This object gives the 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	7	7	–	USINT	RO	Not possible	–
	02	Model	*1	–	–	ARRAY [0..11] OF BYTE	RO	Not possible	–
	03	Device Type	*2	–	–	UDINT	RO	Not possible	–
	04	Product Code	*3	–	–	UDINT	RO	Not possible	–
	05	Vendor Code	00000001 hex *4	–	–	UDINT	RO	Not possible	–
	06	Unit Version	*5	–	–	UDINT	RO	Not possible	–
	07	Serial Number	*6	00000000 to FFFFFFFF hex	–	UDINT	RO	Not possible	–
1001	–	Production Info	–	–	–	–	–	–	–
	00	Number of Entries	2	2	–	USINT	RO	Not possible	–
	01	Lot Number	*7	00000000 to FFFFFFFF hex	–	UDINT	RO	Not possible	–
	02	Hardware Version	*8	–	–	ARRAY [0..19] OF BYTE	RO	Not possible	–

\*1. The product models are assigned in ascending order from the lowest number of array elements. Any remainder elements are filled with spaces.

\*2. The device types are assigned for each product Unit type.  
Bits 0 to 31: Device type

\*3. The product codes are assigned for each product model.  
Bits 0 to 31: Product code

\*4. OMRON vendor code

\*5. Bits 24 to 31: Integer part of the Unit version.  
Bits 16 to 23: Fractional part of the Unit version.  
Bits 0 to 15: Reserved  
(Example) For Ver.1.0, 0100□□□□ hex

\*6. A unique serial number is assigned for each product unit.  
Bits 0 to 31: Serial number

\*7. The year, month, and day of production are assigned to the "lot number".  
Bits 24 to 31: Date of production  
Bits 16 to 23: Month of production  
Bits 8 to 15: Year of production  
Bits 0 to 7: Reserved

\*8. The hardware version is assigned in ascending order from the earliest number of array elements. Any remainder elements are filled 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-series Instructions Reference Manual* (Cat. No. W502-E1-07 or later) 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
7000	–	Bit Output	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Output Bit 00	FALSE	TRUE or FALSE	–	BOOL	RW	Possible	N
	02	Output Bit 01	FALSE	TRUE or FALSE	–	BOOL	RW	Possible	N
	03	Output Bit 02	FALSE	TRUE or FALSE	–	BOOL	RW	Possible	N
	04	Output Bit 03	FALSE	TRUE or FALSE	–	BOOL	RW	Possible	N

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD3121/OD3153/OD3256/OD3257	4	4 (fixed)
NX-OD2154/OD2258/OC2633/OC2733	2	2 (fixed)
Other models	0	0 (fixed)

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7001	–	BYTE Output	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Output Bit 8 bits	00 hex	00 to FF hex	–	BYTE	RW	Possible	N

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD4121/OD4256	1	1 (fixed)
Other models	0	0 (fixed)

\*2. Detailed data for Output Bit 8 bits are as follows.

- Bit 0: Output Bit 00
- Bit 1: Output Bit 01
- .
- .
- .
- Bit 7: Output Bit 07

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7002	–	Word Output	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Output Bit 16 bits	0000 hex	0000 to FFFF hex	–	WORD	RW	Possible	N

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD5121/OD5121-5/OD5256/OD5256-5	1	1 (fixed)
Other models	0	0 (fixed)

\*2. Detailed data for Output Bit 16 bits are as follows.

- Bit 0: Output Bit 00
- Bit 1: Output Bit 01
- .
- .
- .
- Bit 15: Output Bit 15

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7003	–	DWORD Output	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Output Bit 32 bits	00000000 hex	00000000 to FFFFFFFF hex*2	–	DWORD	RW	Possible	N

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD6121-5/OD6256-5	1	1 (fixed)
Other models	0	0 (fixed)

\*2. Detailed data for Output Bit 32 bits are as follows.

- Bit 0: Output Bit 00
- Bit 1: Output Bit 01
- .
- .
- .
- Bit 31: Output Bit 31

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7010	–	Time Stamp	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Output Bit 00 Time Stamp	0	0 to +18446744073 709551615	ns	ULINT	RW	Possible	N
	02	Output Bit 01 Time Stamp				ULINT	RW	Possible	N

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD2154/OD2258	2	2 (fixed)
Other models	0	0 (fixed)

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6011	–	Specified Time Stamp Output Status	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Output Bit 00 Output Status	FALSE	TRUE or FALSE *2	–	BOOL	RO	Possible	N
	02	Output Bit 01 Output Status				BOOL	RO	Possible	N

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD2154/OD2258	2	2 (fixed)
Other models	0	0 (fixed)

\*2. The meaning of the set values for Output Bit□□Output Status is as follows.

Set value	Meaning
FALSE	Output completion
TRUE	Waiting for output to refresh

## 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
5010	–	Load Rejection Output Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Load Rejection Output for Output Bit 00	FALSE	TRUE or FALSE *2	–	BOOL	RW	Not possible	Y
	02	Load Rejection Output for Output Bit 01	FALSE		–	BOOL	RW	Not possible	Y
	03	Load Rejection Output for Output Bit 02	FALSE		–	BOOL	RW	Not possible	Y
	04	Load Rejection Output for Output Bit 03	FALSE		–	BOOL	RW	Not possible	Y

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD3121/OD3153/OD3256/OD3257	4	4 (fixed)
NX-OC2633/OC2733	2	2 (fixed)
Other models	0	0 (fixed)

\*2. The meaning of the set values for Load Rejection Output for Output Bit □□ is as follows.

Set value	Meaning
FALSE	OFF
TRUE	Hold the present value.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5011	–	Load Rejection Byte Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Load Rejection Output for Output Bit (8 bits)	00 hex	00 to FF hex <sup>*2</sup>	–	BYTE	RW	Not possible	Y

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD4121/OD4256	1	1 (fixed)
Other models	0	0 (fixed)

\*2. The detailed data and meaning of the set values for Load Rejection Output for Output Bit (8 bits) are as follows.

Bit 0: Load Rejection Output for Output Bit 00

Bit 1: Load Rejection Output for Output Bit 01

.

.

.

Bit 7: Load Rejection Output for Output Bit 07

Set value	Meaning
0	OFF
1	Hold the present value.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5012	–	Load Rejection Word Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Load Rejection Output for Output Bit (16 bits)	0000 hex	0000 to FFFF hex <sup>*2</sup>	–	WORD	RW	Not possible	Y

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD5121/OD5121-5/OD5256/OD5256-5	1	1 (fixed)
Other models	0	0 (fixed)

\*2. The detailed data and meaning of the set values for Load Rejection Output for Output Bit (16 bits) are as follows.

Bit 0: Load Rejection Output for Output Bit 00

Bit 1: Load Rejection Output for Output Bit 01

.

.

.

Bit 15: Load Rejection Output for Output Bit 15

Set value	Meaning
0	OFF
1	Hold the present value.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5013	–	Load Rejection DWord Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Load Rejection Output for Output Bit (32 bits)	00000000 hex	00000000 to FFFFFFFF hex *2	–	DWORD	RW	Not possible	Y

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD6121-5/OD6256-5	1	1 (fixed)
Other models	0	0 (fixed)

\*2. The detailed data and meaning of the set values for Load Rejection Output for Output Bit (32 bits) are as follows.

Bit 0: Load Rejection Output for Output Bit 00

Bit 1: Load Rejection Output for Output Bit 01

.

.

.

Bit 31: Load Rejection Output for Output Bit 31

Set value	Meaning
0	OFF
1	Hold the present value.



## A-5-4 Digital Mixed I/O Units

### Unit Information Objects

This object gives the 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	7	7	–	USINT	RO	Not possible	–
	02	Model	*1	–	–	ARRAY [0..11] OF BYTE	RO	Not possible	–
	03	Device Type	*2	–	–	UDINT	RO	Not possible	–
	04	Product Code	*3	–	–	UDINT	RO	Not possible	–
	05	Vendor Code	00000001 hex *4	–	–	UDINT	RO	Not possible	–
	06	Unit Version	*5	–	–	UDINT	RO	Not possible	–
	07	Serial Number	*6	00000000 to FFFFFFFF hex	–	UDINT	RO	Not possible	–
1001	–	Production Info	–	–	–	–	–	–	–
	00	Number of Entries	2	2	–	USINT	RO	Not possible	–
	01	Lot Number	*7	00000000 to FFFFFFFF hex	–	UDINT	RO	Not possible	–
	02	Hardware Version	*8	–	–	ARRAY [0..19] OF BYTE	RO	Not possible	–

- \*1. The product models are assigned in ascending order from the lowest number of array elements. Any remainder elements are filled with spaces.
- \*2. The device types are assigned for each product Unit type.  
Bits 0 to 31: Device type
- \*3. The product codes are assigned for each product model.  
Bits 0 to 31: Product code
- \*4. OMRON vendor code
- \*5. Bits 24 to 31: Integer part of the Unit version.  
Bits 16 to 23: Fractional part of the Unit version.  
Bits 0 to 15: Reserved  
(Example) For Ver.1.0, 0100□□□□ hex
- \*6. A unique serial number is assigned for each product unit.  
Bits 0 to 31: Serial number

- \*7. The year, month, and day of production are assigned to the "lot number".  
 Bits 24 to 31: Date of production  
 Bits 16 to 23: Month of production  
 Bits 8 to 15: Year of production  
 Bits 0 to 7: Reserved
- \*8. The hardware version is assigned in ascending order from the earliest number of array elements. Any remainder elements are filled 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-series Instructions Reference Manual* (Cat. No. W502-E1-07 or later) 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
6002	–	WORD Input	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Bit 16 bits	0000 hex	0000 to FFFF hex *2	–	WORD	RO	Possible	–

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-MD6121-5/MD6256-5	1	1 (fixed)
Other models	0	0 (fixed)

\*2. Detailed data for Input Bit 16 bits are as follows.

- Bit 0: Input Bit 00
- Bit 1: Input Bit 01
- .
- .
- .
- Bit 15: Input Bit 15

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7002	–	WORD Output	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Output Bit 16 bits	0000 hex	0000 to FFFF hex *2	–	WORD	RW	Possible	N

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-MD6121-5/MD6256-5	1	1 (fixed)
Other models	0	0 (fixed)

\*2. Detailed data for Output Bit 16 bits are as follows.

- Bit 0: Output Bit 00
- Bit 1: Output Bit 01
- .
- .
- .
- Bit 15: Output Bit 15

## 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
5000	–	Input Filter Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Filter Value Setting	3	0 to 11 *2	–	USINT	RW	Not possible	Y
	02	Input Filter Mode Setting	0	0/1 *3	–	USINT	RW	Not possible	Y

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-MD6121-5/MD6256-5	2	2 (fixed)
Other models	0	0 (fixed)

\*2. The meaning of the set values for Input Filter Value Setting is as follows.

Set value	Meaning
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 ms

\*3. The meaning of the set values for Input Filter Mode Setting is as follows.

Set value	Meaning
0	Enable ON Filter and OFF Filter
1	Enable Only OFF Filter

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5012	–	Load Rejection Word Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Load Rejection Output for Output Bit (16 bits)	0000 hex	0000 to FFFF hex *2	–	WORD	RW	Not possible	Y

\*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-MD6121-5/MD6256-5	1	1 (fixed)
Other models	0	0 (fixed)

\*2. The detailed data and meaning of the set values for Load Rejection Output for Output Bit (16 bits) are as follows.

Bit 0: Load Rejection Output for Output Bit 00

Bit 1: Load Rejection Output for Output Bit 01

.

.

.

Bit 15: Load Rejection Output for Output Bit 15

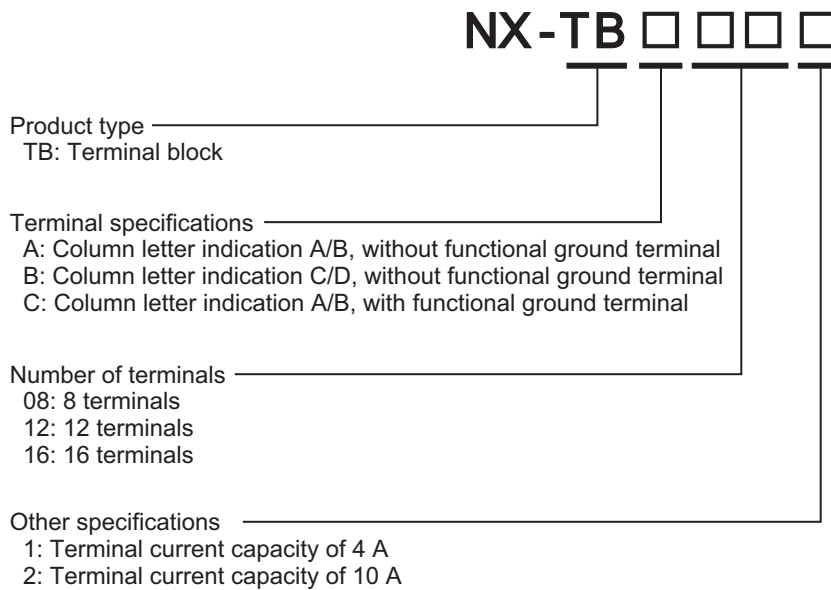
Set value	Meaning
0	OFF
1	Hold the present value.

# A-6 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-6-1 Model Notation

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



## A-6-2 List of Terminal Block Models

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

Terminal Block model	Number of terminals	Ground terminal	Terminal current capacity
NX-TBA081	8	Not provided	4 A
NX-TBA121	12		
NX-TBA161	16		
NX-TBB121	12		
NX-TBB161	16		
NX-TBA082	8		
NX-TBA122	12	Provided	10 A
NX-TBA162	16		
NX-TBB122	12		
NX-TBB162	16		
NX-TBC082	8		
NX-TBC162	16		

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

# A-7 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

### A-7-1 Relationship between Unit Versions of NX Units, Communications Coupler Units and CPU Units, and Versions of Sysmac Studio

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

With the combinations of the unit versions/versions shown below, you can use all the functions that are supported by each unit version of each Unit model.

Use the unit versions/versions that correspond to the NX Unit models and the unit versions or the later/higher 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.

Refer to the user's manuals for the specific Units for the functions that were added or changed for each unit version update of the Communications Coupler Units or NX Units.

Refer to the *NX-series Data Reference Manual* (Cat. No. W525-E1-03 or later) for information on the relationship between the support functions of the Communications Coupler Units and restrictions on the NX Units.

Model		: Model numbers of NX Units.
Unit Version		: Unit versions of NX Units.
EtherCAT	Communications Coupler Units	: Unit versions of EtherCAT Coupler Units, NX-ECC201 and NX-ECC202, which are compatible with the NX Units.
	CPU Units	: Unit versions of NJ-series CPU Units, NJ501-□□□□ and NJ301-□□□□, which are compatible with the EtherCAT Coupler Unit.
	Sysmac Studio	: Sysmac Studio versions that are compatible with the Ether-CAT Coupler Unit.

NX Units		Corresponding Unit Versions/Versions <sup>*1</sup>					
Model	Unit version	EtherCAT					
		Communications Coupler Units	CPU Units	Sysmac Studio			
NX-ID3317	Ver.1.0	Ver.1.0	Ver.1.05	Ver.1.06			
NX-ID3343							
NX-ID3344		Ver.1.1	Ver.1.06 <sup>*2</sup>	Ver.1.07			
NX-ID3417		Ver.1.0	Ver.1.05	Ver.1.06			
NX-ID3443		Ver.1.1	Ver.1.06 <sup>*2</sup>	Ver.1.07			
NX-ID3444							
NX-ID4342		Ver.1.0	Ver.1.05	Ver.1.06			
NX-ID4442							
NX-ID5142-5					Ver.1.10		
NX-ID5342					Ver.1.06		
NX-ID5442					Ver.1.10		
NX-ID6142-5							
NX-IA3117						Ver.1.08	
NX-OD2154					Ver.1.1	Ver.1.06 <sup>*2</sup>	Ver.1.07
NX-OD2258							
NX-OD3121					Ver.1.0	Ver.1.05	Ver.1.06
NX-OD3153							
NX-OD3256							
NX-OD3257							
NX-OD4121							
NX-OD4256							
NX-OD5121							
NX-OD5121-5		Ver.1.10					
NX-OD5256		Ver.1.06					
NX-OD5256-5		Ver.1.10					
NX-OD6121-5		Ver.1.06					
NX-OD6256-5							
NX-OC2633							
NX-OC2733	Ver.1.08						
NX-MD6121-5	Ver.1.10						
NX-MD6256-5							

- \*1. Depending on the type of Unit, some models do not have all of the versions given in the above table. For those models, the oldest version applies. The oldest version means the oldest of the versions or the later versions given in the above table. Refer to the relevant user's manuals for specific Units for details on the relationship between models and versions.
- \*2. The instructions for time stamp refreshing are supported by CPU Units with unit version 1.06 or later. If you do not use instructions for time stamp refreshing, you can use version 1.05. Refer to the *NJ-series Instructions Reference Manual* (Cat. No. W502-E1-08 or later) for details on the instructions for time stamp refreshing.





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